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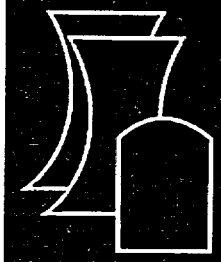

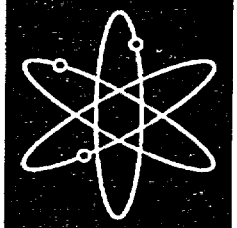

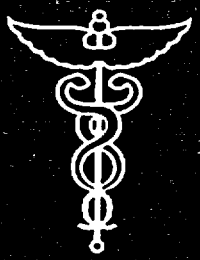

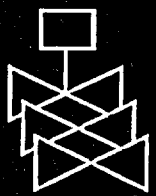

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 2

Regarding the Oconee Nuclear Station

Final Report

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
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11. ABSTRACT *(200 words or less)*

This final supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the Nuclear Regulatory Commission (NRC) by Duke Energy Corporation (Duke) to renew the operating licenses for the Oconee Nuclear Station (ONS) Units 1, 2, and 3 for an additional 20 years under 10 CFR Part 54. The supplemental environmental impact statement includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse impacts. It also includes the staff's recommendations regarding the proposed action.

Based on the analysis and findings in the Generic Environmental Statement, the environmental report submitted by Duke, consultation with other Federal and State agencies, its own independent review, and its consideration of public comments, the NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for ONS Units 1, 2, and 3 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

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Abstract

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental effects of renewing nuclear power plant operating licenses for a 20-year period in the *Generic Environmental Impact Statement for Renewal of Nuclear Plants* (GEIS), NUREG-1437, and codified the results in 10 CFR Part 51. The GEIS (and its Addendum 1) 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 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by Duke Energy Corporation (Duke) to renew the operating licenses (OLs) for Oconee Nuclear Station (ONS) Units 1, 2, and 3 for an additional 20 years under 10 CFR Part 54. This SEIS includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

Neither Duke nor the staff has identified significant new information for any of the 69 issues for which the GEIS reached generic conclusions and which apply to ONS. Therefore, the staff concludes for these issues that the impacts of renewing the ONS OLs will not be greater than impacts identified in the GEIS for these issues. For each of these issues, the GEIS conclusion is that the impact is of SMALL significance (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and from spent fuel, which were not assigned a single significance level) and that additional mitigation measures are likely not to be sufficiently beneficial to be warranted.

Each of the remaining 23 issues that applies to ONS is addressed in this SEIS. For each applicable issue, the staff concludes that the significance of the potential environmental effects of renewal of the OL is small. The staff also concludes that additional mitigation measures are likely not to be sufficiently beneficial as to be warranted.

The NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for ONS Units 1, 2, and 3 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Duke; (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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Executive Summary

By letter dated July 7, 1998, Duke Energy Corporation (Duke) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Units 1, 2, and 3 of the Oconee Nuclear Station (ONS) for an additional 20-year period. If the operating licenses are renewed, Federal (other than NRC) agencies, State regulatory agencies, and the owners of the plant will ultimately decide whether the plant will continue to operate. This decision will be 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 operating licenses are not renewed, Units 1, 2, and 3 will be shut down on or before the expiration of the current operating licenses, which are February 6, 2013, October 6, 2013, and July 19, 2014, respectively.

Under the National Environmental Policy Act of 1969 (NEPA), an environmental impact statement (EIS) is required for major Federal actions significantly affecting the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. 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 operating license; 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437.[a]

Upon acceptance of the Duke application, the NRC staff began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and to conduct scoping. The staff visited the ONS site in October 1998 and held public scoping meetings on October 19, 1998, in Clemson, South Carolina. The staff reviewed the Duke environmental report (ER) and compared it to the GEIS, consulted with Federal, State, and local agencies, conducted an independent review of the issues following the guidance set forth in the draft *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, NUREG-1555, Supplement 1, and considered the public comments from the scoping process and the comment period for the draft Supplemental Environmental Impact Statement (SEIS) for ONS (that was issued on May 20, 1999). Two public meetings were held in Clemson, South Carolina, on July 8, 1999, during which the staff described the preliminary results of the NRC environmental review and answered questions related to it in order to provide members of the public with information to assist them in formulating their comments. This SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

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

The Commission has adopted the following definition 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) decisionmakers.

The goal of the 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 decisionmakers 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 ONS continues to operate beyond the period of the current operating licenses.

The GEIS contains the results of a systematic evaluation of the consequences of renewing an operating license and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using a three-level standard of significance—SMALL, MODERATE, or LARGE—based on Council on Environmental Quality guidelines. These significance levels are 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.

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS shows that

(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 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.

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

Of the 23 issues not meeting 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, are not categorized. Environmental justice was not evaluated on a generic basis and must also 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 SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The 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 are considered include the no-action alternative (not renewing the ONS operating licenses) and alternative methods of power generation. Among the alternative methods of power generation, coal-fired and gas-fired generation appear the most likely if the power from ONS is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the ONS site or an unspecified "greenfield" site.

Duke and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Duke nor the staff has identified any significant new information related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither Duke nor the staff has identified any new issue applicable to the ONS that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all 69 Category 1 issues.

The staff has reviewed the Duke analysis for each Category 2 issue and has conducted an independent review of each issue. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at ONS. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Four additional Category 2 issues that apply to both refurbishment and to operation during the renewal term are only discussed in relation to

operation during the renewal term. Duke has stated that their evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications necessary to support the continued operation of ONS beyond the end of the existing operating licenses. In addition, routine 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 (FES) for ONS.

Twelve Category 2 issues, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. For all 12 Category 2 issues and environmental justice, the 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 staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for ONS, the staff concludes that none of the candidate SAMAs are cost beneficial.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

In the event that the ONS operating licenses are not renewed and the units cease operation on or before the expiration of their current operating licenses, the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of ONS. The impacts may, in fact, be greater in some areas.

The NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for Oconee Nuclear Station Units 1, 2, and 3 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by Duke; (3) consultation with other Federal, State, and local agencies; (4) the staff's own independent review, and (5) the staff's consideration of public comments.

Abbreviations/Acronyms

AEA	Atomic Energy Act
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
ALI	annual limits on intake
AOC	averted offsite property damage costs
AOE	averted occupational exposure
AOSC	averted onsite costs
APE	averted public exposure
Btu	British thermal units
BWST	borated water storage tank
CCW	condenser circulating water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COE	cost of enhancement
CRAC	Calculations of Reactor Accident Consequences
CWA	Clean Water Act
DBA	design basis accidents
DO	dissolved oxygen
DOC	Department of the Census
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
Duke	Duke Energy Corporation
EC	effluent concentration
EIS	Environmental Impact Statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESRP	Environmental Standard Review Plan for License Renewal
EWST	elevated water storage tank
FERC	Federal Energy Regulatory Commission
FES	final environmental statement
FR	Federal Register

FSAR	Final Safety Analysis Report
ft	feet
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act)
FWS	U.S. Fish and Wildlife Service
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
gpd	gallons per day
gpm	gallons per minute
ha	hectare
HE	high energy
HLW	high-level waste
HPI	high pressure injection
HPSW	high pressure service water
HVAC	heating, ventilation, and air conditioning
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination for External Events
IRP	Integrated Resource Plan
ISFSI	Independent Spent Fuel Storage Installation
km	kilometer
kV	kilovolt
LOCA	loss-of-coolant accident
LWR	light-water reactors
m	meter
MACCS	Melcor Accident Consequence Code System
mi	mile
MTHM	metric tonnes of heavy metal
MTU	metric ton of uranium
MW	megawatt
MW(e)	megawatt electric
MW(t)	megawatt thermal
MWd/MTU	megawatt-days per metric ton of uranium
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NIEHS	National Institute of Environmental Health Sciences

NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRR	Office of Nuclear Reactor Regulation
ODCM	Offsite Dose Calculation Manual
OL	operating license
ONS	Oconee Nuclear Station
PDS	plant damage states
PRA	Probabilistic Risk Assessment
PSI	pollutant standards index
RAI	request for additional information
RCM	reactor coolant makeup
RCRA	Resource Conservation and Recovery Act
REMP	radiological environmental monitoring program
SAMA	Severe Accident Mitigation Alternative
SCDHEC	South Carolina State Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCR	selective catalytic reduction
SCSHPO	South Carolina State Historic Preservation Office
SEIS	supplemental environmental impact statement
SGTR	steam generator tube rupture
SRM	staff requirements memorandum
SSF	standby shutdown facility
UFSAR	Updated Final Safety Analysis Report

1.0 Introduction

Duke Energy Corporation (Duke)[a] operates Oconee Nuclear Station (ONS) Units 1, 2, and 3 in northwestern South Carolina under operating licenses (OLs) DPR-38, DPR-47, and DPR-55 issued by the U.S. Nuclear Regulatory Commission (NRC). These OLs will expire in 2013 for Units 1 and 2 and in 2014 for Unit 3. By letter dated July 7, 1998, Duke submitted an application to the NRC to renew the ONS OLs for an additional 20 years under Title 10 of the Code of Federal Regulations (CFR) Part 54. Duke is a *licensee* for the purposes of its current OLs and an *applicant* for the renewal of the OLs.

The National Environmental Policy Act of 1969 (NEPA) requires an environmental impact statement (EIS) for major Federal actions significantly affecting the quality of the human environment. As provided in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996; 1999a),[b] under NRC's environmental protection regulations in 10 CFR Part 51 implementing NEPA, renewal of a nuclear power plant operating license is identified as a major Federal action significantly affecting the quality of the human environment. Therefore, an EIS is required for a plant license renewal review. The EIS requirements for a plant-specific license renewal review are specified in 10 CFR Part 51. Pursuant to 10 CFR 54.23 and 51.53(c), Duke submitted an environmental report (ER) (Duke 1998) in which Duke analyzed the environmental impacts associated with the proposed action, considered alternatives to the proposed action, and evaluated any alternatives for reducing adverse environmental effects.

As part of NRC's evaluation of the application for license renewal, the NRC staff is required under 10 CFR Part 51 to prepare an EIS for the proposed action, issue the statement in draft form for public comment, and issue a final statement after considering public comments on the draft. This report is the final plant-specific supplement to the GEIS (supplemental environmental impact statement [SEIS]) for the Duke license renewal application. The staff will also prepare a separate safety evaluation report in accordance with 10 CFR Part 54.

The following sections in this introduction describe the background and the process used by the staff to assess the environmental impacts associated with license renewal, describe the proposed Federal action, discuss the purpose and need for the proposed action, and present the status of compliance with environmental quality standards and requirements that have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. Chapters 3 and 4 discuss the potential environmental impacts of plant refurbishment and plant operation during the renewal term,

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(a) Duke Energy Corporation has held the license for the ONS Units 1, 2, and 3 since September 16, 1997. Before that date, Duke Power Company held the license. Duke Power Company remains a division of Duke Energy Corporation.

(b) 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.

respectively. Chapter 5 contains an evaluation of potential environmental impacts of plant accidents and includes consideration of severe accident mitigation alternatives (SAMAs). Chapter 6 discusses the uranium fuel cycle and solid waste management, and Chapter 7 discusses decommissioning. The alternatives to license renewal are considered in Chapter 8. Finally, Chapter 9 summarizes the findings of the prior chapters, draws conclusions related to 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 commitments of resources), and presents the recommendation of the staff with respect to the proposed action. Additional information is included in Appendices. Appendix A contains a discussion of comments on the draft SEIS issued on May 20, 1999. Appendix B lists preparers of this supplement, and Appendix C lists the chronology of correspondence between NRC and Duke with regard to this supplement. The remaining appendices are identified in subsequent sections.

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. The GEIS 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) described the activity that affects the environment, (2) identified the population or resource that is affected, (3) assessed the nature and magnitude of the impact on the affected population or resource, (4) characterized the significance of the effect for both beneficial and adverse effects, (5) determined whether the results of the analysis applied to all plants, and (6) considered whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants.

The standard of significance was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27) for assessing environmental issues as SMALL, MODERATE, or LARGE. Using the CEQ terminology, the NRC established three significance levels 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 assigned a significance level to each environmental issue. In assigning these levels, it was assumed that ongoing mitigation measures would continue.

The GEIS included 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 characteristic

(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 (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 not likely 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

In the GEIS, the staff assessed 92 environmental issues and determined that 69 qualified as Category 1 issues, 21 qualified as Category 2 issues, and two issues were not categorized. The latter two issues, environmental justice and chronic effects of electromagnetic fields, are to be addressed in a plant-specific analysis. Of the 92 issues, 10 are related to refurbishment, 74 are related to operations 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 of the GEIS is codified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

License Renewal Evaluation Process

An applicant seeking to renew its operating license is required to submit an ER as part of its application. This ER must provide an analysis of the issues listed as Category 2 in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 in accordance with 10 CFR 51.53(c)(3)(ii). The ER must include a discussion of actions to mitigate 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 need not 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 essential for determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. Section 51.53(c)(2) also provides that certain other issues, including the need for power and other issues not related to the environmental effects of the proposed action need not be considered in the ER. In addition, the ER need not 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). Pursuant to 10 CFR 51.53(c)(3)(I)(iii) and (iv), the ER is not required to contain an analysis of any Category 1 issues unless there is significant new information on a specific issue. New and significant information is (1) information that identifies a significant environmental issue not covered in the GEIS and codified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, or (2) information that was not considered in the analyses summarized in the GEIS and which leads to an impact finding different from that codified in 10 CFR Part 51.

In preparing to submit its application to renew the ONS operating licenses, Duke developed a process to ensure that new and significant information regarding the environmental impacts of license renewal for ONS would be properly reviewed before submitting the ER and to ensure that new and significant information related to renewal of the ONS licenses would be identified, reviewed, and addressed during the period of NRC review. Duke reviewed the Category 1 issues appearing in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, to verify that the conclusions of the GEIS remained valid with respect to ONS. This review was performed by personnel from Duke's Group Environmental Health and Safety and the Oconee station personnel. Duke has committed to repeating this review process at 1-year intervals until a determination on the Oconee license renewal application is made. Duke also committed to include the South Carolina Department of Health and Environmental Control (SCDHEC), the South Carolina Department of Natural Resources (SCDNR), and the U.S. Fish and Wildlife Service (FWS) as part of the review process and making revisions to the ER if new issues were identified that had not been included in the GEIS or if changes to conclusions made in the ER were required.

The NRC staff also has a process for identifying new and significant information. That process is described in detail in a draft of the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (ESRP), NUREG-1555, Supplement 1 (February 1999 pre-publication copy) (NRC 1999b). The search for new information includes a review of an applicant's ER and the process for discovering and evaluating the significance of new information; review of records of public meetings and correspondence; review of environmental quality standards and regulation coordination with Federal, State, and local environmental protection and resource

agencies; and review of the technical literature. Any new information discovered by the 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. Neither Duke nor the staff has identified any new issue applicable to ONS that has a significant environmental impact.

The discussion of the environmental issues considered in the GEIS that are applicable to ONS is found in Chapters 3 through 7. At the beginning of the discussion of each set of issues, there is a table that 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 10 CFR Part 51, Subpart A, Appendix B, Table B-1, followed by the 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 SEIS sections where the analysis is presented. The SEIS sections discussing the Category 2 issues are listed immediately following the table.

The NRC prepares an independent analysis of the environmental impacts of license renewal as well as a comparison of these impacts to the environmental impacts of alternatives. The evaluation of Duke's license renewal application began with publication of a notice of acceptance for docketing (63 FR 42885, August 11, 1998). The staff published a notice of intent to prepare an EIS and conduct scoping (63 FR 50257, September 21, 1998). Two public scoping meetings were held on October 19, 1998, in Clemson, South Carolina. Comments received during the scoping meeting were summarized in the *Environmental Impact Statement Scoping Process, Oconee Nuclear Station, Summary Report,* January 1999 (NRC 1999c).

The staff visited the ONS Site on October 19 through 22, 1998, 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 of this document. Other documents related to ONS were also reviewed and are referenced.

The staff followed the review guidance contained in the February 1999 prepublication version of the ESRP (which was under development at the time of the Duke application). It issued requests for additional information (RAIs) to Duke by letters dated December 29, 1998 (NRC 1998a and 1998b). Duke provided its responses in a letter dated March 4, 1999 (Duke 1999). The staff reviewed this information, incorporated it into its analysis, and, on May 20, 1999, issued a draft of the SEIS, which contained the preliminary results of its evaluation and recommendation.

With the publication of the EPA Notice of Filing of the draft SEIS (64 FR 28843, May 28, 1999), a 75-day comment period began 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 were held in Clemson, South Carolina, on July 8, 1999, during which the staff described the preliminary results of the NRC environmental review and answered questions related to it in order to provide members of the public with information to assist them in formulating their comments. The comment period for the ONS draft SEIS ended on August 16, 1999.

This report presents the staff's final analysis that considers and weighs the environmental effects of the proposed renewal of the ONS licenses, the environmental impacts of alternatives to license renewal, and alternatives available for avoiding adverse environmental effects. The staff considered the comments that were received during the comment period. The disposition of these comments is addressed in Appendix A of this SEIS. The staff modified the analysis set forth in the draft SEIS to address certain comments, where appropriate. A vertical bar in the margin indicates where the staff made changes to the draft SEIS. In addition, Chapter 9, "Summary and Conclusions," provides the NRC staff's final recommendation to the Commission on whether the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

1.1 The Proposed Federal Action

The proposed Federal action is renewal of the operating licenses for ONS Units 1, 2, and 3. ONS is located in Oconee County, South Carolina, approximately 13 km (8 mi) northeast of Seneca, South Carolina. The plant has three pressurized light-water reactors, each with a design rating for net electrical power output of 887 megawatts (MW(e)). Plant cooling is provided by a once-through heat dissipation system into Lake Keowee. Keowee Hydroelectric Station, was constructed at approximately the same time as ONS. ONS produces electricity to supply the needs of more than 730,000 homes. The current operating license for Unit 1 expires on February 6, 2013, for Unit 2 on October 6, 2013, and for Unit 3 on July 19, 2014. By letter dated July 7, 1998, Duke submitted an application to renew these operating licenses for an additional 20 years of operation (i.e., until February 6, 2033, for Unit 1, October 6, 2033, for Unit 2, and July 19, 2034, for Unit 3).

1.2 Purpose and Need for the Action

Although a licensee must have a renewed license to operate a plant beyond the term of the existing operating license, 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 Commission 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 (AEA) of 1954, as amended, 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 operating license is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license.

1.3 Compliance and Consultations

Duke is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. Duke provided a list in its ER of the status of authorizations from Federal, State, and local authorities for current operations as well as environmental approvals and consultations associated with ONS license renewal. Authorizations most relevant to the proposed license renewal action are summarized in Table 1-1. The full list of authorizations provided by Duke is included as Appendix E.

The staff reviewed the list and has 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. Agency interactions identified no new and significant environmental issues. The staff has also not identified any new and significant environmental issues.

Table 1-1. Federal, State, and Local Authorizations

Agency	Authority	Requirement	License Permit Number	Permit Expiration or Consultation Date	Activity Covered
NRC	Atomic Energy Act, 10 CFR Part 50	Operating license	DPR-38, DPR-47, DPR-55	Expires February 6, 2013, October 6, 2013, and July 19, 2014	Operation of ONS Units 1, 2, and 3
FERC	Federal Power Act, Section 4(e)	Associated hydro project	FERC Project No. 2503	Expires 2016	License for Keowee Dam and Hydro Station
FWS	Endangered Species Act, Section 7	Consultation Informal Consultation	NA	Consultation initiated June 23, 1998 June 30, 1999	Operation during the renewal term
SCDHEC	Clean Air Act, Section 112	Air quality permit	1820-0041	April 22, 2002	Air quality permit
SCDHEC	Safe Drinking Water Act, 42 U.S.C. 1412	Water quality	202098AI	In compliance	ONS has a permit for a drinking water well in protected area
SCDHEC	RCRA-subtitle 1	Permit	06673,11174, 11843	Issued January 1, 1982, November 3, 1988, and November 3, 1989	Underground storage tanks
SCDHEC	FWPCA Section 402	State discharge permit	SCR000000	Issued October 1, 1992, in compliance	General storm water permit
SCDHEC	FWPCA Section 402	Water quality	SCR0000515	Issued September 29, 1999 Expires September 30, 2003	Discharges of process waste water (NPDES permit)
SCDHEC	RCRA Section 3005	Permit	SCD043979822	Issued March 9, 1998	Part A Hazardous Waste Permit, Interim Storage Facility for Mixed Wastes
SCSHPO	National Historic Preservation Act, Section 106	Consultation	NA	Letter from Duke requesting consultation dated September 30, 1997	Operation during the renewal term

EPA - U.S. Environmental Protection Agency
FERC - Federal Energy Regulatory Commission
FWPCA - Federal Water Pollution Control Act (also known as the Clean Water Act)
FWS - U.S. Fish and Wildlife Service
NPDES - National Pollutant Discharge Elimination System
RCRA - Resource Conservation and Recovery Act
SCDHEC - South Carolina Department of Health and Environmental Control
SCSHPO - South Carolina State Historic Preservation Office
NA - Not applicable

1.4 References

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.53, "Postconstruction environmental reports."

10 CFR 51.95, "Postconstruction environmental impact statements."

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effect of renewing the operating license of a nuclear power plant."

10 CFR Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

10 CFR 54.23, "Contents of application - environmental information."

40 CFR 1508.27, "Terminology and Index - Significantly."

63 FR 42885, "Notice of Acceptance for Docketing of the Application and Notice of Opportunity for a Hearing Regarding Renewal of Licenses Nos. DPR-38, DPR-47 and DRP-55." August 11, 1998.

63 FR 50257, "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." September 21, 1998

64 FR 28843, "Duke Energy Corporation, Oconee Nuclear Station, Units 1, 2, and 3; Notice of Availability of the Draft Supplement to the Generic Environmental Impact Statement and Public Meeting for the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3." May 27, 1999.

Atomic Energy Act of 1954, as amended, 42 USC 2011, et seq.

Duke Energy Corporation. 1998. *Application for Renewed Operating Licenses - Oconee Nuclear Station, Units 1, 2, and 3.* Volume IV, Environmental Report.

Duke Energy Corporation. 1999. Letter from M.S. Tuckman, Duke Energy Corporation to U.S. Nuclear Regulatory Commission. Subject: License Renewal-Response to Requests for Additional Information, Oconee Nuclear Station. Dated March 4, 1999.

Endangered Species Act, as amended, 16 USC 1531, et seq.

Federal Water Pollution Control Act (FWPCA), as amended, 33 USC 1251, et seq. (also known as the Clean Water Act).

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

National Historic Preservation Act, as amended, 16 USC 470, et seq.

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

U.S. Nuclear Regulatory Commission (NRC). 1998a. Letter from U.S. NRC to William R. McCollum, Duke Energy Corporation. Subject: Request for Additional Information for the Review of the Oconee Nuclear Station Units 1, 2, and 3. Environmental Report Associated with License Renewal-Environmental. Dated December 29, 1998.

U.S. Nuclear Regulatory Commission (NRC). 1998b. Letter from U.S. NRC to William R. McCollum, Duke Energy Corporation. Subject: Request for Additional Information for the Review of the Oconee Nuclear Station Unit Nos. 1, 2 & 3 Environmental Report Associated with License Renewal - SAMA. Dated December 29, 1998.

U.S. Nuclear Regulatory Commission (NRC). 1999a. *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*, NUREG-1437 Vol. 1, Addendum 1. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, NUREG-1555, Supplement 1. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999c. *Environmental Impact Statement Scoping Process: Summary Report - Oconee Nuclear Station Units 1, 2 and 3, Oconee County, South Carolina.* Washington, D.C.

2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

The Oconee Nuclear Station (ONS) is located near State Highways 130 and 183 on Lake Keowee in eastern Oconee County, South Carolina, approximately 13 km (8 mi) northeast of Seneca, South Carolina. The site is within 40 km (25 mi) of the boundaries of the States of North Carolina and Georgia, as shown in Figure 2-1. ONS is a three-unit plant. Each unit is equipped with a nuclear steam supply system manufactured by Babcock & Wilcox that uses a pressurized light-water reactor (LWR) and once-through cooling with water from Lake Keowee. The electricity generated is transferred to the switchyards located at the ONS site. Each unit has a design rating for net electrical power output of 887 megawatts electric [MW(e)]. Each unit is rated at 846 MW(e) net power. This provides a combined station total of 2538 MW(e) net power. The amount of electricity produced by ONS can supply the needs of more than 730,000 homes. Descriptions of the plant and its environs follow in Section 2.1, and the plant's interaction with the environment is presented in Section 2.2.

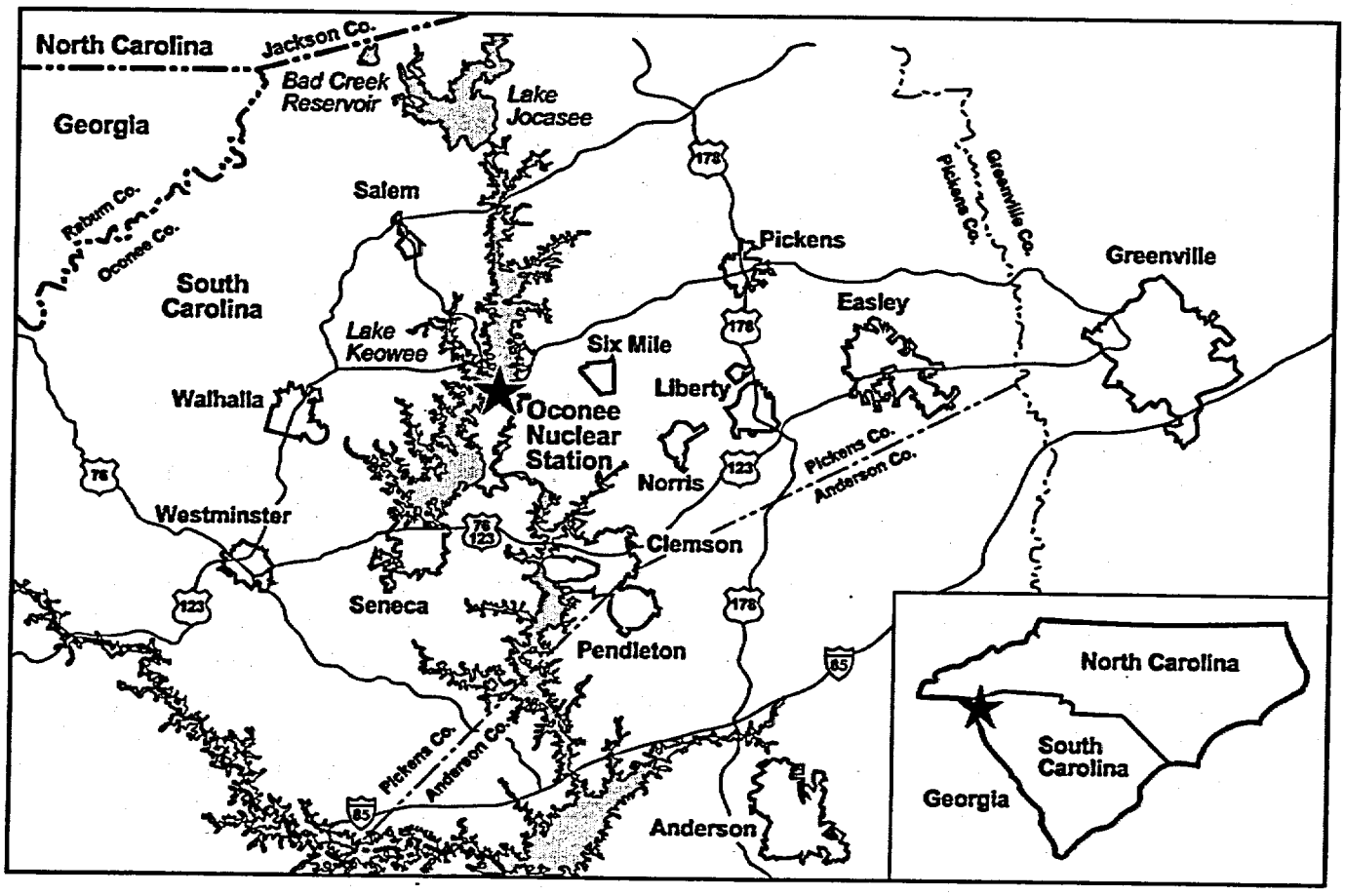

Figure 2-1. Location of Oconee Nuclear Station

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

ONS is located on 210 ha (510 acres) in a rural part of northwestern South Carolina. Figure 2-1 shows the location of ONS in relationship to the tri-state area (northwest South Carolina, northeast Georgia, and southwest North Carolina). The site is surrounded by an exclusion area of 1.6-km (1-mi) radius as shown in Figure 2-2. All land is owned by Duke in full except for a small rural church lot, a highway right-of-way, and approximately 4 ha (9.9 acres) included in the Hartwell Reservoir project.

The region surrounding ONS was identified by the Generic Environmental Impact Statement (GEIS) as having a medium population density. Approximately 1700 persons comprise the non-outage work force at ONS. There are 1350 Duke employees normally onsite. The remainder of the 1700 persons are contract or vendor workers. The plant is located near the cities of Seneca, Walhalla, and Clemson, South Carolina. The nearest town is Six Mile, located 6 km (4 mi) east northeast. The majority of the land area is forest, with pasture, cropland, and residential development each contributing significant proportions of land use. The land within 8 km (5 mi) of the plant is primarily forest.

The property consists of rolling hills, with surface elevations ranging from about 210 m to 273 m (700 ft to 900 ft) within the region. The area is well drained by several intermittent streams flowing away from the center of the site in a radial pattern. The site lies within the drainage area of the Little and Keowee Rivers, which flow southerly into the Seneca River and subsequently discharge into the main drainage course of the Savannah River. The average annual rainfall at the site area is approximately 135 cm (53 in).

ONS is part of Duke's integrated energy producing area called the Keowee-Toxaway complex. ONS was constructed as a part of the Keowee-Toxaway Project (FERC Project #2503). This project also included the construction of Lake Keowee, Lake Jocassee, and the associated hydroelectric stations. Construction of the project occurred between 1968 and 1974. The Keowee-Toxaway Complex is located in the upper Savannah River drainage basin. It consists of the three-unit ONS, the Keowee Hydroelectric Station (a two-unit conventional hydroelectric facility), the Jocassee Hydroelectric Station (a four-unit pumped storage hydroelectric facility) and the Bad Creek Pumped Storage Project (a four-unit pumped storage hydroelectric facility). A pumped storage hydroelectric facility can operate in a generating mode or in a pumping mode to store water for later generation of electric power. In the generating mode, electricity is generated by allowing water to flow from Lake Jocassee (upper pond) into Lake Keowee (lower pond). In the pumping mode, water is pumped into Lake Jocassee from Lake Keowee for generation of electricity at a later time. The Bad Creek Pumped Storage Facility uses Lake Jocassee as the lower pond, and the Bad Creek Reservoir serves as the upper pond. Figure 2-3 illustrates the location of ONS in relationship to the rest of the Keowee Toxaway project and the Bad Creek project.

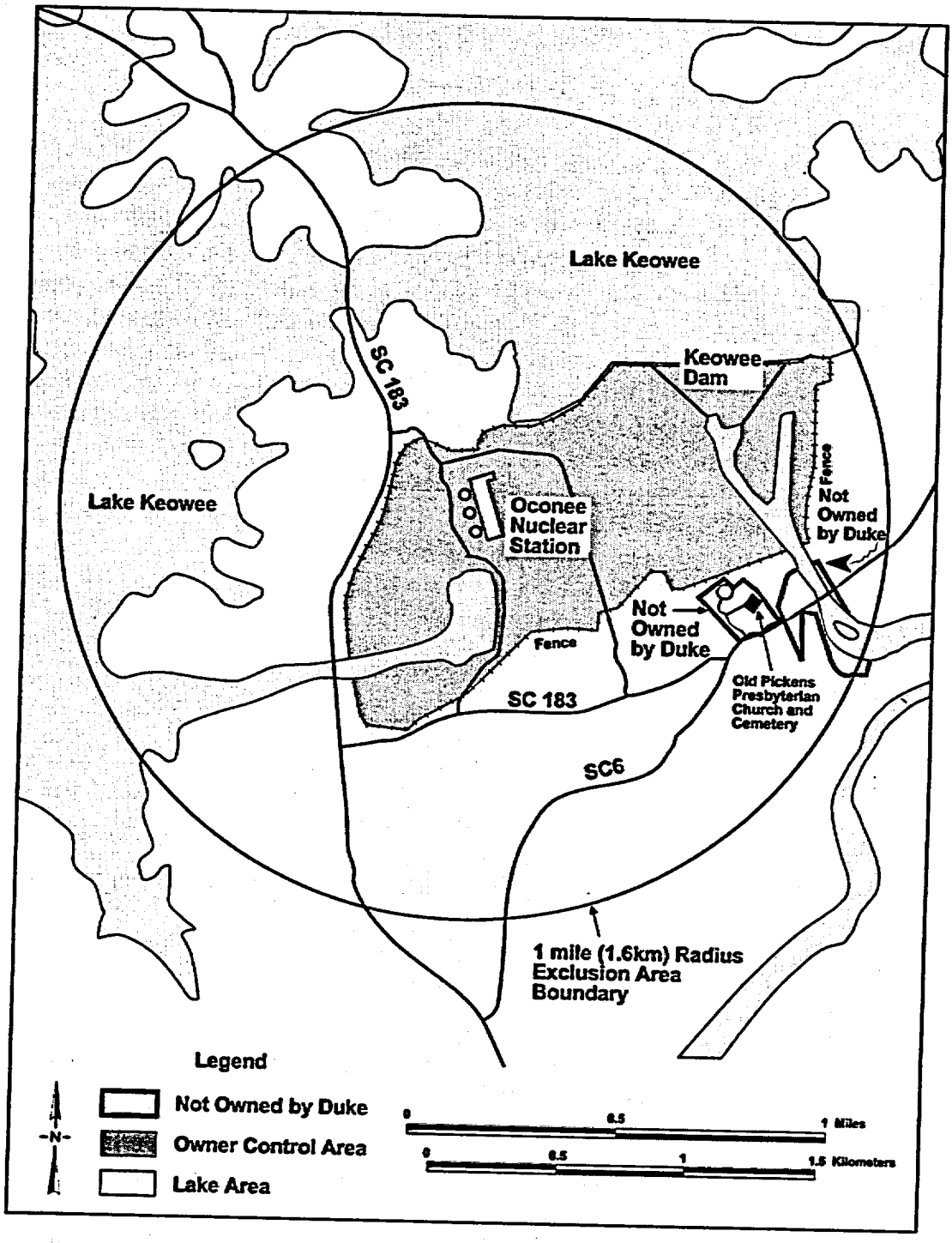

Figure 2-2. Oconee Nuclear Station - One-Mile Exclusion Area

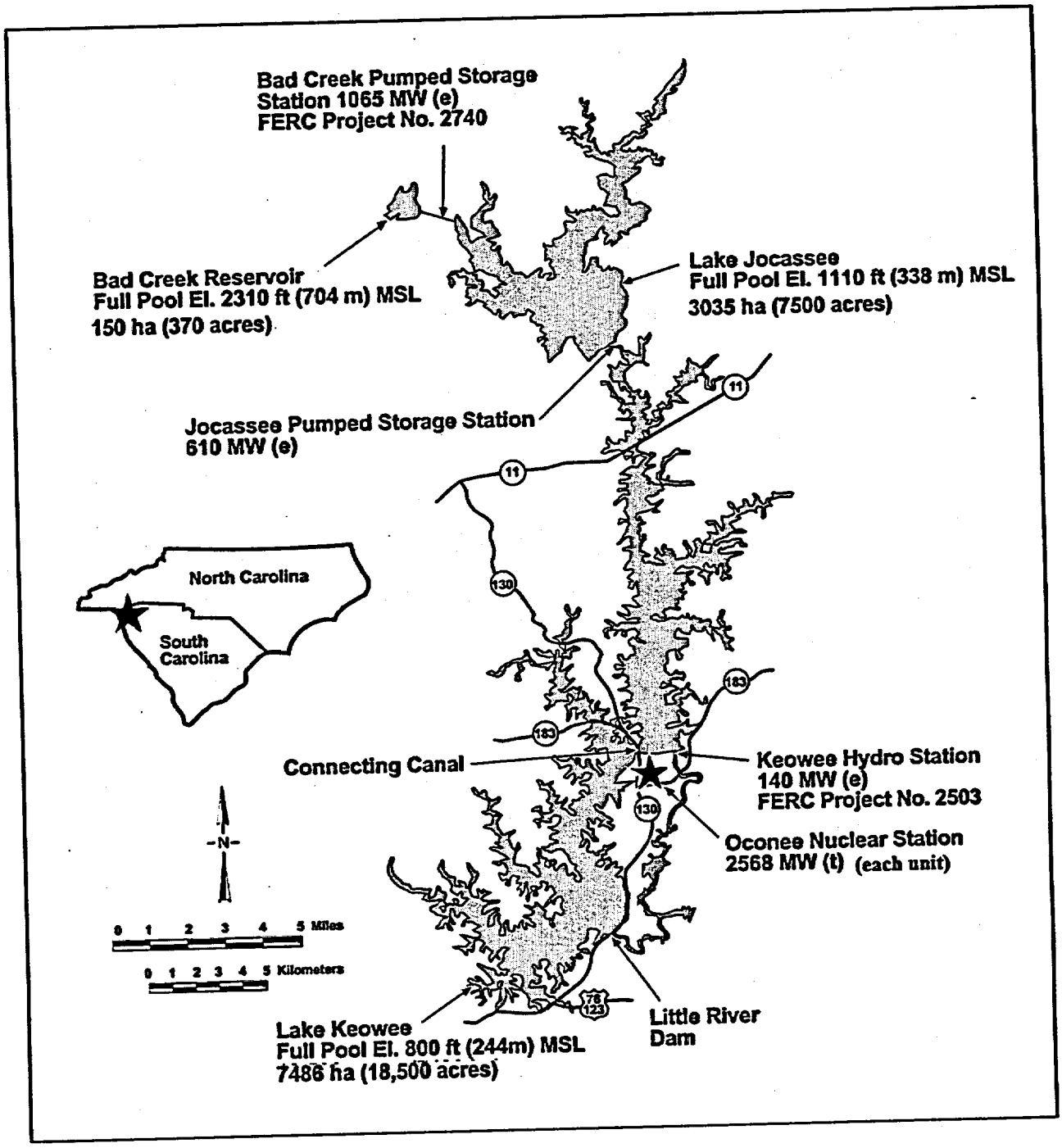

Figure 2-3. Location of Oconee Nuclear Station Relative to Other Parts of Keowee-Toxaway Project

ONS is on the shores of Lake Keowee. The main bodies of the lake lie to the north and southwest of the site. Lake Keowee was formed by damming the water of the Little River and the Keowee River above the Hartwell Reservoir. Hartwell Reservoir, an Army Corps of Engineers' reservoir, is located south and downstream of the site. Lake Jocassee is approximately 17.5 km (11 mi) to the north. Keowee Lake covers about 7490 ha (18,500 acres) and has 480 km (300 mi) of shoreline, which is developed with both permanent and vacation residences, along with campgrounds, boat launch areas, marinas, golf courses, and some small retail establishments. The volume of Lake Keowee is 1.18×10^9 m^3 (952,300 acre ft). The mean depth is 16 m (52 ft) with a maximum depth of 43 m (141 ft). In addition to uses for the needs of the nuclear and hydroelectric power plants, Lake Keowee is used as a source of municipal drinking water by Greenville and Seneca and is extensively used for recreation by fishermen, swimmers, skiers, and boaters.

2.1.1 External Appearance and Setting

The station is sited within a forested valley and is only visible from the neighboring highways in a few locations. The most obvious view is that of the water tower. ONS consists of three cylindrical concrete reactor building structures, approximately 38 m (125 ft) in diameter and about 61 m (200 ft) high. A turbine building and an auxiliary building are shared among the three units. Switchyards are located near the turbine building. Various other office buildings and facilities are located at ONS to support the station. Figure 2-4 shows the general features of the ONS site. Figure 2-5 presents an aerial view of the facility showing the three cylindrical reactor buildings.

Duke has an independent spent fuel storage installation (ISFSI) located on the site that has a license separate from the operating license. Duke was issued a Materials License (No. SNM-2503) for the ISFSI on January 29, 1990, with an expiration date of January 31, 2010. The ISFSI is outside the scope of this review.

The Old Pickens Presbyterian Church and Cemetery are located to the southeast of ONS on a small parcel of land that is not owned by Duke. The church is the only building remaining from the original Pickens town site. A Visitor's Center on a hill just above the site displays "The Story of Energy," which describes how sources of energy are found in nature and converted into electricity by Duke's generating facilities. There is also a lakeside picnic area, a nature trail, and landscaped grounds.

The site's geological setting is in the southeastern Piedmont physiographic province, and the site is underlain by crystalline rocks (AEC 1972). This northeastward-trending belt of ancient metamorphic rocks extends northward from Alabama east of the Appalachians, and in South Carolina, it crosses the state from the fall line on the east to the Blue Ridge and Appalachian Mountains on the west. These rocks are generally recognized as being divided into four parallel northeast-southwest-trending belts in the Carolinas. From southeast to northwest, these are the Carolina Slate Belt, the Charlotte Belt, the Kings Mountain Belt, and the Inner Piedmont Belt. The site is in the northwestern Inner Piedmont Belt.

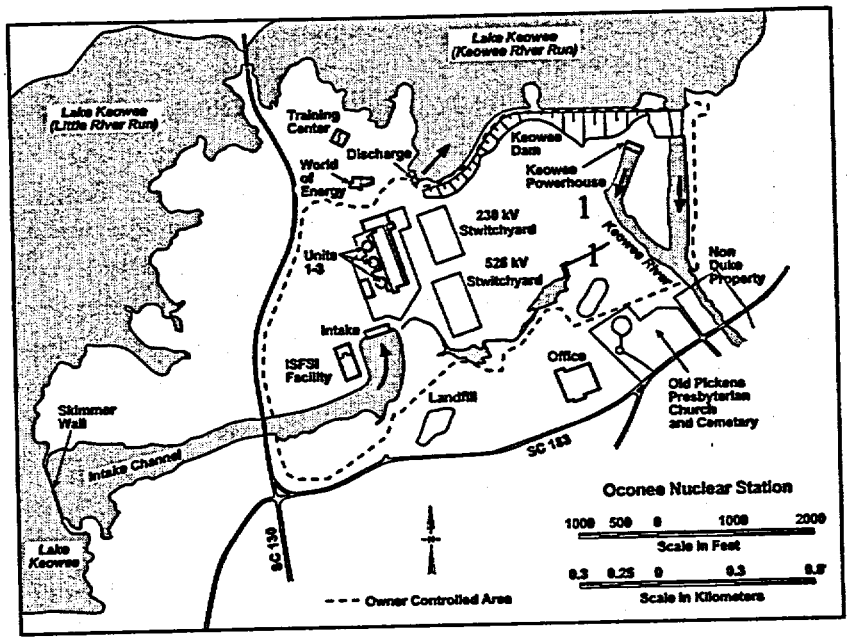

Figure 2-4. Oconee Nuclear Station Layout

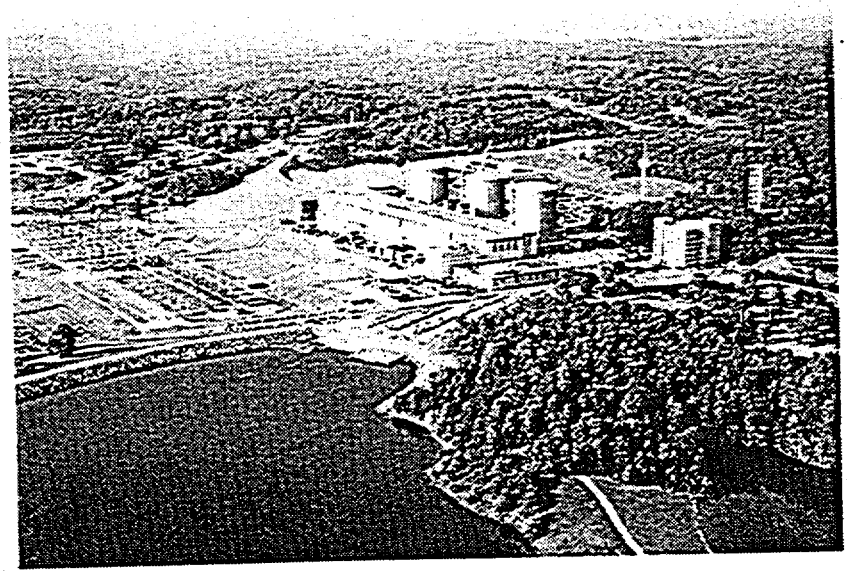

Figure 2-5. Oconee Nuclear Station (aerial photo)

The rocks are geologically ancient and complex. These rocks were folded and metamorphosed when the Appalachian Mountains were formed during the Appalachian Revolution, some 270 million years ago. Faults and other lines of weakness dating from this Revolution may serve to locate present-day minor crustal movements that produce small earthquakes, and their location is of some importance. The most important is the Brevard fault zone that passes 17.5 km (11 mi) northwest of the site. The design criteria for the Station took this fault zone into account. Small earthquakes have been detected along this zone with intensities of IV to VI. Using this scale of intensities, V and VI represent disturbances that can dislodge plaster, etc.; X, XI, and XII represent disturbances that are severely damaging (AEC 1972).

In addition to the Brevard fault, there are fault zones 48 km (30 mi) to 320 km (200 mi) southeast where quake intensities of VII or VIII have been recorded. But because of their distance from the site, these zones are of slight importance for ONS (AEC 1972).

ONS is in the drainage basins of the Little and Keowee Rivers, which receive the runoff of surface water and groundwater from the site. The residual soil in the area is comparatively impermeable, particularly in late winter and early spring when the soil is saturated, and much of the precipitation goes into direct surface runoff. The residual soils do accept some water, and the area is underlain by a water table that is a subdued replica of the topography. Groundwater is not an important source of water supply in the area; all neighboring towns obtain their municipal supplies from above-ground sources.

The rate of movement of the groundwater was calculated to be 45 m to 76 m (150 ft to 250 ft) per year (AEC 1972). The residual soil has excellent ion exchange properties.

2.1.2 Reactor Systems

ONS is a three-unit plant. Each unit is a pressurized LWR, with a nuclear steam supply system manufactured by Babcock & Wilcox. Each unit has a design rating for net electrical power output of 887 MW(e) and is operated at a maximum core thermal power output level of 2568 MW(t). The turbines are manufactured by General Electric Company. Each turbine is a tandem, compound, six-flow exhaust, indoor unit.

ONS fuel is low-enriched (up to 5 percent by weight)[a] uranium dioxide in the form of pellets contained in zirconium alloy fuel rods (tubes fitted with welded end caps).

(a) Naturally occurring uranium contains several forms of uranium, including approximately 0.7 percent uranium-235, the form that a nuclear reactor uses. The nuclear fuel manufacturing process removes some of the other forms, resulting in a slightly higher percentage ("enrichment") of uranium-235.

Duke can operate ONS in accordance with the methodology presented in B&W topical report BAW-10186P-A, which was approved by the staff in its letter dated April 29, 1997 (NRC 1997). Based on this methodology, cycle length, and fuel enrichment, the ONS fuel burnup[a] rate does not exceed 62,000 megawatt-days per metric ton uranium (MWd/MTU).

Reactor containment structures are designed with engineered safety features to protect the public and plant personnel from an accidental release of radioactive fission products, particularly in the unlikely event of a loss-of-coolant accident (LOCA). These safety features function to localize, control, mitigate, and terminate such events to limit exposure levels below applicable dose guidelines. The reactor is controlled using a combination of chemical controls (boric acid dissolved in coolant water) and solid absorber material.

2.1.3 Cooling and Auxiliary Water Systems

ONS is equipped with a once-through heat dissipation system that withdraws cooling water from the Little River arm of Lake Keowee, from underneath a skimmer wall. The discharge for the cooling water is located on the Keowee River arm of the lake just above the Lake Keowee dam. The Keowee River and the Little River basins are connected by a canal, approximately 31 m (100 ft) wide and 12 m (40 ft) deep (illustrated in Figure 2.2). It is nearly 3.2 km (2 mi) by lake from the point of discharge to the mouth of the intake canal. A natural cove was deepened and extended to within a few hundred feet of the power plant as part of the project when initially licensed. Across the mouth of the cove, a skimmer wall was constructed extending from above the surface of the lake (normally 244 m [800 ft] above mean sea level) down to an elevation of 223 m (735 ft). This wall ensures that cooler water from near the bottom of the lake enters the intake canal. Further into the intake cove is a submerged dam, or weir, with its crest at 233 m (770 ft) above mean sea level. The distance from the weir to the intake structures is nearly 1.2 km (0.75 mi). Figure 2-4 shows the water flow for the plant and illustrates the location of the skimmer wall, intake structure, and the outfall for the once-through cooling system.

Each generating unit has three separate water loops. The primary coolant loop is a closed piping system: pressurized water in the system is circulated through the reactor and transfers heat from the reactor to the steam generator. The secondary loop is also a closed system: water from this system is converted into steam (in the steam generators) that is used to drive the turbine. The third loop is an open system: water from the Little River arm of Lake Keowee is used to cool the spent steam in the secondary loop, and then it is returned to the Keowee River arm of Lake Keowee. The principal components of the third cooling loop are the skimmer wall, intake structure, circulating water pumps, condensers, and discharge conduits.

(a) "Burn-up" is the length of use of, or total energy generated by, the nuclear fuel and is measured as megawatt-days per metric ton uranium.

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

ONS uses liquid, gaseous, and solid radioactive waste management systems to collect and process the liquid, gaseous, and solid wastes that are the by-products of the ONS operation. These systems reduce radioactive liquid, gaseous, and solid effluents before they are released to the environment. The ONS waste processing systems meet the design objectives of 10 CFR Part 50, Appendix I, and control the processing, disposal, and release of radioactive liquid, gaseous, and solid wastes. Radioactive material in the reactor coolant is the source of gaseous, liquid, and solid radioactive wastes in LWRs. Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products are contained in the sealed fuel rods, but small quantities escape the fuel rods and contaminate the reactor coolant. Neutron activation of the primary coolant system also is responsible for coolant contamination.

Non-fuel solid wastes result from treating and separating radionuclides from gases and liquids and from removing contaminated material from various reactor areas. Solid wastes also consist of reactor components, equipment, and tools removed from service as well as contaminated protective clothing, paper, rags, and other trash generated from plant design and operations modifications and routine maintenance activities. Solid wastes may be shipped to a waste processor for volume reduction before disposal or may be sent directly to the licensed burial site. Spent resins and filters are dewatered and stored or packaged for shipment to an offsite processing or disposal facility.

Fuel rods that have exhausted a certain percentage of their fuel and that are removed from the reactor core for disposal are called spent fuel. ONS currently operates on an 58-month refueling cycle for all three units. Spent fuel is stored onsite either in a spent fuel pool in the Auxiliary Building or in dry storage at the ONS ISFSI. ONS also temporarily stores mixed waste onsite (mixed wastes are composed of radioactive material and hazardous waste). This storage is governed by the Atomic Energy Act (AEA) for radioactive material and the Resource Conservation and Recovery Act (RCRA) for hazardous waste, consistent with NRC and EPA requirements (42 USC 2011-2259 [AEA]; 42 USC 6901 [RCRA]).

The systems used for processing—liquid waste processing, gaseous waste processing, solid waste processing, and nonradioactive waste systems—are discussed in the subsequent sections.

The Offsite Dose Calculation Manual (ODCM) specifies the following methodology and parameters used to calculate potential offsite doses due to radioactive liquid and gaseous effluents and to ensure

compliance with the dose limitations of the Selected Licensee Commitments (Section 16.11, "Radiological Effluents Control," of the Updated Final Safety Analysis Report [UFSAR]):

- The concentration of radioactive liquid effluents released from the site to the unrestricted area will be limited to ten times the effluent concentration (EC) levels of 10 CFR Part 20, Appendix B, Table 2.

- The exposures to any individual member of the public from radioactive liquid effluents will not result in doses greater than the design objectives of 10 CFR Part 50, Appendix I.

- The dose rate at any time at the site boundary from radioactive gaseous effluents will be limited to (a) less than or equal to 5 mSv/yr (500 mrem/yr) to the whole body and less than or equal to 30 mSv/yr (3000 mrem/yr) to the skin for noble gases and (b) less than or equal to 15 mSv/yr (1500 mrem/yr) to any organ for iodine-131 and 133, tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days.

- The exposure to any individual member of the public from radioactive gaseous effluents will not result in doses greater than the design objectives of 10 CFR Part 50, Appendix I.

- The dose to any individual member of the public from the nuclear fuel cycle will not exceed the limits of 40 CFR Part 190 and 10 CFR Part 20.

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

Based on the water source and process train, radioactive liquid wastes from the operation of ONS are accumulated in storage tanks. These wastes are collected in the Auxiliary Building and transferred to the Radwaste Facility for processing by filtration or demineralization or both. The Radwaste Facility processes high-activity wastes, low-activity wastes, and miscellaneous wastes from the Auxiliary Building. There is also an Interim Radwaste Building that can process liquid wastes, but it is not currently in use.

ONS liquid wastes are disposed of by one of the following three methods based on the concentration of radioactive material in the waste:

- Collected, sampled, and analyzed and then discharged directly to the tailrace of the Keowee Hydroelectric plant.

- Processed by filtration or demineralization or both, collected, sampled, and analyzed with the filters and/or resins and then packaged and shipped to an approved licensed burial ground.

- Processed by filtration or demineralization or both, collected, sampled, and analyzed with the filters and/or resins and then packaged and shipped to an offsite vendor waste processor.

The potential waste generation rate for the three units is 28,343 m^3 (944,773 ft^3) per year. The liquid waste holdup capacity is approximately 303,200 liters (80,000 gal). The actual liquid waste generated is reported in the Oconee Annual Effluent Report.

The ODCM prescribes the effluent release rate that will ensure that the concentration of radioactive liquid effluents released from the site to the unrestricted area is less than ten times the effluent concentrations of 10 CFR Part 20, Appendix B, Table 2. In addition, the ODCM provides calculations for the radiation monitor alarm/trip set points that define the relationship between the measured effluent activity, the maximum allowable effluent activity, and the effluent flowrate needed to ensure that the instantaneous release rate is not exceeded and thereby that the Selected Licensee Commitments are met.

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

Radioactive gaseous wastes at ONS are created by the evolution of gases in liquid contained in tanks and piping. The wastes are monitored and released at a permissible rate prescribed by the ODCM. Units 1 and 2 share a Gaseous Waste Disposal System, and Unit 3 has a separate system that can be interconnected to the Unit 1 and 2 system. The purposes of the Gaseous Waste Disposal Systems are to (1) maintain a non-oxidizing cover gas of nitrogen in tanks and equipment that may contain radioactive gas, (2) holdup gas for decay, and (3) release the gases under controlled conditions.

The gaseous wastes are to be released in the following ways depending on the source, quantities, and concentration of radioactive material: (1) release of Auxiliary Building ventilation air and Reactor Building purges into the unit vents, (2) release of Reactor Building purges through high-efficiency particulate and charcoal iodine filters to the unit vents, (3) release of waste gas directly or through high efficiency particulate and charcoal iodine filters to the unit vents, (4) diversion of gaseous radioactive waste to waste gas tanks followed by a controlled release to the unit vents via high-efficiency particulate and charcoal iodine filters after sampling and analysis, and (5) release of Radwaste Facility heating, ventilation, and air conditioning (HVAC) and process exhaust.

The ODCM prescribes the effluent release rate to ensure that releases are less than the Selected Licensee Commitments. In addition, the ODCM provides the calculational methodology for the radiation monitor alarm/trip set points, which defines the relationship between the measured effluent activity, the maximum allowable effluent activity, and the effluent flowrate needed to ensure that the instantaneous release rate limit is not exceeded and thereby that the Selected Licensee Commitments are met.

2.1.4.1 Solid Waste Processing and Handling

Solid waste is packaged in containers to meet the applicable requirements of 49 CFR Parts 171 through 177. Disposal and transportation are performed in accordance with the applicable

requirements of 10 CFR Part 61 and Part 71, respectively. There are no releases to the environment from radioactive solid wastes created at ONS. NRC and the state of South Carolina have approved the disposal of slightly contaminated materials within the Owner Controlled Area. For each onsite disposal, the waste is analyzed and confirmed to have acceptably low radionuclide concentrations, following the approval process described in 10 CFR 20.2002.

Approximately 150 shipments are made from ONS each year. About 120 are radioactive material shipments (contaminated parts, tools, equipment, sources, etc.) and 30 radwaste shipments (dry active waste, dewatered resins, irradiated hardware, etc.). The radwaste shipments may be shipped to a waste processor to reduce the volume before disposal or may be sent directly to a licensed burial site.

From year to year, the volume of radioactive contaminated waste generated will vary, but averages are about 750 m^3 (25,000 ft^3) per year. ONS has been aggressively reducing volume and minimizing waste for several years and plans to continue to do so in the future.

2.1.5 Nonradioactive Waste Systems

The primary nonradioactive chemical wastes produced by ONS are from reactor coolant system make-up water, steam generator make-up water, water treatment demineralizers, and deborating demineralizers. Non-sanitary, nonradioactive wastes are neutralized and sent to the holding ponds, eventually being discharged to the Keowee River, downstream from the Keowee Hydroelectric Station. Sanitary wastes are routed to an aerated sewage lagoon. The effluents are treated by chlorination. The treated effluents from the sanitary waste treatment system are dechlorinated before being discharged.

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation of a nuclear power plant. Some of the maintenance activities conducted at ONS include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and public safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of a major component. Scheduled refueling outages commonly have a duration of 35 to 55 days for a single unit. An additional 800 to 900 workers are onsite during a typical outage. Scheduled refueling outages for ONS occur on 18-month intervals for all three units.

Duke performed an aging management review and developed an integrated plant assessment for managing the effects of aging on systems, structures, and components in accordance with 10 CFR Part 54. The integrated plant assessment identified several activities that must necessarily be conducted during the period of extended operation. These activities include inspections and replacement of certain components. The applicant indicated that replacing these components and conducting additional inspections are within the bounds of normal plant operations. Therefore, Duke expects to conduct these activities during plant operation or normal refueling and other outages, but plans no outages specifically for the purpose of refurbishment. Duke has no plans to add additional full-time persons (non-outage workers) at the plant during the period of the extended license.

2.1.7 Power Transmission System

The ONS FES (AEC 1972) lists the transmission lines shown in Table 2-1 as being "attributable to the (Oconee) nuclear station." These lines account for 528 km (330 mi) of lines and about 3120 ha (7800 acres) of land in the rights-of-way. Figure 2-6 illustrates the location of these transmission lines.

Table 2-1. Transmission Lines from Oconee Nuclear Station

Destination	Double or Single	kV	Distance (mi)[a]	Width of Right-of-way (ft)[a]	Date Line was Energized
Tiger	d	230	53	150	November 1, 1973
Central (2)	d	230	9	270	October 31, 1970
Site H (McGuire)	s	525	130	200	July 2, 1974
Newport	s	525	110	200	April 1, 1973
N. Greenville	d	230	28	200	January 1, 1970

(a) Information taken from AEC (1972). Distances are left in English units as they were in the original.

These transmission lines were constructed concurrently with the construction of Oconee and the Keowee-Toxaway project and at a time that the Duke transmission system was being expanded in the Piedmont area. These lines are owned and operated by Duke Electric Transmission, a division of Duke Energy separate from Duke Power (Duke 1998a). The applicant indicated that the transmission lines will remain in service following the termination of operation and the decommissioning of Oconee, unless business needs require otherwise. The applicant stated that the 525 kV and the 230 kV lines from the Oconee substation provide an outlet for the 1675 MW of electrical power at the Jocassee and Bad Creek Pumped Storage Hydro plants. They are a source of power when these units are in pump mode.

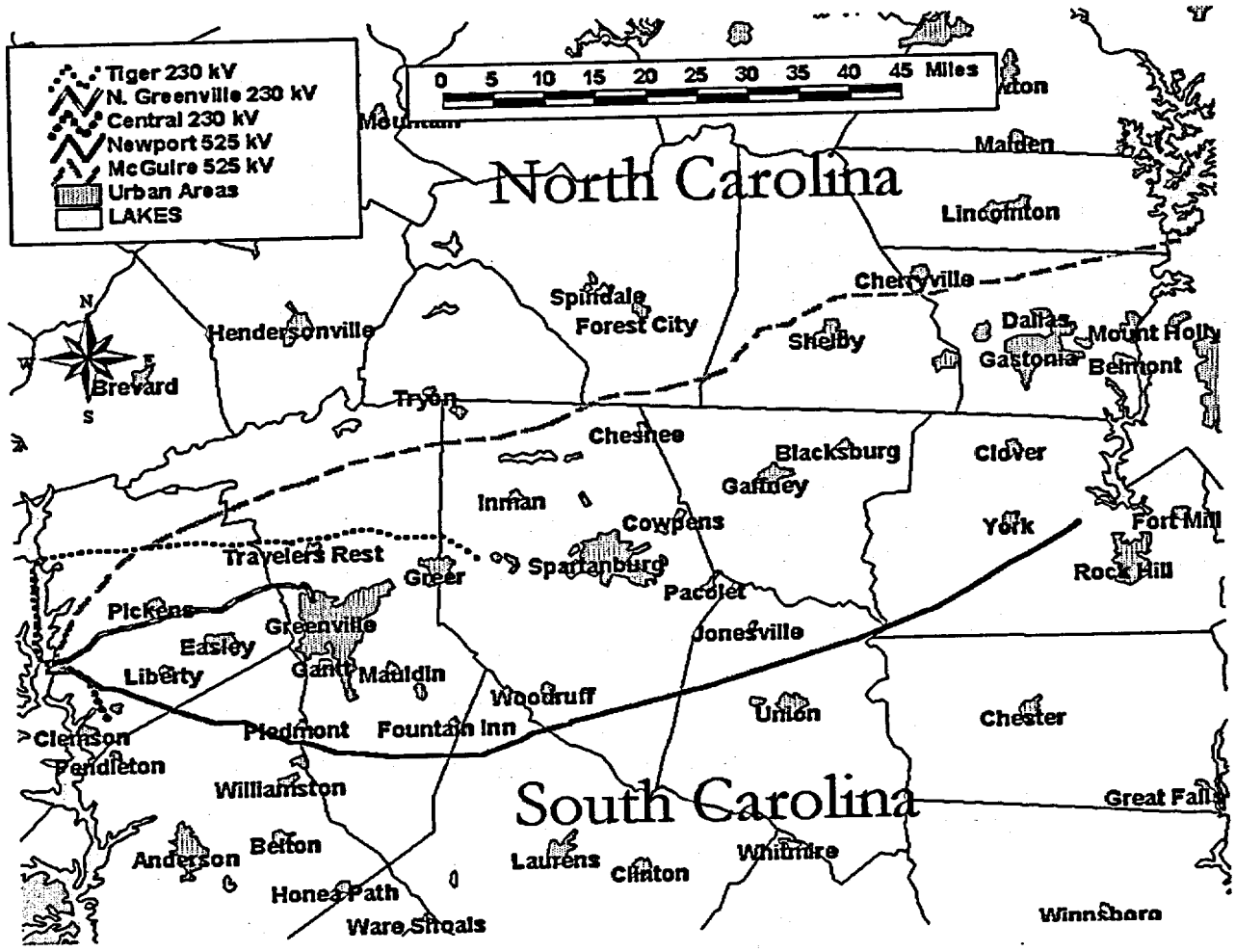

Figure 2-6. Transmission Lines Attributable to the Oconee Nuclear Station in the Final Environmental Statement (AEC 1972)

In addition, Duke stated that three of the lines were energized before initial ONS startup. These lines are also used for tie-ins to the Virginia-Carolinas subregion of the Southeastern Electric Reliability Council as well as for connections to Georgia and Florida. In its license renewal application, Duke (1998a) proposed that the transmission lines that should be considered to connect the plant to the transmission system are only those lines from the Oconee Turbine Building to the 230 kV and the 525 kV switchyards. However, as provided in 10 CFR 51.53(c)(3)(ii)(H), the scope of the review of transmission lines for the Category 2 issue concerning electric shock is the set of transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system. The NRC staff has determined that the scope of the review of transmission lines for the Category 2 issue concerning threatened or endangered species should be identical to the scope of review for electric shock (NRC 1999b). As stated above, the ONS FES indicates that all the transmission lines listed in Table 2-1 were "attributable to [ONS]." Accordingly, the staff has determined that all these lines were

constructed for the specific purpose of connecting ONS to the transmission system and determined that all of the transmission lines discussed in the FES should be evaluated.

2.2 Plant Interaction with the Environment

Subsections 2.2.1 through 2.2.8 provide general descriptions of the environment 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. Subsection 2.2.9 describes the historical and archaeological resources in the area, and 2.2.10 describes possible impacts on other Federal project activities.

2.2.1 Land Use

ONS is located in the northwest corner of South Carolina. The station is in the eastern portion of Oconee County. It is approximately 13 km (8 mi) northeast of the city of Seneca, the largest city in Oconee County. Lake Keowee occupies the area immediately north and west of the station. Lake Keowee covers approximately 7500 ha (18,500 acres) and was created by dams on the Lower Keowee and Little River.

The total area occupied by the station is 210 ha (510 acres). Forests cover the majority of the land area in the region surrounding ONS. The topography of the immediate area is undulating to rolling. Surface elevations range from approximately 210 m (700 ft) to 275 m (900 ft).

Oconee County is predominantly rural. The county's major population centers and developed areas are concentrated in the east central portion of the county around the municipalities of Walhalla, Westminster, and Seneca. Walhalla is the county seat for Oconee County. Table 2-2 shows a breakdown of land use in Oconee County in 1994. The amount of developed land is increasing with time.

Table 2-2. Land Use in Oconee County in 1994 (Talbert & Bright 1996)

Land Use	Hectares	(Acres)	% of Total
Farming	97,700	(241,300)	56.3
Residential	5,700	(14,100)	3.3
Government Owned	41,000	(101,200)	23.6
Other (commercial and industrial)	9,500	(23,500)	5.5
Water Bodies	19,700	(48,600)	11.3
Total	173,600	(428,700)	100

The land occupied by the station is in an unincorporated portion of Oconee County. Oconee County has not imposed any zoning or land-use restrictions in the unincorporated portions of the county.

2.2.2 Water Use

Water from Lake Keowee (8.3×10^6 m^3/d [2200 million gpd]) provides once-through condenser circulating water (CCW) for ONS (see Section 2.1.3). Lake Keowee serves as the lower pond for the Jocassee Pumped Storage Station and furnishes energy to drive the Keowee Hydroelectric Station. Water from the Seneca water treatment plant (120 m^3/d [0.03 million gpd]) is used for potable water. Treated waste water (51 m^3/d [0.01 million gpd]) from the plant's liquid rad-waste system is diluted and returned to the Keowee dam tailrace. Treated water (5300 m^3/d [1.4 million gpd]) from the sewage treatment system, the chemical treatment system, the landfill leachate collection system, chemical treatment ponds, storm water runoff, and the turbine building sump are returned to the Keowee River at a location below the tailrace. Figure 2.7 illustrates the water flow for the plant.

In addition to serving the needs of the nuclear and hydroelectric power plants, Lake Keowee is used as a source of municipal drinking water for the cities of Greenville and Seneca. Lake Keowee experiences extensive recreational use by fishermen, boaters, skiers, and swimmers.

Seven groundwater wells are located at the Oconee site. One of these wells is used to supply the site baseball field with drinking water and with water for a restroom facility. This well is also used for seasonal irrigation at the site baseball field and has a pumping capacity of 0.0019 m^3/s (30 gpm). The well at the baseball field is the only onsite groundwater well permitted to supply drinking water. There are two groundwater wells used to supply seasonal irrigation for landscaping at a training building and office complex. The other four wells are used infrequently as low volume, non-potable water sources.

The estimated combined pumping rate for all groundwater wells at the Oconee site is less than 0.068 m^3/s (100 gpm).

2.2.3 Water Quality

The concentrations of all minerals in Lake Keowee are very low, with total dissolved solids of less than 25 mg/L (0.00021 lb/gal). Water clarity is generally very high. Dissolved oxygen concentrations in the surface waters are adequate, and algae are never present in nuisance concentrations. Due to low nutrient content of its waters, Lake Keowee has a relatively low standing crop (pounds per acre) of fish.

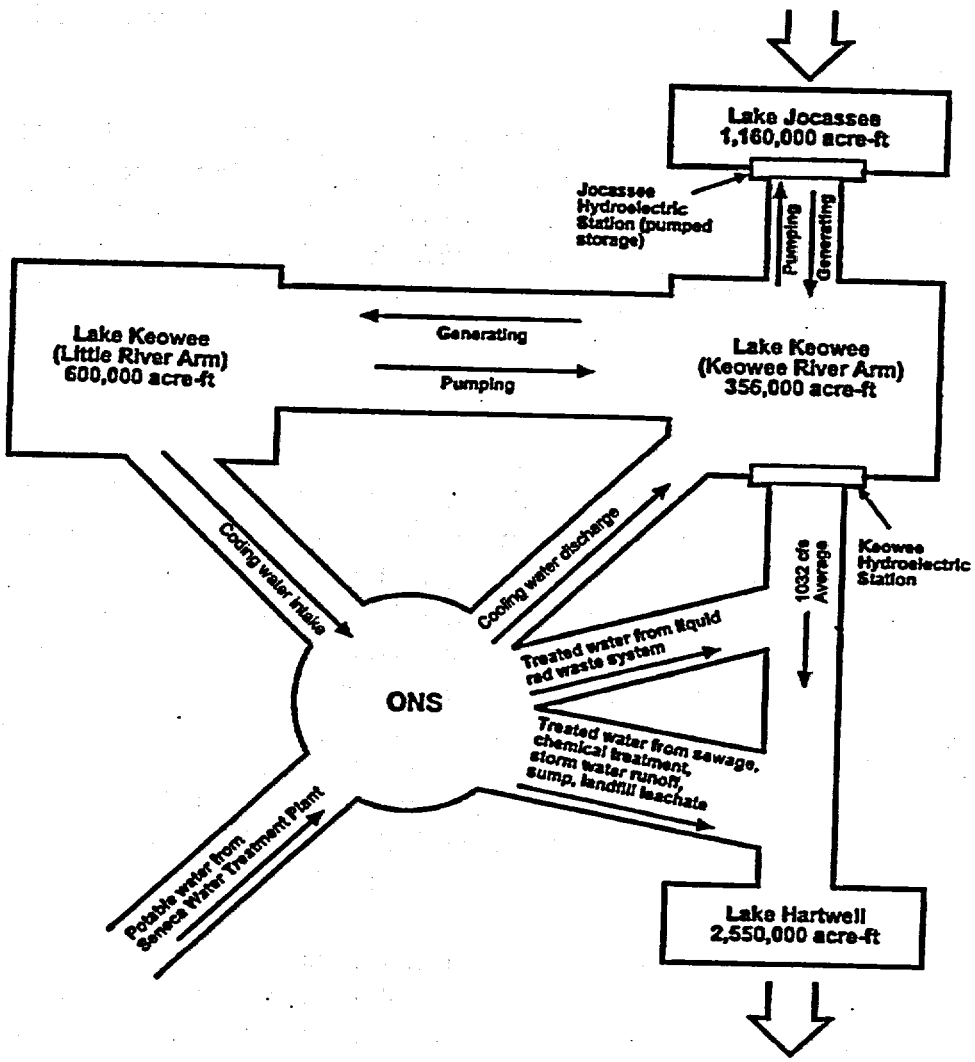

Figure 2-7. Oconee Nuclear Station - Water Flow Diagram

SCDHEC, as part of the Clean Lakes program, monitors the water quality and use of lakes in the State. These results are published in *Watershed Water Quality Assessment, Savannah and Salkehatchie Basins, Technical Report No. 003-97* (SCDHEC 1997). In this document, SCDHEC reported that

> Eutrophication assessments indicate that Lake Keowee is the least eutrophic large lake in South Carolina, characterized by very low nutrient concentrations. Preservation of this lake's desirable trophic condition is recommended. Aquatic life uses are not supported in Lake Keowee due to occurrences of copper in excess of the aquatic life acute standards, including a high concentration of copper measured in 1995, compounded by a significant increasing trend in pH. A significant increasing trend in dissolved oxygen concentration and a significant decreasing trend in five-day

biochemical oxygen demand suggest improving conditions for these parameters. Recreational uses are fully supported at this site.

Pursuant to the Federal Water Pollution Control Act (FWPCA) (33 USC 1251), also known as the Clean Water Act (CWA), the water quality of plant effluent discharges is regulated through the National Pollutant Discharge Elimination System (NPDES). The SCDHEC is the state agency delegated by the EPA to issue the NPDES permit. The current permit (SC0000515) was issued on September 29, 1999, and expires on September 30, 2003. Any new regulations promulgated by EPA or the SCDHEC would be included in future permits.

2.2.4 Air Quality

ONS is located on the eastern slope of the Appalachian Mountains at an elevation of about 240 m (800 ft) mean sea level. The climate of the region is generally mild. Climatological records for Greenville-Spartanburg, South Carolina (NOAA 1998), which should be representative of the site, show normal daily maximum temperatures ranging from about 10°C (50°F) in January to about 31°C (88°F) in July; normal daily minimum temperatures range from about -1°C (30°F) in January to about 20°C (68°F) in July. Precipitation, which averages about 130 cm (51 inches) per year, is spread rather uniformly through the year. Monthly average wind speeds range from 2.7 m/s (6.1 mph) to 3.75 m/s (8.4 mph), with the highest speeds during the winter and lowest speeds during the summer. The influence of the Appalachian Mountains is seen in the prevailing wind directions, which are west-southwest and northeast. Section 2.3 of the ONS updated final safety analysis report (UFSAR) (Duke 1998b) contains a more detailed description of the climate of the region and site.

Climatological records also show that the area is subject to occasional storms, including destructive winds. In most years, one or more tropical storms affect the site; however, ONS is sufficiently far inland that the winds associated with these storms are below hurricane force. Tornadoes are infrequent in this region and are generally small when they occur.

For about two-thirds of the year, the region is under the influence of the Bermuda high pressure system. High pressure systems are typically associated with low winds and increased potential for air pollution problems. As indicated in 40 CFR 81.334, 40 CFR 81.341, and the 1997 South Carolina Air Quality Annual Report (SCDHEC 1998), South Carolina and North Carolina are in attainment of the National Air Quality Standards. The only non-attainment area in Georgia is an ozone non-attainment area in the Atlanta region (40 CFR 81.311). The Pollutant Standards Index (PSI) is an air quality index developed by the EPA in cooperation with the Council on Environmental Quality. For 1997, the average PSI for the Spartanburg, Greenville, Anderson metropolitan area was 48, which is associated with *Good* air quality (SCDHEC 1998). The daily PSIs for 211 days were in the *Good* range, and the remaining daily PSIs were in the *Moderate* range. The days with *Moderate* PSIs resulted from ozone formation.

The Oconee site is within 100 km (62 mi) of the Great Smoky Mountains National Park and Shining Rock Wilderness Area. These areas are designated in 40 CFR, Part 81, Subpart D, as mandatory Class I Federal areas in which visibility is an important value. As a result of the proximity of the Oconee Site to these Class I areas, future industrial development at the site will be subject to strict Federal standards for pollution control (SCDHEC 1998).

2.2.5 Aquatic Resources

Lake Keowee serves the needs of the local nuclear and hydroelectric power plants and is also used as a source of municipal drinking water by the cities of Greenville and Seneca, South Carolina. It is used extensively by fishermen, boaters, skiers, and swimmers, and its banks are developed with vacation and permanent residences, campgrounds, boat launch areas, marinas, golf courses, and small retail establishments.

Algae have never been present in nuisance concentrations, and, because of the low nutrient content of the water, Lake Keowee has a relatively low standing crop of fish. A creel census conducted in 1973 indicated that largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and crappie (*Pomoxis*, spp.) were the most important recreational species in Lake Keowee (Edwards et al. 1976). Data on angler effort and harvest rates collected over a period from 1974 to 1993 (Barwick et al. 1995) confirmed that largemouth bass remained the most important sportfish in the reservoir and that sunfish (*Lepomis* spp., including bluegill) and crappie were the only other species that contributed in a significant way to the reservoir's sport fishery.

The U.S. Fish and Wildlife Service (FWS), in a letter dated April 17, 1998, provided a list of the Federally endangered and threatened species that potentially occur in Oconee County, South Carolina. No Federally listed aquatic species were identified for Oconee County. However, the bog turtle *(Clemmys muhlenbergii)* occurs in neighboring Pickens County and was listed as a threatened species due to similarity of appearance to the northern population of the same species. A survey conducted during June 1998 by Dr. L.L. Gaddy (Duke 1998a) found no Federal- or State-listed threatened or endangered species present within a 1.6-km (1-mi) radius Unit 2's reactor building at ONS. This includes the owner-controlled areas as well as additional lands along the Keowee River and along Lake Keowee. No State-ranked aquatic species listed as occurring in Oconee or Pickens Counties have been identified as occurring on or in the immediate vicinity of ONS.

The importance of fishery resources to the local community has promoted a partnership between Duke and SCDNR. Recently, SCDNR and Duke Power Company signed a Memorandum of Understanding (Keowee-Toxaway Fisheries Resources 1996) and developed a 10-year work plan to enhance communication between the two groups and provide for continued research, management, and enhancement of the fisheries resources in the watershed.

2.2.6 Terrestrial Resources

The vegetation in the vicinity of ONS has been variously described as part of the oak-pine-hickory biome of the eastern deciduous forest (Greller 1988) or as part of the southern mixed forest province (Bailey 1976, 1980). Much of the Piedmont region near ONS was cleared and converted to cotton production during the late 1800s and then abandoned in the 1930s. Most of the existing forested areas in the vicinity of ONS consequently represent second growth forests. The various pine species, such as loblolly (*Pinus taeda*), shortleaf (*P. echinata*), and Virginia (*P. virginiana*) pines, are the dominant conifers. Common hardwoods include red and white oaks (*Quercus rubra*, *Q. alba*), hickory (*Carya sp.*), and tulip poplar (*Liriodendron tulipifera*), among others. The understory is dominated by shrubs such as dogwood (*Cornus florida*), mountain laurel (*Kalmia latifolia*), and redbud (*Cercis canadensis*), as well as many species of herbs and grasses.

White-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), rabbits (*Sylvilagus floridanus*), squirrels (*Sciurus carolinensis* and *Tamiasciurus hudsonicus*), beavers (*Castor canadensis*), muskrats (*Ondatra zibethica*), foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), opossums (*Didelphis marsupialis*), skunks (*Mephitus mephitus* and *Spilogale putorius*), river otters (*Lutra canadensis*), mink (*Mustela vison*), and various mice, voles, and shrews are wildlife species found in the project area. The white-tailed deer is the most popular game species, and black bear are hunted in the areas to the west of ONS.

The turkey (*Meleagris gallopavo*), bobwhite quail (*Colinus virginianus*), and mourning dove (*Zenaida macroura*), are the most common game birds. Many species of songbirds inhabit the area, including the eastern bluebird (*Sialia sialis*), red-eyed vireo (*Vireo olivaceus*), cardinal (*Cardinalis cardinalis*), tufted titmouse (*Parus bicolor*), woodthrush (*Hylocichla mustelina*), summer tanager (*Piranga rubra*), blue-gray gnatcatcher (*Polioptila caerulea*), hooded warbler (*Wilsonia citrina*), and Carolina wren (*Thryothorus ludovicianus*). The box turtle (*Terrapene carolina*), common garter snake (*Thamnophis sirtalis*), timber rattlesnake (*Crotalus horridus*), and assorted frogs, toads, and salamanders comprise the herpetofauna.

Extensive areas of ONS are protected or managed as upland natural areas, wetlands, or wildlife areas. In support of the environmental report, Duke funded a survey of all lands within a 1.6-km (1-mi) radius of the plant site. This survey, which was conducted in May and June 1998, identified several areas that retain characteristics of mature upland forests that the applicant has designated as protected natural areas. Wetlands were also identified during this survey, and these are managed as sensitive environmental areas. The applicant has a program of wildlife enhancement in unused portions of the plant site. The program was designed in partnership with the South Carolina Wildlife Federation, the SCDNR, and the National Wild Turkey Federation. This program has established semi-natural meadows, enhanced wetland native plants, placed wood duck and bluebird nesting boxes, and developed a butterfly garden.

The field survey also included an inventory of endangered, threatened, and otherwise noteworthy plant and animal species within a 1.6 km (1 mi) radius of ONS. No Federally listed, proposed, or candidate threatened or endangered species were identified during the onsite survey. However, three State-listed plant species and one plant species not previously known in South Carolina (Table 2-3) were identified. The populations of these four species were all confined to "natural areas" located toward the periphery of the survey area, well away from areas used for normal plant operations. Three additional state-listed plant and one animal species have been reported from the general area in the past, but were not located within the 1.6-km (1-mi) radius of ONS during this survey (Table 2-3).

Table 2-3. Endangered, Threatened, and South Carolina State Listed Plant and Animal Species Found on or Historically Occurring in the Vicinity of the Oconee Nuclear Station

Scientific Name	Common Name	State Status[a]	Occurrence[b]
	ANIMALS		
Sigmora robusta	a centipede	SC	Historical
	PLANTS		
Carex laxiflora	Loose-flowered sedge	SR	Present
Carex prasina	Drooping sedge	SC	Present
Echinacea laevigata	Smooth coneflower	FE, SC	Historical
Nestronia umbellula	Indian olive	SC	Present
Orobanche uniflora	One-flowered broomrape	SC	Historical
Pachysandra procumbens	Allegheny spurge	SC	Historical
Viola tripartita	Three-parted violet	SC	Present

(a) FE = Federally endangered, SC = Species of Concern in South Carolina, SR = new state record for species.

(b) Historical = species have been reported from the general area in the past, but were not located within the 1-mile radius of ONS during the applicant's survey; Present = species was found within a 1-mile radius of ONS.

During the spring of 1998, Duke contacted the FWS and the SCDNR to request information about threatened or endangered species that potentially could occur in the vicinity of the ONS. The staff contacted the FWS during the spring of 1999 to request similar information concerning the ONS related transmission lines. The FWS identified (FWS 1998) nine species that have been reported to occur within either Pickens or Oconee counties, South Carolina, and eight additional species reported from the other counties crossed by the transmission lines (Table 2-4). None of the species listed in Table 2-4 are known to inhabit the immediate vicinity of the ONS.

Federally listed species that have been occasionally sighted near ONS include the threatened bald eagle (*Haliaeetus leucocephalus*) and the endangered peregrine falcon (*Falco peregrinus*). Bald eagles are occasional visitors near the ONS site, but are not known to nest or to reside near the site for

significant time periods. Bald eagles are known to be more numerous and spend more time in the vicinity of the Jocassee and Bad Creek Reservoirs. Peregrine falcons are occasional transients near ONS. Attempts have been made to introduce individuals near the Jocassee dam, but they are not known to reside near ONS.

Transmission lines associated with the ONS extend through a number of additional counties in both South Carolina and North Carolina. The FWS provided the staff information about threatened and endangered species that may occur in these counties. This list is summarized in Table 2-4.

Table 2-4. Federally Listed Threatened or Endangered Species Known or Potentially Occurring Near the ONS or in Counties Crossed by Transmission Lines Associated with the ONS

Species	Common Name	Status[a]	COUNTY												
			Greenville, SC	Spartanburg, SC	Anderson, SC	Laurens, SC	Union, SC	York, SC	Rutherford, NC	Cleveland, NC	Gaston, NC	Lincoln, NC	Oconee, SC	Pickens, SC
ANIMALS														
Haliaeetus leucocephalus	Bald eagle	T			X			X					X	X
Falco peregrinus anatum	Peregrine falcon	E	X						X				X	X
Picoides borealis	Red-cockaded woodpecker	E				X								
Myotis sodalis	Indiana bat	E							X				X	
Clemmys muhlenbergii	Bog turtle	T*	X								X			X
PLANTS														
Sisyrinchium dichotomum	White irisette	E	X						X					
Hexastylus naniflora	Dwarf-flowered heartleaf	T	X	X				X	X	X		X		X
Helianthus schweinitzii	Schweinitz's sunflower	E						X			X			
Rhus michauxii	Michaux's sumac	E										X		
Echinacea laevigata	Smooth coneflower	E			X								X	X
Helonius bullata	Swamp pink	T	X										X	
Isotria medeoloides	Small whorled pogonia	T	X											
Sagittaria fasciculata	Bunched arrowhead	E	X											X
Sarracenia rubra ssp. *jonesii*	Mountain sweet pitcher plant	E	X											
Amphianthus pusillus	Little amphianthus	T						X						
Gymnoderma lineare	Rock gnome lichen	E	X						X				X	
Trillium persistens	Persistent trillium	E												X
Isoetes malanospora	Black-spored quillwort	E												

(a) E = Endangered, T = Threatened, T* = threatened due to similarity of appearance.

Examination of the National Heritage Databases from South Carolina and North Carolina indicates that three plant species listed in Table 2-4 may occur within or near the transmission line rights-of-way. The bunched arrowhead occurs in the corridors located northwest of Greenville, South Carolina, and in the corridors located northeast of Traveler's Rest, South Carolina. The dwarf-flowered heartleaf occurs near corridors northeast of Traveler's Rest and also between Landrum, South Carolina, and the

McGuire substation. Schweinitz's sunflower is known to occur near the Newport and McGuire substation at the far eastern end of the ONS related transmission system.

2.2.7 Radiological Impacts

Duke has conducted a radiological environmental monitoring program (REMP) around ONS since 1969. The radiological impacts to workers, the public, and the environment have been carefully monitored, documented, and compared to the appropriate standards. The purposes of the REMP are to

- verify that radioactive materials and ambient radiation levels attributable to plant operation are within the limits contained in the Selected Licensee Commitments and the Environmental Radiation Protection standards as stated in 40 CFR Part 190, *Environmental Radiation Protection Standards for Nuclear Power Operations*

- detect any measurable buildup of long-lived radionuclides in the environment

- monitor and evaluate ambient radiation levels

- determine whether any statistically significant increase occurs in the concentration of radionuclides in important pathways.

Radiological releases are summarized in the annual reports titled "Oconee Nuclear Station Units 1, 2, and 3 Annual Radiological Environmental Operating Report" and the annual effluent release reports and includes the results of the monitoring for the ISFSI. The limits for all radiological releases are specified in the Selected Licensee Commitments, and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the aquatic environment (aquatic organisms and shoreline sediment in Lake Keowee and Hartwell Reservoir), atmospheric environment (air particulates and iodine), and terrestrial environment (vegetation and direct radiation).

Review of historical data on releases and the resultant dose calculations revealed that the doses to maximally exposed individuals in the vicinity of ONS were fractions of the limits specified in the Environmental Protection Agency's environmental radiation standards 40 CFR Part 190 as required by 10 CFR 20.1301(d). For 1997 (the most recent year that data were available), dose estimates were calculated based on actual 1997 liquid and gaseous effluent release data (Duke Power 1997). Calculations were performed using the plant effluent release data, onsite meteorological data, and appropriate pathways identified in the ODCM.

A review of whole body and organ doses (Duke Power 1997) revealed the following results: the total body dose estimate to an adult from environmental measurements was 0.0014 mSv/yr (0.14 mrem/yr) and the total body dose estimate from all effluent release pathways was 0.00615 mSv/yr (0.615 mrem/yr). The critical pathway for both of these estimates was from fish consumption. Cesium-

137 was the major contributing radionuclide. These doses, which are representative of the doses from the past 5 years, are provided to demonstrate that the impact to the environment from releases from ONS is small.

The applicant does not anticipate any significant changes to the radioactive effluent releases or exposures from ONS operations during the renewal period and, therefore, the impacts to the environment are not expected to change.

2.2.8 Socioeconomic Factors

The staff reviewed the applicant's environmental report and information obtained from several county staff members, local real estate agents/appraisers, and social services providers during the October 1998 site visit. The following information describes the economy, population, and communities near ONS.

2.2.8.1 Housing

Between 1970 and 1990, total housing units in Oconee County increased from 14,032 to 25,983 (DOC 1991; U.S. Bureau of the Census 1988). Approximately 146 new households, or one percent of the growth in households, may be attributed to ONS employment (NRC 1996). A total of 891 ONS employees currently live in Oconee County (as of January 1999). As of January 1999, 515 ONS employees live in Pickens County and 161 live in Anderson (see Table 2-5). County growth has continued since 1990. Based on the estimates in the GEIS (NRC 1996) of 2,300 direct employment in 1990, immigrant ratio of 16.4 percent, and indirect employment multiplier of 0.41, ONS may have accounted for 3,243 direct and indirect jobs in Oconee, Pickens, and Anderson Counties. This accounted for 378 households and less than 2 percent of the housing growth from 1970 to 1990. Between 1980 and 1990, the number of housing units in the Tri-County (Oconee, Pickens, and Anderson) area increased approximately 22.5 percent to a total of 122,602 units (Knight 1998a). Table 2-6 provides the number of housing units and housing unit vacancies by county in the Tri-County area for the years 1970 to 1996.

Since 1990, Oconee County population has continued to increase from 57,494 at the 1990 Census to 64,059 in 1998 (Table 2-7). Pickens County increased in population from about 93,894 in 1990 to 104,618 in 1998 (Table 2-7). About 4,000 units were added to the Oconee County housing stock between 1990 and 1996, as the county became a more popular bedroom community, recreation area, and second home and retirement community and as manufacturing jobs were added (Table 2-6). The east end of Pickens County increasingly became a bedroom community for Greenville. At the time of the 1990 Census, about 10,700 Pickens County residents per day commuted to Greenville County (Knight 1997) and this number likely has increased. Clemson University is a major employer in Pickens County, with 7,156 jobs in 1997 (Knight 1997). Anderson County increased in population from 145,177 at the 1990 Census to 160,791 in 1998 (South Carolina Statistical Abstract [South Carolina Office of

Table 2-5. Employee Residence Information, Oconee Nuclear Station, January 1999

County and Selected Cities	Duke and Contractor Employees
Oconee County	891
Salem	50
Seneca	454
Tamassee	19
Walhalla	138
West Union	75
Westminister	125
Other Cities and Towns	30
Pickens County	515
Central	102
Clemson	45
Easley	127
Liberty	68
Pickens	83
Six Mile	79
Other Towns and Cities	11
Anderson County	161
Anderson	88
Belton	13
Pendleton	20
Other Towns and Cities	40
Greenville County	35
Other Counties	29
North Carolina	49
Georgia	65
Other States	40
Total	1785

Source: Duke (1999a).

Table 2-6. Housing Units and Housing Units Vacant (Available) by County 1970-1996

	1970	1980	1990	1996
		OCONEE COUNTY		
Housing Units	14,032	20,226	25,983	30,000
Occupied Units	12,764	17,373	22,358	25,200
Vacant Units	1,268	2,853	3,625	4,800
		PICKENS COUNTY		
Housing Units	18,673	28,469	35,865	40,700
Occupied Units	17,274	25,986	33,422	38,200
Vacant Units	1,399	2,483	2,443	2,500
		ANDERSON COUNTY		
Housing Units	35,981	51,369	60,753	67,700
Occupied Units	33,277	46,944	55,481	60,700
Vacant Units	2,704	4,375	5,264	7,000

Source: 1990 Census of Housing, file STF1A, Table H2; Reference 1 (DOC. 1991); 1988 City and County Data Book; South Carolina Statistical Abstract (South Carolina Office of Research and Statistical Services 1998).

Table 2-7. Population Growth in Oconee, Pickens, and Anderson Counties, South Carolina (1970-1998)

	Oconee County		Pickens County		Anderson County	
	Population	Annual Growth %	Population	Annual Growth %	Population	Annual Growth %
1970	40,728	–	59,956	–	105,474	–
1980	48,611	1.8	79,292	2.8	133,235	2.4
1990	57,494	1.7	93,896	1.7	145,177	0.9
1998	64,059	1.4	107,087	1.7	160,791	1.3

Sources: U.S. Bureau of the Census, County Population Estimates for July 1, 1998 and Population Change for July 1, 1997 to July 1, 1998, Population Estimates Program Population Division, March 12, 1999; Knight 1998a.

Research and Statistical Services 1998]), due largely to growth in branch plant manufacturing. In 1997, Anderson County employed 15,800 in major manufacturing facilities, compared with 8,400 in Oconee County and 6,800 in Pickens County (Knight 1997). Oconee County added 4,017 housing units between 1990 and 1996; Pickens County added 4,835 housing units over the same period; while Anderson County added 6,947 units (Table 2-6). Housing availability in the Tri-County area is not limited by growth-control measures. With a 1996 vacancy rate of approximately 10 percent, over 14,300 units are available for occupancy in the three closest counties (Bureau of Census 1996).

2.2.8.2 Public Services

- **Water Supply**

Potable water used in Oconee County is from both subsurface and surface sources and is used primarily for domestic and industrial uses. The county has four privately owned water systems, five municipal water systems, and a single sewer commission that serves the incorporated towns in the county and some selected rural areas. Table 2.8 shows source and capacity information on selected water supply systems in communities near ONS, as well as the area served by each. Both Seneca and Greenville are served with surface water from Lake Keowee, which is very high quality and has low concentrations of minerals and nutrients. Large areas of Oconee County are not served by public water supplies. According to the Oconee Community Facilities Plan, some supplies are threatened by incompatible development, including septic tanks around lakes and sedimentation and erosion from land-clearing activities. Both Seneca and Walhalla (which draws water from Coneross Creek, above Lake Keowee) have identified current plant capacity as inadequate for meeting future water demand. Seneca is searching for a location for a new treatment plant to meet future demand, while Walhalla is considering construction of a new treatment plant in the next 5 years, drawing on Lake Jocassee (reducing its need to depend on the limited capacity of Coneross Creek).

Availability of adequate wastewater collection is considered to be a current constraint on development in both Oconee and Pickens Counties. Public wastewater collection is provided in Oconee County by the municipalities of Seneca, Walhalla, and Westminster, while water treatment is provided by the Oconee County Sewer Authority (Oconee County Planning Commission 1997). Private treatment operators serve Chickasaw Point, Keowee Key, and Newry. The Authority operates the Coneross Waste Treatment Plant, which was expanded in capacity to 0.4 m^3/s (7.8 million gpd). Average daily volume is only 0.14 m^3/s (3 million gpd). While the difference allows considerable excess capacity for economic development within the area served by the system, there are large portions of the county not served, and there are institutional constraints that make serving the I-85 corridor a problem in Oconee County. Pickens County has limited excess capacity, and this constrains the county's ability to absorb or recruit manufacturing. Current excess capacity has been only about 0.02 m^3/s (500,000 gpd), and a current $12 million upgrade is expected to primarily replace older, environmentally unacceptable capacity, expanding excess capacity to 0.04 m^3/s (800,000 gpd).

Table 2-8. Major Public Water Supply Systems in Oconee County in 1997

Water System	Source	Maximum Daily Consumption (Gallons)	Average Daily Consumption (Gallons)	Area Served
Salem Water Department	Two wells on SC Highway 130	Unavailable	Unavailable	City Limits
Seneca Light and Power	Lake Keowee	5.914 million	4.406 million	City of Seneca, with lines 16 km (10 mi) north and south
Walhalla Water Department	Coneross Creek	2.2 million	1.42 million	Walhalla city limits, Town of West Union, Surrounding area
Westminster Commission of Public Works	Chauga River	3.62 million	2.314 million	Unavailable, but generally along US 123 and US 76
Pioneer Water Systems	Seneca and Westminster systems	Unavailable	Unavailable	South portion of county, including Fair Play and Townville

Source: Oconee County Planning Commission 1997.

- **Education**

In 1996, there were approximately 49,600 students enrolled in schools in the Oconee-Pickens-Anderson County area (Knight 1997). Enrollment totals for the public schools were 10,056 in Oconee County, 26,187 in Anderson County, and 13,353 in Pickens County. Oconee County has 11 public elementary schools, four middle schools, four high schools, and four private schools. In Anderson County, there are 27 public elementary, 11 middle/junior high schools, 9 high schools, and 5 private schools. Pickens County has 15 public elementary schools, 5 middle schools, 5 high schools, and 8 private schools. Pickens and Anderson Counties have some post-secondary capability. Anderson County has Tri-County Technical College (enrollment 3,250), Forrest Junior College (enrollment 899), and Anderson College (a private, 4-year university with an enrollment of 245). Pickens County has Clemson University, with 16,526 enrollment, and Southern Wesleyan University, with an enrollment of 1,298. Economic development also benefits from the presence of technical college and university education in nearby Greenville, especially Greenville Tech.

The area has comparatively low student/teacher ratios, despite also having relatively low property taxes. For 1996, student/teacher ratios were 14.8/1 in Oconee County, 16.9/1 in Pickens County, and varied from 15.4/1 to 18.5/1 among the five school districts in Anderson County (Knight 1997). Property tax rates in 1997 were $1.99/$1000 in Oconee County (Knight 1998b), $2.04/$1000 in Pickens County,

and $2.24/$1000 in Anderson County (an average of the range among 31 districts of $1.95 to $2.64).[a] Reflecting population growth, during the 1996-97 school year, the Oconee School District opened two new elementary schools, Fair Oak and Orchard Park, with a combined enrollment of over 1,100 students (Oconee County Planning Commission 1997). Fair Play Elementary School was closed and replaced by Fair Oak. All schools in the county except West Oak and Seneca High Schools received some expansion or upgrade. These two schools had received upgrades in recent years.

- **Transportation**

Oconee County is served by I-85 at its southeast corner, plus U.S. highways 76 and 123 and State highways 28 and Scenic 11. ONS is on a two-lane highway with service to the site being convenient from four main directions. Highway access remains adequate for the time being, but population growth in the county may create crowded conditions in the future, particularly at selected intersections.

Pickens County is not served by the Interstate Highway system, but has ready access to the I-85 corridor via U.S. 76 , 123, and 178. State Highways 8, 96, 135, 137, 124, and Scenic 11 complete the major road net. Highway 123 runs the length of Pickens County from east to west with four-lane service to Greenville. State Highway 133 (which runs north-south on the east side of Lake Keowee) and State Highway 183 from Pickens serve as commuting highways from Pickens County to ONS. Although several of the residential communities on both sides of Lake Keowee have long, narrow access roads, none of these roads has been identified as seriously congested.

The period from 1995 to 2015 has been projected by the State of South Carolina to be one of moderate population growth (1.1 percent per year). Oconee County is projected to grow at about the same rate as the state during that period, while Pickens and Anderson Counties are expected to grow at about 0.9 percent per year. At these rates, Oconee County would increase its current population by about 50 percent at the end of the license renewal period (see Section 2.2.8.1 and Knight 1998a). Significant upgrading of most arterial links and main highways is likely to be required to accommodate such growth. The population of the other two counties would grow by about 40 percent and also likely would require highway upgrades.

2.2.8.3 Offsite Land Use

Oconee and Pickens Counties both have land-use plans, but neither has zoning regulations (Talbert & Bright, Inc. 1996; interview with Pickens County Director of Planning, October 22, 1998). Industrial development is concentrated in the I-85, S.C. Route 123, Route 28, and Route 76 corridors in the two counties and in Anderson County. There are some restrictions on building practices, but these are not extensive. Industrial development has been limited in Pickens County by lack of sewer and water infrastructure. Oconee County has been relatively selective about the industry they target. Oconee

(a) Personal contact, Hara T. Knight, South Carolina Appalachian Council of Governments, March 1999.

County also has a sanitary landfill that is nearly at capacity and may constrain growth if it is not replaced (Oconee County Planning Commission 1997).

The continued availability of ONS and the associated tax base is an important feature in Oconee County's ability to continue to invest in infrastructure and to draw industry and new residents. In 1998-1999, the Oconee County Operational Budget was $26.2 million and the school operating budget $41.1 million, for a total of $67.4 million. Duke will pay $22.3 million in taxes on ONS in 1998-1999, or roughly a third of the county combined operational and school budget.[a] In Pickens County, continued presence of the plant will have less influence on development or land use, since the plant does not directly contribute to the tax base of the county. There is relatively little impact on land use in Anderson County from Oconee-related population. Duke helps with industrial recruiting in all three counties.

2.2.8.4 Visual Aesthetics and Noise

From the air, the principal visual features of the ONS region are Lakes Keowee, Jocasee, and Hartwell and the countryside, which is generally wooded or in small farms. The position of the plant relative to Lake Keowee is such that the ONS is only visible from the water within the first 1.6 km (1 mi) to the north. Further north, islands and the topography of the shoreline render the plant invisible. From the lake, the shoreline appears mostly wooded with upscale housing developments and boat launches.

Scenic resources inland from the lake have changed since ONS construction because of population growth. This growth has resulted in housing and some roadside development supplanting agricultural and wooded areas. However, South Carolina Highway 130, which follows the east side of Lake Keowee south of the plant and follows the west side of the lake to the north of the plant, mainly affords attractive views of the lake and surrounding hilly, wooded countryside with interspersed development and occasional agricultural lands. This is the main access route to the plant from either north or south. The view on South Carolina Highway 183 coming from either the east or west shows mainly woods and fields and does not reveal ONS until the traveler is within a hundred yards of the plant gate.

Because of woods and topography, noise from the ONS is generally not an issue. The only sounds heard offsite are the plant loudspeakers, which can be heard nearby on the lake.

2.2.8.5 Demography

The update to Duke's Final Safety Analysis Report (Duke 1998b) refers to Duke's emergency response plan, which had an estimated resident population as 65,423 within 16 km (10 mi) of ONS for 1990. This

(a) Letter to Michael J. Scott, Staff Scientist, Pacific Northwest National Laboratory from Phyllis E. Lombard, Finance Director, Oconee County, October 22, 1998.

is only slightly different than Duke's current estimate of 64,405 (Duke 1999a). Seasonal resident population adds another 6,694, transient summer weekend visitors add 8,636 more, and on Clemson football weekends, there may be over 75,000 visitors to the area.

Tables 24.1 through 24.5 in Duke (1999a) estimated resident population for 1990 and each decade through the proposed ONS license renewal term (2010, 2020, 2030). The 2010 projections represent estimated population near the first year of license renewal for Unit 1 (2013), and the projections for the year 2030 represent populations after the end of the renewal term (2034 for Unit 3). Near the end of the license renewal term (2030), the population within 80 km (50 mi) of ONS is expected to be approximately 1.3 million, as compared with 990,000 in 1990 (Duke 1998b).

Data for 1990 are based on the 1990 Census of Population. Future population estimates were developed by combining information that was available from the 1990 Census[a] and resident population projections found in the GEIS, Vol. 2, page A-46.

The 1990 resident population distribution (by distance and directions) is found in Table 24.1 of Duke (1999a). Populations for the sectors[b] were calculated using population values at the census block level, the smallest enumeration level used by the Census Bureau. Census blocks whose geographic centroid was located within a sector were considered to lie within that sector. For each sector that is located within 80 km (50 mi) of the plant, the population numbers for the blocks within each sector were summed to give a total for that sector.

The projected population within the sectors for the years 2000, 2010, 2020, and 2030 was calculated by increasing the 1990 population for each sector by the percentage increases between the respective periods.

The projected 1990 population within 80 km (50 mi) of the Oconee Nuclear Station from the GEIS is 990,000 persons. The 1990 Census Bureau data for the year 1990 indicated 1,021,226 people living within 80 km (50 mi) of the plant. This difference (3.2 percent) was considered to be small. Therefore, Duke (1999a) used the predicted total population values found in the GEIS for the 80-km (50-mi) radius around the plant to extrapolate the 1990 population distribution data forward in time for the years 2010 and 2030. The total resident population within the 80-km (50-mi) radius for the year 2020 (not listed in the GEIS) was determined by using linear interpolation between the population totals for the years 2010 and 2030. This same procedure was applied by the staff to Duke's estimates to obtain the population by sector within 16 km (10 mi).

(a) US Census Bureau C90STF3A

(b) A sector is identified by a combination of its compass direction and the distance of its outer edge from the plant. For instance, the sector that is between 11.25 and 33.75 degrees and 64 km (40 mi) and 80 km (50 mi) from a plant is identified as NNE50.

- **Resident Population Within 16 km (10 mi)**

The estimated resident population within 16 km (10 mi) of ONS for the years 1990, 2010, 2020, and 2030 is listed in Tables 2-9 through 2-12. Figure 2-8 illustrates the 10-mile radius from ONS.

Between 1970 and 1990, the population within 16 km (10 mi) of ONS increased about 70 percent, from 37,831 (AEC 1972) to 64,405 (Duke 1999a). Current projections indicate that by the year 2010, the population within 16 km (10 mi) will be 73,789 (obtained from the FSAR [Duke 1998b]), which is about 39 percent higher than projected in the original FES (AEC 1972). The higher growth within the 16-km (10-mi) radius is primarily related to rapid population growth in Oconee County. Between 1980 and 1990, Oconee County grew half again as fast as the State (1.7 percent per year vs. 1.1 percent per year). According to agency projections, it is expected to grow at about the same rate as the state through the year 2015 (Knight 1998a). Factors stimulating growth in Oconee County include proximity to high-quality recreation and to Greenville. To these factors one could add relatively easy commutes to metropolitan areas (45-min to 1-hr commute by car), less development and lower taxes than those areas, and less stringent land use, zoning, and development regulations compared with some surrounding counties.

- **Resident Population Within 80 km (50 mi)**

The estimated resident population distribution within 80 km (50 mi) of ONS for the years 1990, 2010, 2020, and 2030 is shown in Tables 2-13 through 2-16. Figure 2-9 illustrates the 80-km (50-mi) radius from ONS.

Between 1970 and 1990, the population within 80 km (50 mi) of ONS increased approximately 36 percent, from about 730,000 (AEC 1972) to about 1,020,000 (Table 2-14). Current population projections in the environmental report (ER) (Duke 1998a) indicate that by the year 2010, the population within 80 km (50 mi) will be approximately 1,170,000.

Table 2-17 lists the age distribution of Oconee County in 1990 compared to the U.S. population.

- **Transient Population**

The transient population in the vicinity of ONS can be identified as daily or seasonal. Daily transients are associated with places where a large number of people gather regularly, such as local businesses, industrial facilities, and schools. Seasonal transients result from the use of weekend recreational areas such as Lakes Keowee, Jocasee, and Hartwell. It is estimated that seasonal transients increase the population within 16 km (10 mi) of ONS by approximately 10 percent during the summer months (Oconee Nuclear Station Emergency Response Plan, Duke 1999b). The daily and seasonal population associated with selected industry and recreation within 16 km (10 mi) of the station is listed in Table 2-18.

Table 2-9. Estimated Population Distribution in 1990 Within 16 km (10 mi) of ONS

Sector	0 to 1 Miles	1 to 2 Miles	2 to 3 Miles	3 to 4 Miles	4 to 5 Miles	5 to 10 Miles	Total
N	0	0	0	8	3	143	154
NNE	0	0	30	64	9	186	288
NE	0	13	44	192	222	1,351	1,823
ENE	2	0	39	206	387	1,599	2,233
E	6	23	123	167	229	2,128	2,676
ESE	0	12	38	121	436	2,768	3,375
SE	0	103	158	84	144	6,825	7,314
SSE	0	0	0	0	105	14,858	14,963
S	0	8	6	0	202	3,823	4,038
SSW	0	5	5	4	86	10,989	11,090
SW	0	26	3	145	120	2,916	3,210
WSW	0	0	44	277	114	2,858	3,294
W	0	43	34	176	142	4,192	4,587
WNW	0	16	38	66	67	1,227	1,415
NW	0	14	62	661	35	1,514	2,285
NNW	0	40	110	364	140	1,007	1,660
Total	8	302	735	2,535	2,440	58,384	64,405

Source: U.S. Census Bureau - 1990 Census, File C90STF3A (DOC 1991)

Table 2-10. Estimated Population Distribution in 2010 Within 16 km (10 mi) of ONS

Sector	0 to 1 Miles	1 to 2 Miles	2 to 3 Miles	3 to 4 Miles	4 to 5 Miles	5 to 10 Miles	Total
N	0	0	0	9	3	164	176
NNE	0	0	34	73	10	213	330
NE	0	15	51	220	254	1,548	2,089
ENE	2	0	45	236	443	1,831	2,558
E	7	26	141	192	262	2,438	3,066
ESE	0	14	43	139	500	3,171	3,867
SE	0	117	181	96	165	7,820	8,380
SSE	0	0	0	0	120	17,023	17,143
S	0	9	7	0	231	4,379	4,626
SSW	0	6	6	5	98	12,591	12,706
SW	0	30	4	166	137	3,342	3,678
WSW	0	0	51	318	131	3,274	3,774
W	0	50	39	202	163	4,802	5,255
WNW	0	19	44	75	77	1,406	1,621
NW	0	16	71	758	40	1,735	2,618
NNW	0	45	126	417	160	1,153	1,902
Total	9	346	842	2,905	2,796	66,891	73,789

Source: Computed from Table 2-14.

Table 2-11. Estimated Population Distribution in 2020 Within 16 km (10 mi) of ONS

Sector	0 to 1 Miles	1 to 2 Miles	2 to 3 Miles	3 to 4 Miles	4 to 5 Miles	5 to 10 Miles	Total
N	0	0	0	9	4	174	187
NNE	0	0	36	78	11	226	350
NE	0	16	54	234	270	1,641	2,214
ENE	3	0	48	250	470	1,941	2,711
E	7	27	149	203	278	2,584	3,249
ESE	0	14	46	147	530	3,361	4,098
SE	0	124	192	102	175	8,288	8,881
SSE	0	0	0	0	127	18,041	18,168
S	0	9	7	0	245	4,641	4,903
SSW	0	6	6	5	104	13,344	13,466
SW	0	32	4	176	145	3,541	3,898
WSW	0	0	54	337	139	3,470	4,000
W	0	53	41	214	173	5,090	5,570
WNW	0	20	47	80	81	1,490	1,718
NW	0	17	75	803	42	1,839	2,775
NNW	0	48	134	442	170	1,223	2,016
Total	**10**	**367**	**892**	**3,079**	**2,963**	**70,893**	**78,204**

Source: Computed from Table 2-15.

Table 2-12. Estimated Population Distribution in 2030 Within 16 km (10 mi) of ONS

Sector	0 to 1 Miles	1 to 2 Miles	2 to 3 Miles	3 to 4 Miles	4 to 5 Miles	5 to 10 Miles	Total
N	0	0	0	10	4	184	198
NNE	0	0	38	82	11	238	369
NE	0	17	57	247	285	1,733	2,338
ENE	3	0	51	264	496	2,050	2,864
E	8	29	158	214	294	2,730	3,433
ESE	0	15	48	156	560	3,550	4,329
SE	0	131	203	107	185	8,755	9,382
SSE	0	0	0	0	134	19,060	19,194
S	0	10	8	0	259	4,904	5,180
SSW	0	7	7	5	110	14,097	14,226
SW	0	33	4	186	154	3,741	4,118
WSW	0	0	57	356	147	3,666	4,225
W	0	56	43	226	183	5,377	5,884
WNW	0	21	49	84	86	1,574	1,815
NW	0	17	79	848	44	1,942	2,931
NNW	0	51	141	466	179	1,291	2,129
Total	**11**	**388**	**942**	**3,252**	**3,130**	**74,893**	**82,615**

Source: Computed from Table 2-16.

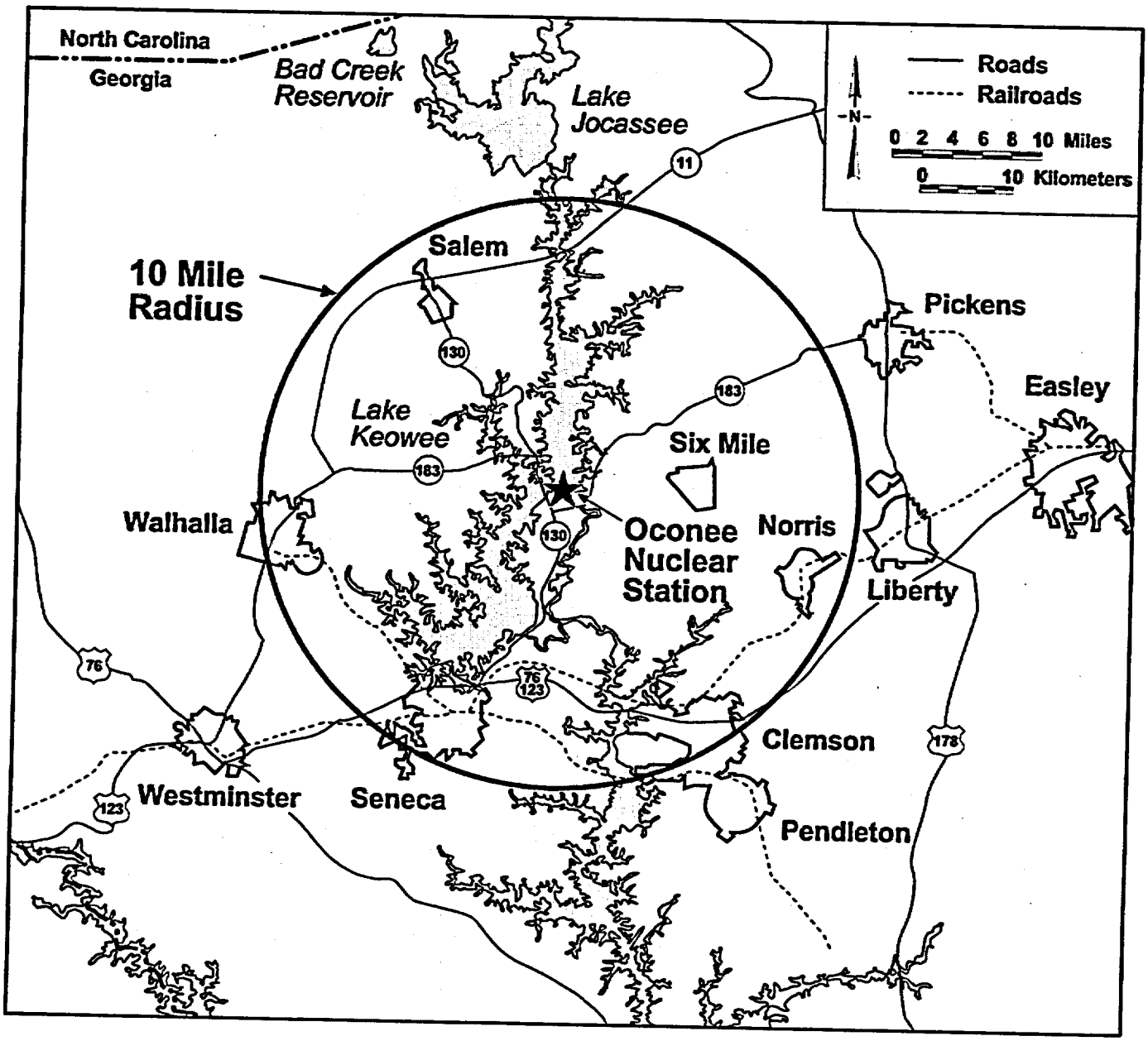

Figure 2-8. Oconee Nuclear Station - 16-km (10-mi) Radius

Table 2-13. Estimated Population Distribution in 1990 Within 80 km (50 mi) of ONS

Sector	0-10 Miles	10-20 Miles	20-30 Miles	30-40 Miles	40-50 Miles	Total
N	154	355	2,557	444	22,328	25,838
NNE	288	547	6,285	18,676	26,660	52,456
NE	1,823	4,692	4,331	4,631	41,165	56,642
ENE	2,233	13,845	34,721	46,169	36,182	133,150
E	2,676	29,511	112,819	117,286	30,134	292,426
ESE	3,375	5,678	25,609	14,078	12,455	61,195
SE	7,314	5,916	36,445	12,423	11,055	73,153
SSE	14,963	11,038	38,834	9,191	2,715	76,741
S	4,038	3,363	6,624	9,659	13,001	36,685
SSW	11,090	5,290	7,450	10,407	9,024	43,261
SW	3,210	6,814	8,155	5,772	6,847	30,798
WSW	3,294	4,722	13,914	13,605	20,881	56,416
W	4,587	3,070	2,403	3,427	3,540	17,027
WNW	1,415	1,017	4,945	3,116	4,151	14,644
NW	2,285	579	2,678	14,770	5,142	25,454
NNW	1,660	354	1,946	7,872	13,508	25,340
Total	**64,405**	**96,791**	**309,716**	**291,526**	**258,788**	**1,021,226**

Source: U.S. Census Bureau - 1990 Census, File C90STF3A (DOC 1991).

Table 2-14. Estimated Population Distribution in 2010 Within 80 km (50 mi) of ONS

Sector	0-10 Miles	10-20 Miles	20-30 Miles	30-40 Miles	40-50 Miles	Total
N	176	407	2,930	509	25,581	29,602
NNE	330	627	7,201	21,397	30,544	60,098
NE	2,089	5,376	4,962	5,306	47,162	64,894
ENE	2,558	15,862	39,779	52,895	41,453	152,548
E	3,066	33,810	129,255	134,372	34,524	335,027
ESE	3,867	6,505	29,340	16,129	14,269	70,110
SE	8,380	6,778	41,754	14,233	12,666	83,810
SSE	17,143	12,646	44,491	10,530	3,111	87,921
S	4,626	3,853	7,589	11,066	14,895	42,029
SSW	12,706	6,061	8,535	11,923	10,339	49,563
SW	3,678	7,807	9,343	6,613	7,844	35,285
WSW	3,774	5,410	15,941	15,587	23,923	64,635
W	5,255	3,517	2,753	3,926	4,056	19,508
WNW	1,621	1,165	5,665	3,570	4,756	16,777
NW	2,618	663	3,068	16,922	5,891	29,162
NNW	1,902	406	2,229	9,019	15,476	29,032
Total	**73,788**	**110,892**	**354,836**	**333,996**	**296,489**	**1,170,000**

Source: Duke 1999a.

Table 2-15. Estimated Population Distribution in 2020 Within 80 km (50 mi) of ONS

Sector	0-10 Miles	10-20 Miles	20-30 Miles	30-40 Miles	40-50 Miles	Total
N	187	431	3,105	539	27,111	31,373
NNE	350	664	7,631	22,677	32,371	63,693
NE	2,214	5,697	5,259	5,623	49,984	68,776
ENE	2,711	16,811	42,159	56,060	43,933	161,674
E	3,249	35,833	136,988	142,412	36,590	355,071
ESE	4,098	6,894	31,095	17,094	15,123	74,305
SE	8,881	7,183	44,252	15,084	13,423	88,824
SSE	18,168	13,403	47,153	11,160	3,297	93,181
S	4,903	4,083	8,043	11,728	15,786	44,544
SSW	13,466	6,423	9,046	12,636	10,957	52,529
SW	3,898	8,274	9,902	7,009	8,314	37,396
WSW	4,000	5,734	16,895	16,520	25,354	68,502
W	5,570	3,728	2,918	4,161	4,298	20,675
WNW	1,718	1,235	6,004	3,784	5,040	17,781
NW	2,775	703	3,252	17,934	6,244	30,907
NNW	2,016	430	2,363	9,558	16,402	30,769
Total	**78,202**	**117,526**	**376,065**	**353,979**	**314,227**	**1,240,000**

Source: Duke 1999a.

Table 2-16. Estimated Population Distribution in 2030 Within 80 km (50 mi) of ONS

Sector	0-10 Miles	10-20 Miles	20-30 Miles	30-40 Miles	40-50 Miles	Total
N	198	455	3,280	570	28,642	33,144
NNE	369	702	8,062	23,957	34,199	67,289
NE	2,338	6,019	5,556	5,941	52,805	72,659
ENE	2,864	17,760	44,539	59,224	46,413	170,801
E	3,433	37,856	144,721	150,451	38,655	375,116
ESE	4,329	7,284	32,851	18,059	15,977	78,499
SE	9,382	7,589	46,751	15,936	14,181	93,839
SSE	19,194	14,159	49,815	11,790	3,483	98,441
S	5,180	4,314	8,497	12,390	16,677	47,058
SSW	14,226	6,786	9,557	13,350	11,576	55,494
SW	4,118	8,741	10,461	7,404	8,783	39,507
WSW	4,225	6,057	17,848	17,452	26,786	72,369
W	5,884	3,938	3,083	4,396	4,541	21,842
WNW	1,815	1,305	6,343	3,997	5,325	18,785
NW	2,931	743	3,435	18,947	6,596	32,652
NNW	2,129	454	2,496	10,098	17,328	32,505
Total	**82,617**	**124,161**	**397,295**	**373,961**	**331,966**	**1,310,000**

Source: Duke 1999a.

Table 2-17. Estimated Age Distribution of Population in 1990[a]

Age Group	Oconee County, South Carolina		United States	
	Number	Percent	Number	Percent
Under 5	3,573	6.2	19,512,000	7.6
5-19	12,106	21.1	53,523,000	21.0
20-44	21,241	36.9	101,416,000	39.8
45-64	12,666	22.0	48,348,000	19.0
65 and Over	7,908	13.8	32,283,000	12.7
Total	57,494	100.0	255,082,000	100.0

(a) U.S. Bureau of the Census 1990, File STFIA (DOC 1991).

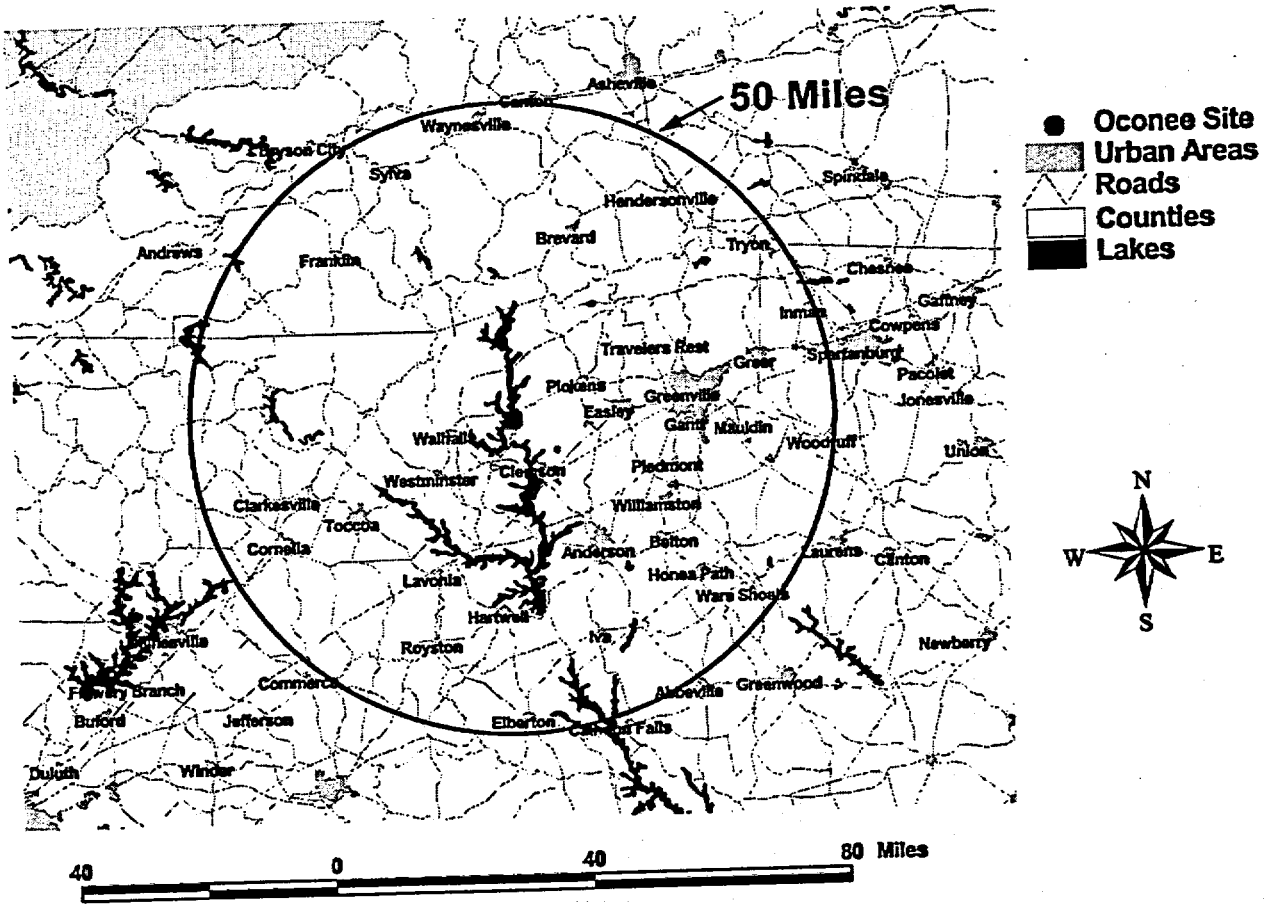

Figure 2-9. Oconee Nuclear Station - 80-km (50-mi) Radius

It should be noted that on most weekdays, a significant portion of the resident population is absent from Oconee County during daytime hours. According to the 1990 Census of Population, 25 percent of employed County residents (about 6700 people) commuted to jobs outside of Oconee County while over 4200 commuted into the county (Talbert & Bright 1996). With increased numbers of in-movers to Oconee County, the number of commuters likely has increased, although no post-1990 numbers are available.

Table 2-18. Transient Population Within 16 km (10 mi) of ONS[a]

Direction	Seasonal Resident Population	Winter Weekday	Winter Weeknight	Summer Weekend	Clemson Football Weekend
N	25	20	0	392	20
NNE	39	0	0	0	0
NE	235	0	0	0	0
ENE	229	0	0	0	0
E	272	0	0	0	0
ESE	300	210	90	90	90
SE	491	468	322	2,515	378
SSE	738	1,486	1,294	1,133	73,688
S	383	100	60	60	0
SSW	848	597	447	797	457
SW	318	1,002	335	3,300	235
WSW	453	1,420	120	169	169
W	517	275	127	122	122
WNW	215	0	0	0	0
NW	715	0	8	0	50
NNW	687	8	0	0	8
Offsite	6,465	5,586	2,803	8,578	75,217
ONS		1395	698	698	698
Total		6,981	3,501	9276	75,915

(a) Source: Oconee Nuclear Station Emergency Response Plan (Duke 1999b), Revision 99-01, Figures J-3B to J-4E.

2.2.9 Historical and Archaeological Resources

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

2.2.9.1 Cultural Background

The area around ONS is rich in prehistoric and historic Native American and historic Euroamerican cultural resources. This part of northwestern South Carolina has an archaeological sequence that extends back to about 10,000 B.C., although human use of the area was probably limited until about 4,000 to 5,000 B.C. when numerous small campsites are evident in the archaeological record. By 1000 B.C., archaeological data suggest a shift from scattered campsites to a more sedentary settlement and a subsistence system that was concentrated on ravine settings. By A.D. 1000, the archeological

evidence for ancestral Cherokee culture is present, beginning with the regional Pisgah Phase (A.D. 1000 to 1500) and the following contact period Qualla Phase (A.D. 1500 to 1850) (Dickens 1976; Keel 1976). Pisgah villages included upright wooden post houses encircled by a palisade. These villages were commonly located in the larger alluvial valleys where soils were suitable for horticulture. This general village pattern continued into the Early Qualla Phase with the Late Qualla Phase being characterized by the Europeanization of Native American technology, economy, and settlement patterns after A.D. 1820.

The Cherokee were first noted in the written record by Spanish explorers in 1540. During the Qualla historic period, the Cherokee Indian cultural group has been divided into three subgroups, based on cultural, linguistic, and environmental distinctions (Dickens 1979). Of these subgroups, the Lower Cherokee grouping occupied the foothills of the Appalachian Mountains near the upper reaches of the Savannah River system. The Keowee River valley, which includes ONS and the associated reservoir, was one of the principal riverine settings for Lower Cherokee settlements of this period. Other Lower Cherokee villages are documented from historical written references in this part of South Carolina (Sheriff 1994; Ross 1980). During the 18th century, Keowee was the most important of these villages (Harmon 1986). The Cherokee village of Keowee, which is today located beneath the waters of Lake Keowee about 8 km (5 mi) north of ONS, was partially excavated during a preimpoundment archaeological project sponsored by Duke from 1966 to 1968. Also investigated by this project was Fort Prince George, a garrison constructed across the river from Keowee Village by the British Government in 1753 to protect the Lower Cherokee from French intrusions into the area and to secure trade relations between the British and the Cherokees (Hembree and Jackson 1998; Williams 1998).

The Cherokee Indian presence throughout their former extensive homelands came to a close in the late 1700s through a series of treaties with the Colonies and the United States, culminating with the well-documented removal of the Cherokee and other southeastern tribes to Indian Territory in the West (Perdue and Green 1995). The part of South Carolina, including the Oconee project area, was included in a land cession treaty completed in May of 1777 (Royce 1884). A small number of Cherokee in North Carolina avoided the removal actions and today are recognized as the Eastern Band of Cherokee Indians, with their tribal headquarters at Cherokee, North Carolina, some 80 km (50 mi) north of ONS. Cherokees removed to the West are today known as the Cherokee Nation of Oklahoma.

Following the 1777 treaty, northwestern South Carolina was immediately occupied by land-hungry white settlers. The first deeds in the Keowee River valley date to 1784; by the turn of the century, most of the land along the Keowee and adjacent valleys had been deeded. Hembree and Jackson (1998) document the historical development of the Keowee River valley from initial settlement through construction of Duke's Keowee-Toxaway Project that transformed the entire river valley.

2.2.9.2 Historical and Archaeological Resources at ONS

Archaeological

As noted above, archaeological investigations were conducted throughout the Keowee-Toxaway Project area, basically the Keowee River valley from the present Keowee Dam and ONS north to include the inundated portion of Lake Keowee. This effort was conducted by personnel from the South

Carolina State Department of Archaeology during which 39 archaeological sites were recorded. Of this total, 9 of the sites were archaeologically tested, and significant excavations were completed at 6 sites, including Keowee Indian village and Fort Prince George (Beuschel, no date). Although final reports of these activities were not issued following the fieldwork, recent documents have provided some detail (Harmon 1986; Williams 1998). Information gained about both the Cherokee occupation and the British operation of Fort Prince George is also presented in the interpretive displays at the Keowee-Toxaway State Park.

Archaeological site file searches at the South Carolina Department of Archives and History and the Institute of Archaeology and Anthropology, University of South Carolina, revealed the presence of four recorded Native American sites within a 1.6-km (1-mi) radius of ONS. Two of these sites were recorded during a field survey of the Oconee-Bad Creek 500 kV transmission line (Brockington 1978). Both of these archaeological sites, located northwest of the ONS, are low-density lithic tool scatter sites and were evaluated as not possessing characteristics that would make them eligible for the National Register of Historic Places. The other two archaeological sites are located southwest of the plant. Each of these sites is also categorized as a nondescript lithic scatter.

Historical

The preinundation archaeological project focused solely on the prehistoric and early historic Cherokee sites and Fort Prince George. The architecture and archaeology of historic Euroamerican period settlements in the overall project area were not documented and evaluated, including the Old Pickens townsite at the location of ONS. A number of cemeteries in the valley were relocated before inundation. Additionally, many historic structures were relocated by Duke, including residences, a girl's camp, two sawmills, and a covered wooden bridge.

The original town of Pickens on the west bank of the Keowee River was active between 1828 and 1868 as the courthouse town of Pickens District, which then included present-day Oconee and Pickens Counties (Hembree and Jackson 1998; Holder 1991). In 1868, the Keowee River was designated as the boundary line between the two newly formed counties. In response to this division, a new town, also called Pickens, was established about 24 km (15 mi) northeast to be the seat of Pickens County. Most of the buildings in the original town of Pickens were torn down or dismantled and moved to the new town of Pickens or to Walhalla, the new county seat of Oconee County.

The original townsite apparently included much of what became ONS. According to Hembree and Jackson (1998), "The Pickens townsite stretched from the bank of the Keowee, along what is now the Pickens-Walhalla Highway [Highway 183], west across the Duke construction and maintenance shops, and north over the site of the nuclear plant."

Today, the only standing structure at the Old Pickens townsite is a one-story brick building built between 1849 and 1851, commonly known as the "Old Pickens Presbyterian Church." A cemetery with over 200 marked graves surrounds the church, including the original cemetery associated with the church and relocated graves from 14 family or other cemeteries that were moved to Old Pickens in the late 1960s before Lake Keowee was filled. A complete listing of tombstone inscriptions from the original and relocated cemeteries is found in the Pendleton Chapter of South Carolina Genealogical Society

(1983-84). The Old Pickens Presbyterian Church was nominated for inclusion in the National Register of Historic Places in 1994 and listed in 1996 (Sherard 1994).

No other historic period sites are currently recorded at ONS. While no historic structures are present, there is potential for either surface or buried historic archaeological remains (e.g., artifact scatters, privies, and refuse dumps) that could exist in areas that have not received substantial soil disturbance.

Any such remains could have been associated either with the Old Pickens townsite, with nearby homesteads along the river, or along Highways 183 and 130. According to the Keowee-Toxaway Project description, 17 houses were relocated in connection with development of ONS (Duke 1971).

For example, Hembree and Jackson (1998) illustrate a historic two-story home, known in the 1800s as the Pleasant Alexander House that once stood in the Oconee project area on the west bank of the Keowee River. During dam construction in the 1960s, Duke used the house as an office, after which it was moved to High Falls County Park where it continues to serve as park offices. In a 1968 aerial photograph of the ONS construction site, the house is clearly evident on the west bank, just below the damsite (Hembree and Jackson 1998). In the same view, two other then-extant historic houses can be seen along the north side of Highway 183, along the southern edge of the plant site. At the same location near the current access road into the plant from Highway 183, there is a small fenced cemetery on the knoll above the road. This cemetery has not been recorded and is not included in the listing of Oconee County historic cemeteries (Pendleton Chapter of South Carolina Genealogical Society 1983-84). Household artifacts in the vicinity of this cemetery indicate that a house was probably at one time associated with the graves.

2.2.10 Related Federal Project Activities

The Federal Power Commission, now the Federal Energy Regulatory Commission (FERC), issued a license (FERC Project No. 2503) to Duke Power on September 1, 1966, for the construction of the Keowee hydroelectric station and the Jocassee pumped storage project. Lake Keowee, from which the ONS draws cooling water, is formed by dams on the Keowee River and Little River. The Keowee hydroelectric station is located at the dam on the Keowee River. The station serves as the onsite emergency electric power source for ONS. The license for the Keowee and Jocassee hydroelectric projects will expire in 2016. Under current FERC rules, Duke will need to file a notice of intent with FERC by 2011 declaring whether it intends to seek a new license for the Keowee and Jocassee hydroelectric projects. At least 2 years before the license expires, Duke will need to file an application for a new license (relicense). FERC procedures for processing a new license are similar to those for an original license.

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

The staff determined that there were no Federal project activities in the vicinity of ONS that could result in cumulative environmental impacts or that would make it desirable for another Federal agency to

become a cooperating agency for preparing the SEIS. The Natural Resources Conservation Service (NRCS), a division of the U.S. Department of Agriculture, was the only Federal agency to participate in the scoping process. NRCS submitted a letter stating that it has partnered with Duke in planning, implementing, and promoting environmental stewardship, such as the cooperative work to prevent and control soil erosion at work sites in the South Carolina mountains and foothills.

2.3 References

10 CFR Part 20, "Standards for Protection Against Radiation."

10 CFR 20.1301(d), "Dose limits for individual members of the public."

10 CFR 20.2002, "Method for obtaining approval of proposed disposal procedures."

10 CFR Part 20, Appendix B, Table 2, "Annual limits on intake (ALIs) and derived air concentrations (DACs) of radionuclides for occupational exposure; effluent concentrations; concentrations for Release to Sewerage."

10 CFR Part 50, Appendix I, "Numerical guides for design objectives and limiting conditions for operation to meet the criterion 'as low as is reasonably achievable' for radioactive material in light-water-cooled nuclear power reactor effluents."

10 CFR 51.53, "Postconstruction environmental reports."

10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 61, "Licensing requirements for land disposal of radioactive waste."

10 CFR Part 71, "Packaging and transportation of radioactive material."

40 CFR 81.311, "Georgia."

40 CFR 81.334, "North Carolina."

40 CFR 81.341, "South Carolina."

40 CFR Part 81, Subpart D, "Identification of Mandatory Class I Federal Areas where Visibility is an Important Factor."

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U.S. Nuclear Regulatory Commission (NRC). 1998. Letter from NRC to Duke Energy Corporation. Subject: Request for Additional Information for the Review of the Oconee Nuclear Station Unit Nos. 1, 2, & 3 Environmental Report Associated with License Renewal - Environmental. Dated December 29, 1998.

U.S. Nuclear Regulatory Commission (NRC). 1999a. Letter from NRC to Duke Energy Corporation. Subject: Use of Framatome Cogema Fuels Topical Report on High Burnup - Oconee Nuclear Station, Units 1, 2, and 3. Dated March 1, 1999.

U.S. Nuclear Regulatory Commission (NRC). 1999b. Letter from NRC to Duke Energy Corporation. Subject: Determination of the Scope of Transmission Lines Impact Assessment for Oconee License Renewal. Dated May 10, 1999.

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3.0 Environmental Impacts of Refurbishment

Environmental issues associated with refurbishment activities were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437 (NRC 1996). The GEIS included 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 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 offsite radiological impacts from the fuel cycle and from 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 did not meet one or more of the criteria of Category 1, and therefore, additional plant-specific review for 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 that 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.

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section, if such actions were planned. Duke indicated that it has performed an evaluation of structures and components pursuant to 10 CFR 54.21 to identify activities that are necessary to continue operation of ONS during the requested 20-year period of extended

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)	
Refurbishment	3.5
GROUNDWATER USE AND QUALITY	
Impacts of refurbishment on groundwater use and quality	3.4.2
LAND USE	
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

operation. These activities include replacement of certain components as well as new inspection activities and are described in Exhibit A of the Oconee Application for Renewed Operating Licenses (Duke 1998).

However, Duke stated that the replacement of these components and the additional inspection activities are within the bounds of normal plant component replacement and inspections; therefore, they are not expected to affect the environment outside the bounds of plant operations as evaluated in the final environmental statement (FES) (AEC 1972). In addition, Duke's evaluation of structures and components as required by 10 CFR 54.21 did not identify any major plant refurbishment activities or modifications necessary to support the continued operation of ONS beyond the end of the existing operating licenses. Therefore, refurbishment is not considered in this SEIS.

Table 3-2. Category 2 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53 (c)(3)(ii) Subparagraph
TERRESTRIAL RESOURCES		
Refurbishment impacts	3.6	E
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)		
Threatened or endangered species	3.9	E
AIR QUALITY		
Air quality during refurbishment (non-attainment 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	

3.1 References

10 CFR Part 51, Subpart A, Appendix B, "Environmental effect of renewing the operating license of a nuclear power plant."

10 CFR 54.21, "Contents of application - technical information."

Duke Energy Corporation 1998. *Application for Renewed Operating Licenses, Oconee Nuclear Station Units 1, 2, and 3.* Volume IV - Environmental Report.

U.S. Atomic Energy Commission (AEC). 1972. *Final Environmental Statement related to Operation of Oconee Nuclear Station Units 1, 2, and 3.* March 1972. Washington, D.C.

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

4.0 Environmental Impacts of Operation

Environmental issues associated with operation during the renewal term were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437 (NRC 1996a; 1999a). The GEIS included 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 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 offsite radiological impacts from the fuel cycle and from 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 did not meet one or more of the criteria of Category 1, and therefore, additional plant-specific review for these issues is required.

This chapter addresses those issues related to operation during the renewal term that are listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to ONS. Section 4.1 addresses the Category 1 issues applicable to the ONS once-through cooling system, while Category 2 issues applicable to the ONS cooling system are discussed at greater length in Sections 4.1.1 through 4.1.4. Section 4.2 addresses Category 1 issues related to transmission lines and land use, while Category 2 issues are discussed in Sections 4.2.1 and 4.2.2. Section 4.3 addresses the radiological impacts of normal operation. There are no Category 2 issues related to radiological impacts of normal operation. Section 4.4 addresses the Category 1 issues related to the socioeconomic impacts of normal operation during the renewal term. Category 2 socioeconomic issues are discussed in Sections 4.4.1 through 4.4.6. Section 4.5 addresses the Category 1 issues related to groundwater use and quality. Category 2 groundwater use and quality issues are discussed in Sections 4.5.1 and 4.5.2. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species, a Category 2 issue. Section 4.7 addresses new information that was raised during the scoping period. The results of the

evaluation of environmental issues related to operation during the renewal term are summarized in Section 4.8. Finally, Section 4.9 lists the references for Chapter 4.

4.1 Cooling System

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to ONS cooling system operation during the renewal term are listed in Table 4-1. Duke stated in its environmental report (ER) (Duke 1998a) that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

- Altered current patterns at intake and discharge structures: 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including reports of studies of Lake Keowee performed for the South Carolina Department of Health and Environmental Control (SDCHEC). Therefore, the staff concludes that there are no impacts of altered current patterns 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including reports of studies of Lake Keowee performed for the SCDHEC. Therefore, the staff concludes that there are no impacts of altered thermal stratification of Lake Keowee during the renewal term beyond those discussed in the GEIS.

Table 4-1. Category 1 Issues Applicable to the Operation of the ONS 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 (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.3.2.2; 4.4.2
Altered thermal stratification of lakes	4.2.1.2.3; 4.4.2.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2.
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in waste water	4.2.1.2.4; 4.3.2.2; 4.4.2.2
Water-use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Microbial organisms	4.3.6
Noise	4.3.7

- 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its

evaluation of other available information. Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of scouring 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including plant monitoring data and technical reports. Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including the NPDES permit for ONS. Therefore, the staff concludes that there are 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 the NPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term." The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including the NPDES permit for ONS. Therefore, the staff concludes that there are 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 waste water: 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including the NPDES permit for ONS. Therefore, the staff concludes that there are no impacts of discharges of other metals in waste water during the renewal term beyond those discussed in the GEIS.

- Water-use conflicts (plants with once-through cooling systems): Based on information in the GEIS, the Commission found that "These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipating systems." The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of available information. Therefore, the staff concludes that there are no water-use conflicts 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of available information. Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including reports by Hudson and Nichols (1978) and Duke (1977). Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft

SEIS, or its evaluation of other available information including Barwick et al. (1995). Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including information from Oliver and Hudson (1987). Therefore, the staff concludes that there are no impacts of thermal plumes 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including pre- and post-operational reports by Oliver and Hudson (1987), Barwick (1984), and Barwick et al. (1995). Therefore, the staff concludes that there are no impacts on the 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including pre- and post-operational studies reported by Oliver and Hudson (1987). Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- Low dissolved oxygen (DO) in the discharge: 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including pre- and post-operational studies conducted by Oliver and Hudson (1987) and the 316(a) demonstration report (Duke 1995). Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses: 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms: 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information including the 316(a) demonstration report (Duke 1995). Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

Category 2 issues related to cooling system operation during the renewal term that are applicable to ONS are discussed in the sections that follow. These issues are listed in Table 4-2.

Table 4-2. Category 2 Issues Applicable to the Operation of the ONS Cooling System During the Renewal Term

ISSUE – 10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.4.3	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3; 4.4.3	B	4.1.2
Heat shock	4.2.2.1.4; 4.4.3	B	4.1.3
Microbiological organisms (human health)	4.3.6	G	4.1.4

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

For plants with once-through cooling systems, entrainment of fish and shellfish in early life stages into cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff reviewed NPDES Permit #SC0000515 (that governs the release of effluents by Oconee Nuclear Power Station into the receiving waters of Lake Keowee and to the Keowee Hydro Station's tailrace). The current permit was issued on September 29, 1999, and expires on September 30, 2003.

The EPA-issued NPDES permit effective February 18, 1975, required Oconee to implement a program to monitor entrainment through plant intake structures in accordance with Section 316(b) of the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act. Rates of entrainment were

studied and summarized in a letter report to the EPA on March 24, 1976 (letter from W.D. Adair, 1976, in Duke 1999a). The summary report, which Duke considers its 316(b) demonstration, indicated that no fish eggs or larvae were collected after extensive sampling that began in May 1973.

While no formal record of acceptance by the EPA of this 316(b) demonstration has been identified, the EPA did issue a modified NPDES permit on August 30, 1976, that deleted requirements to monitor entrainment through plant intake structures (Duke 1998a). No further studies or analyses were required in subsequent NPDES permits.

However, while the EPA was reviewing the 316(b) demonstration report, Duke was conducting additional larval entrainment studies weekly from March through August 1976 to document the efficiency of the skimmer wall to reduce entrainment of larval fish (Olmsted and Adair 1981). Standing crops of fish larvae in the intake canal and in Lake Keowee were compared to numbers of fish larvae entrained under the skimmer wall and through the condensers. Overall, the density of fish larvae entrained was always less than 1 percent of that noted in concurrent lake sampling at ONS. The difference in larvae densities between the lake and intake canal was attributed to the skimmer wall's depth being below the thermocline during the spawning season. Thus, this study served to reinforce the results of the 316(b) demonstration.

On March 2, 1979, the staff issued Amendments to the Licenses for Oconee Units 1, 2, and 3 that deleted the aquatic surveillance and special studies programs because the Environmental Impact Appraisal performed for this amendment concluded the impact of Oconee on the aquatic environment was within the bounds of the final environmental statement (FES) and that the special study programs were no longer necessary (letter from R.W. Reid, March 1979 in Duke 1999a).

The staff has reviewed the available information relative to potential impacts of the cooling water intake system's entrainment of fish and shellfish in early life stages. Based on this review, the staff has concluded that the potential impacts are SMALL, and mitigation is not warranted.

4.1.2 Impingement of Fish and Shellfish

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal. Impingement of shellfish is not an issue because there is no significant population of endemic shellfish species in the vicinity of ONS (Duke 1999b).

The staff reviewed NPDES Permit #SC0000515, which was issued on September 29, 1999, and expires on September 30, 2003. This permit governs the release of effluents by Oconee Nuclear Power Station into the receiving waters of Lake Keowee and to the Keowee River (at the location of the Keowee Hydro Station's tailrace).

An early EPA-issued NPDES permit effective February 18, 1975, required Oconee to implement a program to monitor impingement of fish on plant intake structures in accordance with Section 316(b) of the Clean Water Act. Rates of impingement were studied and summarized in a letter report to the EPA on March 24, 1976 (letter from W.D. Adair 1976 in Duke 1999a). The summary report indicated that

> ...impingement of game and sport fish has been low. Small bluegill and yellow perch were the fishes most commonly impinged prior to the introduction of threadfin shad into Lake Keowee. Since threadfin have become established, we have a situation which is typical of cooling reservoirs in the southeastern U.S. Threadfin comprise the majority of those fish impinged (over 90 percent on most occasions) and contribute most to seasonal trends – i.e., high impingement rates in winter and low in summer. In view of the species and number of fishes affected it is doubtful that impingement at Oconee exerts any significant impact on resident fish populations of Lake Keowee.

These findings on impingement were drawn largely from a study conducted by Duke (Edwards et al. 1976) that determined the number of finfish impinged on stationary screens at Oconee Nuclear Station between July 1974 and May 1975. Six screens (two screens per unit and 25 percent of total screen area) were removed and inspected at 2-week intervals. Over the entire study period, 241,697 fish were collected on representative screens.

Overall, species composition found impinged during the study included threadfin shad, *Dorosoma petenense* (49.3 percent), yellow perch, *Perca flavescens* (2.5 percent), and bluegill, *Lepomis macrochirus* (1.4 percent), even though threadfin shad were only introduced to Lake Keowee in February 1974 and did not show up in impingement samples until November 1974. Many fish collected during the study were unidentifiable (46.8 percent), but were suspected to be almost entirely threadfin shad (Duke 1998a, Attachment B), and the remainder were miscellaneous species that comprised an insignificant portion of the impingement samples.

SCUBA divers inspected all 24 screens at ONS between September 16 and 19, 1974, to ensure that impingement rates were similar for all screens and that subsampling at representative screens from each unit was realistic for estimating total impingement. Significant differences among screens was not apparent (Duke 1998a, Attachment B). Electrofishing, gill-net, and rotenone data were used to compare species composition throughout the lake to species found on intake screens. All species collected on the intake screens were represented in field collection samples, but 33 species collected in the field were not observed on intake screens. This suggests that susceptibility to impingement was, in part, species specific.

Impacts from impingement are determined relative to recreationally or commercially important species. A creel census conducted in 1973 indicated that largemouth bass *(Micropterus salmoides)*, bluegill, and crappie (*Pomoxis* spp.) were the most important sport fish taken from Lake Keowee. Data on angler effort and harvest rates collected over a period from 1974 to 1993 (Barwick et al. 1995) confirmed that largemouth bass remained the most important sportfish in the reservoir and that sunfish (*Lepomis* spp.,

including bluegill) and crappie were the only other species that contributed in a significant way to the reservoir's sport fishery. Sampling conducted from 1972 to 1993 indicated that these species were also the most common sportfish in the reservoir (Duke 1995). Occasional impingement of these species is not expected to produce population-level effects. Again, only 1.4 percent of fish impinged in the 1974–75 study (Edwards et al. 1976) were bluegill. Other sunfish species, largemouth bass, and crappie were included in the "miscellaneous" category that made up less than 0.3 percent of the total fish impinged. Threadfin shad were the most frequently impinged species (49.3 percent). They are a forage fish species and are not considered important by either recreational or commercial standards.

Over the years, NPDES permits issued to Duke for ONS gradually reduced requirements for evaluating impingement because research indicated that important aquatic species were not being adversely impacted. No correspondence could be located indicating EPA's formal approval of the study. However, the EPA issued a modified NPDES permit on August 30, 1976, that deleted requirements to monitor impingement through plant intake structures (Duke 1998a). No further studies or analyses were required in subsequent NPDES permits. On March 2, 1979, the staff issued Amendments to the Licenses for Oconee Units 1, 2, and 3 that deleted the aquatic surveillance and special studies programs because the Environmental Impact Appraisal performed for this amendment concluded that the impact of Oconee on the aquatic environment was within the bounds of the FES and that the special study programs were no longer necessary (letter from R.W. Reid, March 1979 in Duke 1999a).

Although special studies were no longer required, additional impingement studies were performed from January through March 1990 (Barwick 1990). During this period of weekly sampling, only three fish species were found in impingement samples, none of which are considered important sportfish species. Threadfin shad comprised 91.5 percent of the total fish impinged, blueback herring *(Alosa aestivalis)* comprised 8.4 percent, and yellow perch comprised 0.1 percent. The numbers of fish impinged were 2.6 times the number of impinged fish that were reported by Edwards et al. (1976) and were estimated to represent 11.1 percent of the pelagic fish population in the Keowee Reservoir. Although threadfin shad are not commercially or recreationally important, the high rate of impingement merits some discussion. Mobile hydroacoustic surveys conducted during spring and fall 1989, 1990, 1996, and fall 1997 show a pattern in threadfin shad population dynamics that helps explain the high percentage of impinged fish (Duke 1999a).

Table 4-3 (Duke 1999a) shows the fluctuation in pelagic fish populations (approximately 51 percent threadfin shad and 49 percent blueback herring) between spring and fall surveys.

Table 4-3. Fluctuation in Pelagic Fish Populations Between Spring and Fall Surveys

Numbers of Small Pelagic Fish (millions)	Date of Mobile Hydroacoustic Survey
3.0	March 1989
4.9	November 1989
2.6	March 1990
14.1	November 1990
12.5	March 1996
28.2	November 1996
3.7	November 1997

The estimated numbers of small pelagic fish are always lower in spring than fall, following a period of high winter mortality. Blueback herring are not overly susceptible to cold temperatures, but threadfin shad become stressed at temperatures less than 10°C (50°F) and exhibit complete mortality at 4°C (39°F) (Griffith 1978). Areas of Keowee Reservoir often drop below 10°C (50°F) during the winter, severely weakening large numbers of threadfin shad that die or become stressed and unable to resist intake currents. According to the seasonal study conducted by Edwards et al. (1976), 88 percent of all threadfin shad impingement at Oconee occurred between January and March. However, as indicated by the hydroacoustic survey results showing seasonal population fluctuations, threadfin shad have a high fecundity and generally expand their population considerably by fall so long as an adequate number of spawners survived the winter. Edwards et al. (1976) concluded that "the impingement of threadfin shad at (Oconee) does not appear to be a major cause of mortality but is rather an indication of natural mortality of the species."

Based on these data, the staff has reviewed the available information relative to potential impacts of the cooling water intake system on the impingement of fish and shellfish, and concludes that the potential impacts are SMALL, and mitigation is not warranted.

4.1.3 Heat Shock

For plants with once-through cooling systems, the effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation before license renewal.

The staff reviewed NPDES Permit #SC0000515, which was issued on September 29, 1999, and expires on September 30, 2003 (as discussed in Section 4.1.1). This permit governs the release of effluents by Oconee Nuclear Power Station into the receiving waters of Lake Keowee and to the Keowee River at the location of the tailrace to the Keowee Hydro Station.

The staff also reviewed the results of a 316(a) demonstration that Duke submitted in January 1995 (Duke 1999a). Based on the study, the SCDHEC granted a 316(a) variance. Duke submitted a

reapplication in March 1998 and supporting documentation in May 1998 to the SCDHEC requesting a continuation of the variance.

ONS complies with State standards and has an approved NPDES permit and 316(a) variance. Under such circumstances, pursuant to 10 CFR 51.53(c)(3)(ii)(B), no further assessment of heat shock is required. Thus, the staff concludes that potential heat shock impacts resulting from operation of the plant's cooling water discharge system to the aquatic environment on or in the vicinity of the site are SMALL, and mitigation is not warranted.

4.1.4 Microbiological Organisms (Human Health)

For plants discharging cooling water to cooling ponds, lakes, canals, or small rivers, the effects of microbiological organisms on human health are listed as a Category 2 issue and require plant-specific evaluation before license renewal.

ONS has a once-through cooling system that uses Lake Keowee as the cooling source. The Keowee and Little Rivers were impounded to form Lake Keowee. The combined flow rate for the Keowee and Little Rivers is lower than the 9×10^{10} m^3 per year (3.15×10^{12} ft^3 per year) specified in 10 CFR 51.53(c)(3)(ii)(G). This low flow rate raises a concern from the standpoint of the potential for enhancement of thermophylic microorganisms such as *Naegleria fowleri*. This type of organisms could be a potential health concern for members of the public swimming in the cooling source (Duke 1998a).

Although Lake Keowee is a popular site for water-based recreational activities, including swimming and water skiing, these activities are dispersed throughout the lake, rather than being concentrated in specific areas such as near the plant. In addition, the nearest private pier located on the Keowee River arm of the lake is 1300 m (4200 ft) from the discharge structure.

In a letter included with the ER (Duke 1998a), the State toxicologist at the SCDHEC indicated that there "seems to be no significant threat to off-site persons near such heated recreational waters [from operation of ONS] ."

Although there is a potential for deleterious thermophylic microorganisms to be associated with the cooling system, the actual hazard to public health has not been documented or substantiated. The results of analyses and evaluations, including the results of consultation with the State Public Health Department, indicate that the impact of deleterious microbiological organisms during continued operation of the plant during the renewal term are expected to be SMALL, and mitigation is not warranted.

4.2 Transmission Lines

The FES discussed five transmission lines with a total length of 528 km (330 mi) that connect the plant to the Duke Energy Transmission System. They were constructed concurrently with the construction of Oconee and the Keowee-Toxaway Project and connect both Oconee and the Keowee-Toxaway Project hydro plants to the Duke Energy Transmission System.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to the ONS transmission lines are listed in Table 4-4. Duke stated in its ER that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-4. Category 1 Issues Applicable to the ONS 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, consultation with the FWS and SCDNR, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of power line right-of-way management 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 [of bird collisions with power lines] are expected to be of small significance at all sites." The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including the status of the Duke monitoring program, Duke efforts to document collisions, and Duke efforts to protect species nesting on the power lines. Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, consultation with the FWS, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on floodplains and wetland on the power line right-of-way during the renewal term beyond those discussed in the GEIS.

- Air quality effects of transmission lines: Based on 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use: Based on 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

- Power line right-of-way (land use): Based on information in the GEIS, the Commission found that "Ongoing use of power line rights-of-way would continue with no change in restrictions. The effects of these restrictions are of small significance." The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of restriction on use of power line rights-of-way during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-5. They are discussed in Sections 4.2.1 and 4.2.2.

Table 4-5. Category 2 Issues Applicable to the ONS 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

In the GEIS, the Commission found that without a review of the conformance of each nuclear plant transmission line with NESC criteria, it is 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 the other plants, some may have chosen to upgrade line voltage or land use in the vicinity of transmission lines that may have been changed. 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 National Electric Safety Code (NESC) for preventing electric shock from induced currents.

In the ER, Duke stated that the transmission lines that connect Units 1 and 2 to the 230 kV switching station and the lines that connect Unit 3 to the 525 kV switching station meet the vertical clearance requirement specified in the 1997 edition of NESC (1997). Duke states further that the transmission lines constructed concurrently with the Oconee and the Keowee-Toxaway Project are part of the Duke Energy Transmission System. These transmission lines were constructed to the standards of NESC, 6th edition, published in November 1961. According to the ER, there have been no upgrades in line voltage on these transmission lines since they were constructed. Duke reviewed the vertical clearances of the 528 km (330 mi) of transmission lines attributed to Oconee in the FES (AEC 1972) using the 1997 edition of NESC and determined that all clearances exceeded the minimum requirements of the 1997 NESC (Duke 1999a).

Based on the above, the staff concludes that the impact of the potential for electrical shock is SMALL, and mitigation is not warranted.

4.2.2 Electromagnetic Fields - Chronic Effects

In the GEIS, the chronic effects of electromagnetic fields from power lines were given a finding of "not applicable" rather than a Category 1 or 2 designation 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 recent report (NIEHS 1999) includes the following paragraph:

> 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 staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of "not applicable" 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 ONS with regard to radiological impacts are listed in Table 4-6. Duke stated in its ER that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

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 4-7. Duke stated in its ER (Duke 1998a) that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are small, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-7. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
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 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 staff has not identified any

significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-8 lists the Category 2 socioeconomic issues, which require plant-specific analysis and environmental justice, which was not addressed in the GEIS.

4.4.1 Housing Impacts During Operations

In determining housing impacts, the applicant chose to follow Appendix C of the GEIS (NUREG-1437), which presents a population characterization method that is 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 80.5 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS, Figure C.1). ONS was selected by the NRC to be evaluated as a potential socioeconomic case study site. The results of this evaluation, published in the GEIS, classifies the current ONS population as "medium" (GEIS Table C.2).

Table 4-8. Category 2 Issues Applicable to Socioeconomics 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			
Environmental Justice	Not addressed		4.4.6

As described in Section 2.2.8, the Tri–County (Oconee, Pickens, and Anderson) area around ONS is not subject to growth control measures that effectively limit housing development, although Oconee County in particular is attempting to steer the growth toward the center of the county, where the infrastructure is most completely developed. In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, NRC concluded that impacts on housing availability are expected to be of small significance at plants located in a "medium" population area where growth control measures are not in effect. ONS is located in a medium population area and is not located in an area where growth control measures limit housing development, so housing impacts would be expected to be small, even if there were plant-related increases in population.

Small impacts result when no discernable change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs. Although significant housing impacts are expected in all three counties as a result of population growth, it will be difficult to discern the impact from license renewal activities. Although the GEIS assumed an additional staff of 180 permanent workers during the license renewal period, Duke, in the ER, indicated that they "have not identified any increases in staffing related to license renewal-related programs." The staff has reviewed the available information relative to housing impacts. Because Duke expects no increase in staffing levels, there should be no discernable change in housing availability. Therefore, there will be no impact on economic development from license renewal and the staff has concluded that the impact on housing during the license renewal period is SMALL, and mitigation is not warranted.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered small if there is little or no change in the ability of the system to respond to the level of demand, and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of service capabilities occurs during periods of peak demand. Impacts are considered large if existing levels of service (e.g., water or sewer services) are substantially degraded, and additional capacity is needed to meet ongoing demands for services. The GEIS indicates that, absent new significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies. The staff believes that, in view of the expected population increase in the three counties, there may be reason to add significant public services and infrastructure other than water supply during the next 40 years. None of the increase would be due to the impact of additional ONS workers because no need for additional workers has been identified.

Analysis of impacts to the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the plant's permitted withdrawal rate and the plant's actual use of water. The applicant does not expect plant demand to have a direct effect on water resources.

As described in Section 2.2.8, Walhalla and Seneca in eastern Oconee County have some water plant capacity problems, but only Walhalla is actually limited by the water source (Coneross Creek). Walhalla is considering construction of a new water treatment plant. Seneca draws drinking water from Lake Keowee, which is considered adequate. Because ONS obtains its water from an adequate renewable surface water source, and no increase in population is expected as a result of the renewal of the ONS operating license, no impact is expected from license renewal on water supplies. The staff concludes that the impact on water supply is SMALL, and mitigation is not warranted.

4.4.3 Offsite Land Use During Operations

Land use in the vicinity of a nuclear power plant may change as a result of plant-related population growth. It is noted in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that significant changes in land use may be associated with population and tax revenue changes resulting from license renewal. However, Section 3.7.5 of the GEIS notes that if the plant-related increase in population is less than 5 percent of the study area's total population and if plant total tax payments are small relative to the community's total revenue, new population-driven and tax-driven land-use changes during the plant's license renewal term would be small, especially if the community has pre-established patterns of development and has provided adequate public services to support and guide development.

The analysis of offsite land use during the renewal term has two components, population-driven changes in offsite land use and tax-driven changes in offsite land use. No plant-related, population-driven changes in land use are expected during the license renewal term because no increase in employment is expected.

Oconee County is the only jurisdiction that taxes ONS directly, and it is the principal jurisdiction that receives direct tax revenue as a result of ONS's presence. Because there are no major refurbishment activities and no new construction as a result of the license renewal, no new sources of plant-related tax payments are expected that could significantly influence land use in Oconee County. However, continued operation of the plant would provide a significant continuing source of tax revenues to Oconee County. As discussed in Section 2.8, the applicant is expected to pay $22.3 million in property taxes to Oconee County in 1998-99. This payment represented about one-third of the county budget and has a substantial, positive impact on the fiscal condition of Oconee County.

The staff has determined that the significance of project-related tax payments are moderate if the payments to a jurisdiction are between 10 and 20 percent of the total tax revenue of the jurisdiction, and large if the percentage is greater than 20 percent (GEIS). Using these criteria, ONS tax payments, representing around 33 percent of the total Oconee County budget, are of large significance. If the tax-related revenues are medium to large relative to the jurisdiction's total revenue, tax-driven land-use changes would most likely be moderate if the community has no pre-established patterns of development (i.e., land-use plans or controls), or has not provided adequate public services to guide land-use changes in the past (GEIS). The staff defined the magnitude of land-use changes as follows:

- SMALL - Very little new development and minimal changes to the area's land-use pattern.
- MODERATE - Considerable new development and some changes to land-use patterns.
- LARGE - Large-scale new development and many changes to land-use patterns.

Oconee County has experienced significant population growth and moderate land-use changes. The growth is not directly related to the presence of the ONS. Other factors, such as development of Lake Keowee recreational property, industrial growth, proximity to Greenville and Anderson, and less stringent land-use, zoning, and development regulations compared to surrounding counties clearly play a role. Oconee County has not adopted land codes or ordinances nor does it enforce a minimum housing code (Talbert & Bright 1996). However, Oconee County has well established patterns of development and has public services in place to support development, which is being directed toward the center of the county. In combination, these two factors would be expected to result in SMALL land-use impacts from ONS-related taxes.

Continuation of Oconee County's tax receipts from ONS keeps tax rates below what they otherwise would have to be to fund the county's government and also provides for a higher level of public infrastructure and services than otherwise would be possible. This enhances the county's attractiveness as a place to live and tends to accelerate the conversion of open space to residential and commercial uses. On the other hand, the presence of Duke's real estate arm as a major landowner has provided a considerable degree of discipline on development in the county.

Based on this review of the issues, the staff concludes that the net impact of plant-related population increases and tax receipts is likely to be SMALL. While the tax receipts are large enough to result in moderate impacts on land use, Oconee County has a conservative approach to providing water and sewer that limits upgrades and could slow future economic development except in areas already served. In addition, while the relatively low taxes and high levels of public service afforded by ONS-related tax receipts tend to draw population growth to the County, these same receipts make possible formal tax relief programs that favor open space or land-use control programs if such programs are deemed necessary in the future. Additional mitigation does not appear to be warranted.

4.4.4 Public Services: Transportation Impacts During Operations

On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 were revised to clearly state that "Public Services: Transportation Impacts During Operations" is a Category 2 issue (see NRC 1999a for more discussion of this clarification). This issue is treated as such in this final SEIS.

Significant population growth is expected in all three counties in the study area by 2034, as was discussed in Section 2.2.8 of this report. However, none of this expected growth will be due directly to increases in employment at ONS. It may be argued that the industrial tax base afforded by ONS makes the county a more affordable and pleasant place to live and indirectly increases population, but even this indirect impact is likely to be fairly small and difficult to predict. Future general population increase likely will increase highway congestion at specific locations, but the expected magnitude of impact of ONS on this service degradation is SMALL and, thus, no mitigation is warranted.

4.4.5 Historical and Archaeological Resources

Because the Duke license renewal application (Duke 1998a) covering an additional 20 years of operation of the ONS does not include plans for future land disturbances or structural modifications beyond routine maintenance activities at the plant, there would be no identifiable adverse effects to known historical and archaeological resources. Consultation between the license renewal applicant and the South Carolina State Historic Preservation Office resulted in a determination by the State office that no known historical properties included in or eligible for inclusion in the National Register of Historic Places would be affected by the proposed action.

Continued operation of the power plant and protection of the natural landscape and vegetation within the site boundaries would have a beneficial effect in that either known or undiscovered resources would receive *de facto* protection for the term of the license renewal period, being located in an undisturbed area with secured access. Duke has assisted in conservation and security of the adjacent National Register property, the Old Pickens Church and cemetery. This assistance will continue to enhance long-term preservation of that property.

Notwithstanding that Duke does not plan future land disturbances or structural modifications beyond routine maintenance at the plant, there is a possibility that undiscovered and/or unrecorded prehistoric and historic period archaeological sites remain on the 210-ha (510-acre) plant site. Accordingly, additional care should be taken during normal operational or maintenance conditions to ensure that cultural resources are not inadvertently impacted. These activities may include not only operation of the plant itself, but also land management-related actions such as recreation, wildlife habitat enhancement, or maintaining/upgrading access roads throughout the plant site. To ensure that care is taken to protect cultural resources that may be encountered during construction or other land-disturbing activities, the ONS site environmental work practices have been revised. If archeological sites are identified during land-disturbing activities, land-disturbing activities will stop, and the State Historic Preservation Office will be contacted to determine the appropriate steps to be taken before resuming the activities.

The staff concludes that impacts on historical and archaeological resources is SMALL, and mitigation is not needed.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy in which Federal actions should not result in disproportionately high and adverse impacts on low-income or minority populations. A minority population is defined to exist if the percentage of minorities within the census blocks exceeds the percentage of minorities in the entire state of South Carolina by 10 percent, or if the percentage of minorities within the census block is at least 50 percent. For census blocks within the states of Georgia or North Carolina, the percentage of minorities is compared to the percentage of minorities in the respective state. Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under NEPA, and the Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice under NEPA (CEQ 1997). Although it is not subject to the executive order, the Commission has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in Attachment 4 to NRR (Nuclear Reactor Regulation) Office Letter No. 906, Revision 1: *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 1996b).

The scope of the review as defined in NRR Office Letter No. 906, Rev. 1 (NRC 1996b) should include an analysis of impacts on low-income and minority populations, the location and significance of any environmental impacts during operations on populations that are particularly sensitive, and any additional information pertaining to mitigation. The descriptions to be provided by this review should be of sufficient detail to permit subsequent staff assessment and evaluation of specific impacts, in particular whether these impacts are likely to be disproportionately high and adverse, and to evaluate the significance of such impacts.

Air, land, and water resources within about 80 km (50 mi) of ONS were examined. Within that area, a few potential environmental impacts could affect human populations; all of these were considered small. These include

- groundwater use conflicts
- electric shock
- microbial organisms
- accident scenarios.

To decide whether any of these impacts could be disproportionate, the staff examined the geographic distribution of minority and low-income populations recorded during the 1990 Census (DOC 1991), supplemented by field inquiries to the local planning departments in Oconee, Pickens, and Anderson Counties, and to social service agencies in the three counties. The staff focused this portion of the review on the geographic areas most likely to experience the impacts discussed above, i.e., the three closest surrounding counties. This area is referred to as the study area.

Generally speaking, minority populations are a small, dispersed, and declining proportion of the study area's population. Figure 4-1, taken from the 1990 Census (DOC 1991) shows the geographic distribution of minority populations within the 80-km (50-mi) radius of the plant. Minority populations are located primarily in Greenville and Anderson. However, a few scattered census block groups showed a significant concentration of minority individuals in the Seneca and Clemson areas. Figure 4-1 indicates that minority populations in general are either relatively well-mixed into the majority population, or concentrations of minority individuals are too small to be caught in the census detail. This is consistent with the results of field interviews.

Figure 4-2, also taken from the 1990 Census (DOC 1991) shows the geographic distribution of low-income populations within the 80-km (50-mi) radius of the plant. The cross-hatched census blocks show areas where the percentage of households below the poverty level is 10 percent or more greater than the percentage of households below the poverty level in the entire state of South Carolina for those census blocks within the state of South Carolina. It also includes census blocks where the percentage of households below the poverty level exceeds 50 percent. For census blocks within the states of Georgia or North Carolina, the percentage of households below the poverty level is compared to the percentage of households below the poverty level in the corresponding state. The largest concentrations of low-income populations within the 80-km (50-mi) radius are located in North Carolina. Some small groups are scattered throughout the three-county area, although none is within 16 km (10 mi) of ONS. Some of these individuals are known to be ex-sharecroppers effectively engaged in subsistence agriculture. The 1990 Census (DOC 1991) shows concentrations of low-income population at Seneca, Easley, and Clemson, the latter partly due to a large university student population. Low-income housing tends to be concentrated in the Seneca and Clemson area.

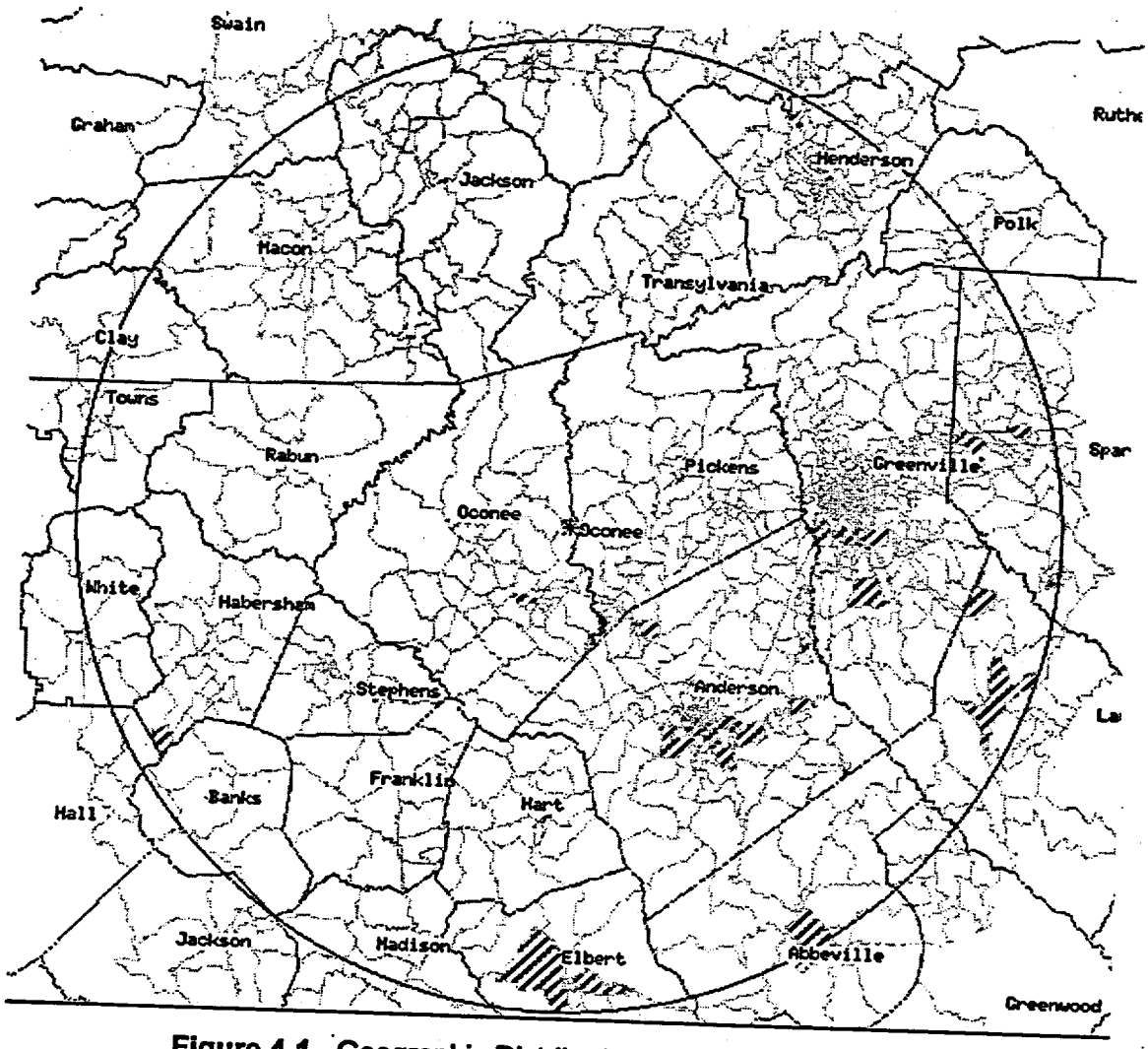

Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of ONS

Examination of the various environmental pathways by which low-income and minority populations could be disproportionately affected reveals no unusual resource dependencies or practices through which these populations could be disproportionately affected. Specifically, no pathways were found through which subsistence agriculture was significantly affected. In general, the prevailing atmospheric transport direction from the ONS site is toward the northeast, thus missing most census blocks showing minority and low-income populations. Therefore, the impact is SMALL, and no special mitigation actions are warranted.

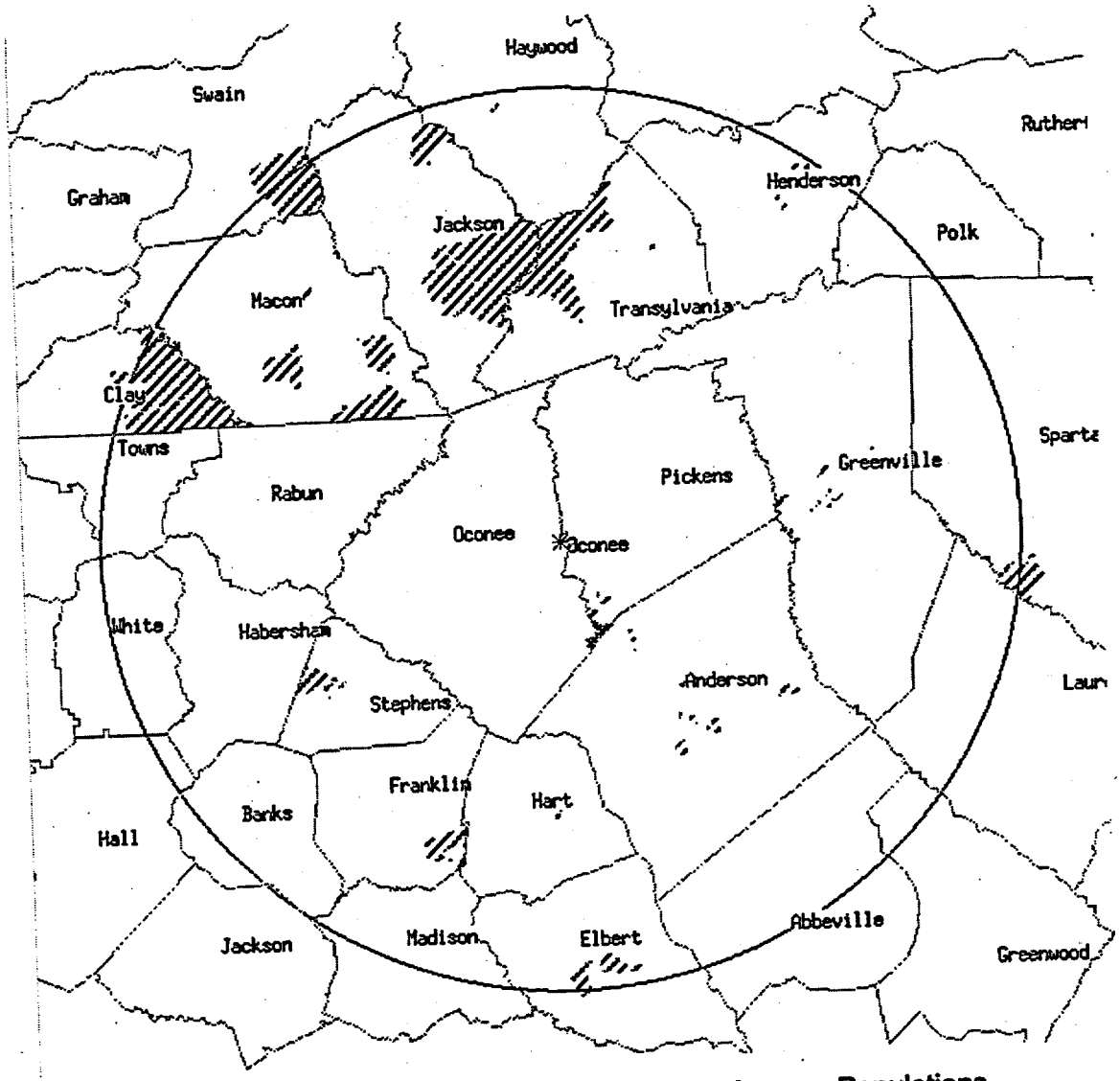

Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of ONS

4.5 Groundwater Use and Quality

A Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, is applicable to ONS groundwater use and quality and is listed in Table 4-9. Duke stated in its ER that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No new and significant information has been identified by the staff in the review process and in the staff's independent review.

Table 4-9. Category 1 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE – 10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Groundwater use conflicts (potable and service water; plants that use <100 gpm).	4.8.1.1

Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, follows.

- Groundwater use conflicts (potable and service water; plants that use <100 gpm): Based on information in the GEIS, the Commission found that "Plants using less than 100 gpm are not expected to cause any groundwater use conflicts." As discussed in Section 2.2.2, ONS's groundwater use is less than 0.068 m^3/s (100 gpm). The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater use conflicts during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to groundwater use and quality.

4.6 Threatened or Endangered Species

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

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected. Consultation under Section 7 of the Endangered Species Act was initiated by Duke during April 1998 with a request for information to FWS concerning species potentially occurring near ONS. The FWS identified (FWS 1998a) nine listed species known to occur in either Oconee or Pickens Counties and one species that could possibly occur in those counties (see Section 2.2.6). Subsequent to that letter, Duke performed a survey of all of the land within 1.6 km (1 mi) of ONS during May and June of 1998. No Federally listed, proposed, or candidate threatened or endangered species were identified during that survey. The results of the survey were documented for the FWS and the South Carolina Department of Natural Resources (SCDNR) (Duke 1998b; Duke 1998c).

Table 4-10. 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

The FWS concurred with Duke's determination that the proposed action will have no effect on listed or proposed endangered or threatened species (FWS 1998b). The SCDNR also concurred with the findings presented in the report submitted by Duke (SCDNR 1998).

Four plant species of concern to the SCDNR were identified within the surveyed area (see Section 2.2.6, Table 2-3). These species were all confined to "natural areas" located toward the periphery of ONS, well away from areas used for normal plant operations.

Based on its review of the applicant's report and their independent analysis, the FWS[a] and the SCDNR concluded that continued operation of the plant under license renewal will have no effect on listed or proposed endangered or threatened species within the immediate vicinity of the ONS.

Federally-listed species are known to occur near the transmission line rights-of-way attributable to the ONS (see Section 2.2.6). Of these, the dwarf-flowered heartleaf and the bunched arrowhead occur within or very near the rights-of-way of the McGuire 525 kV line and the Tiger 230 kV lines, respectively.

The staff submitted a biological assessment to the FWS in a letter dated June 30, 1999 (NRC 1999b). The FWS reviewed the biological assessment and requested more information related to Duke's maintenance practices for the transmission lines and the location of five species: bunched arrowhead, dwarf-flowered heartleaf, smooth coneflower, Schwenitz's sunflower, and mountain sweet pitcher plant. The FWS was concerned about the potential effects from the proposed maintenance of the right-of-way. The FWS conducted field visits to portions of the project area and reviewed the supplemental information provided by Duke. Subsequently, in a letter dated November 4, 1999 (FWS 1999), the FWS concurred with the staff's determination that the renewal of the ONS licenses for a period of 20 years would likely not adversely affect listed species or critical habitat based on the practices and procedures Duke uses to maintain the transmission line rights-of-way. Therefore, it is the staff's determination that the impact on threatened or endangered species of an additional 20 years of

(a) U.S. Fish and Wildlife Service. 1998. Letter dated August 4, 1998, from the Acting Field Supervisor for the Charleston Field Office to Duke Power indicating that continued operation or refurbishment of ONS will have no effect on listed or proposed endangered or threatened species.

maintenance activities for the transmission lines would be SMALL, and further mitigation is not warranted.

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

The 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 operation during the renewal term. The 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 the public scoping meetings, to identify issues with significant new information. Processes for identification and evaluation of new information are described in Section 1.0 under License Renewal Evaluation Process.

4.8 Summary of Impacts of Operations During the Renewal Term

Neither Duke nor the staff is aware of significant new information related to any of the applicable Category 1 issues associated with the ONS operation during the renewal term. Consequently, the staff concludes that the 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 "plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation."

Plant-specific environmental evaluations were conducted for 12 Category 2 issues applicable to ONS operation during the renewal term and for environmental justice. For all 12 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of ONS would be of SMALL significance in the context of the standards set forth in the GEIS and that mitigation would not be warranted.

In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse effects from electromagnetic fields. Therefore, no evaluation of this issue is required.

4.9 References

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5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996). The GEIS included 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 offsite radiological impacts from the fuel cycle and from 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 of Category 1, and therefore, additional plant-specific review for 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

A Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, is applicable to ONS postulated accidents and is listed in Table 5-1. Duke stated in its Environmental Report (ER) (Duke 1998a) that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
POSTULATED ACCIDENTS	
Design-Basis Accidents (DBAs)	5.3.2; 5.5.1

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, follows.

Design-Basis Accidents (DBAs): Based on information in the GEIS, the Commission found "The NRC staff has concluded that the environmental impacts of design basis accidents are of small significance for all plants." The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of DBAs beyond those discussed in the GEIS.

A Category 2 issue related to postulated accidents that is applicable to ONS is discussed in Table 5-2.

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."

The staff has not identified any significant new information with regard to the consequences from severe accidents during its independent review of the Duke ER, the Duke Final Safety Analysis Report (FSAR) (Duke 1998b), the staff's site visit, the scoping process, the review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for ONS. The results of its review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives

It is required in 10 CFR 51.53(c)(3)(ii)(L) that license renewal applicants provide a consideration of alternatives to mitigate severe accidents if the staff has not previously considered SAMAs for the applicant's plant in an EIS or related supplement or in an environmental assessment. The purpose of

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	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

this consideration is to ensure that plant design changes with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for ONS; therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

Duke submitted an assessment of SAMAs for ONS as part of the ER (Duke 1998a). This assessment was based on Revision 2 of the ONS Probabilistic Risk Assessment (Duke 1997a). Revision 2 constitutes a full-scope Level 3 Probabilistic Risk Assessment (PRA) with the analysis of both internal and external events; the internal events analysis is an updated version of the Individual Plant Examination (IPE) model (Duke 1990), whereas the external events analysis is the same as the Individual Plant Examination for External Events (IPEEE) model (Duke 1995). In identifying and evaluating potential SAMAs, Duke took into consideration the insights and recommendations from earlier risk studies as well as several more recent risk studies. Duke concluded that none of the candidate SAMAs evaluated were cost effective for ONS.

Based on a review of the SAMA assessment, NRC issued a request for additional information (RAI) to Duke by letter dated December 29, 1998 (NRC 1998). Major issues concerned the process used by the license renewal applicant to identify potential SAMAs, the implementation status of numerous enhancements identified in previous studies, and the inclusion of averted onsite costs (AOSC) in Duke's value impact analysis. Duke submitted additional information by letter dated March 4, 1999 (Duke 1999), clarifying the SAMA identification process, the disposition of previously identified design enhancements, and the impact of AOSC on the cost-benefit analysis. This response provided additional clarification regarding the staff's concerns and reaffirmed that none of the SAMAs would be cost-beneficial even when averted onsite costs are included.

The staff's assessment of SAMAs for ONS is provided in Section 5.2.3.2.

5.2.2 Estimate of Risk for ONS

Duke's estimates of the offsite risk at ONS are summarized below. The summary is followed by the staff's review of Duke's risk estimates.

5.2.2.1 Duke Risk Estimates

The ONS PRA model, which forms the basis for the SAMA analysis, is a Level 3 risk analysis; i.e., it includes the treatment of core damage frequency, containment performance, and offsite consequences. The model, which Duke refers to as PRA, Revision 2, consists of an internal events portion, based on an updated version of the IPE (Duke 1990) and an external events portion, based on the current version of the IPEEE (Duke 1995). The calculated total core damage frequency for internal and external events in Revision 2 is 8.9E-5 per year.

Since the ONS PRA is a "living" PRA, the original version of the IPE is being continuously updated to reflect various design and procedural changes, such as those related to the improvements identified in the IPE, to incorporate comments from the "peer review certification" and to reflect up-to-date operational experience. A comparison of risk profiles between the original IPE PRA (which was reviewed by the staff) and the current version (internal events portion of PRA, Revision 2) indicated that there are no significant differences that could change the results of the SAMA analysis by impacting the approach used to identify potential SAMAs or the assessed risk reductions.

Since the issuance of the ONS PRA, Revision 2, report, the total core damage frequency has been recalculated. An IPEEE supplemental report (Duke 1997b) further evaluated the relay chatter issue and updated the seismic core damage frequency (CDF) to be 3.5E-5 per year. A high pressure injection (HPI) reliability study performed in response to an operational event (Duke 1997c) resulted in an updated core damage frequency of 4.3E-5 per year for all events, excluding seismic. Thus, by removing conservative assumptions related to the original seismic analysis and the HPI system, the net effect of these two studies would be to reduce the total CDF for ONS from 8.9E-5 per year to 7.8E-5 per year. Despite the availability of these later studies, the results of the ONS PRA, Revision 2, were used as the basis for the SAMA analysis since the later studies did not include Level 2 and Level 3 calculations and because the net impact of the changes was a small decrease in CDF.

Since Duke's PRA is based on ONS Unit 3, the licensee performed an analysis to determine the applicability of the PRA results to Units 1 and 2 and submitted the analysis as part of the IPE. This analysis concluded that inter-unit differences do not have a significant impact on the PRA results. Most mechanical and electrical systems of Units 1 and 2 are redundant and diverse from those of Unit 3. Those systems and structures that are shared affect all three units in a similar fashion during a severe accident scenario. Because civil structures of Units 1 and 2 are similar to those of Unit 3, external events impact structures and components similarly for each unit. Therefore, the results and insights of the ONS PRA are applicable to all three units.

The Level 2 (also called containment performance) portion of the ONS PRA model, Revision 2, including the plant damage state descriptors, the Containment Event Tree, and the source term binning and containment release categories, is essentially the same as the IPE Level 2 analysis. The offsite (or Level 3) consequence analyses were carried out using the NRC-developed Calculations of Reactor Accident Consequences Version 2 (CRAC2) code, and site-specific data for meteorology, population, and evacuation modeling.

Duke estimated the total CDF for internally and externally initiated events to be 8.9E-5 per year based on Revision 2 of the ONS PRA. The breakdown of the CDF is provided in Table 5-3. External event initiators represent about 71 percent of the total CDF and are dominated by seismic (44 percent of total CDF) and tornado initiators (16 percent of total CDF). External flood and fire initiators together account for about 11 percent of the total CDF. Internal event initiators represent about 29 percent of the total CDF and are dominated by internal flood (11 percent of total CDF), transient (9 percent of total CDF), and loss of coolant accident initiators (8 percent of total CDF). Remaining contributors together account for less than 2 percent of total CDF.

Duke estimated the dose to the population within 80 km (50 mi) of the ONS site from all initiators (internal and external) to be 0.0492 person-sievert (person-Sv) (4.92 person-rem) per year (Duke 1999). The breakdown of the total population dose by containment end-state is summarized in Table 5-4. Of the total risk from all initiators, about 80 percent is due to external events. Interfacing system loss-of-coolant accident (LOCA), containment isolation failure, and late containment failure dominate external event risk (Column 3 of Table 5-4) and total risk from all initiators (Column 4 of Table 5-4) with nearly equal contributions from each. Early containment failure accounts for approximately 10 percent of the total risk from all initiators, with the majority of this contribution coming from external events. Only about 20 percent of the total risk from all initiators is due to internal events, with the majority of this risk from late containment failure (Column 2 of Table 5-4). All other internal event contributors combined account for less than 10 percent of the total risk from all initiators.

5.2.2.2 Review of Duke's Risk Estimates

Duke's estimate of offsite risk at ONS is based on Revision 2 of the ONS PRA. For purposes of this review, the staff considered the ONS study in terms of the following major elements:

- the Level 1 and 2 risk models that form the bases for the November 1990 IPE submittal (Duke 1990)
- the major modifications to the IPE model that have been incorporated in Revision 2 of the PRA (Duke 1997b)

Table 5-3. ONS Core Damage Frequencies

Initiating Event	Frequency (per year)	% of Total CDF (Int+Ext)
EXTERNAL INITIATORS		
Seismic	3.9E-5	44
Tornado	1.4E-5	16
External Flood	5.9E-6	6
Fire	4.5E-6	5
Total External	**6.3E-5**	**71**
INTERNAL INITIATORS		
Internal Flood	9.5E-6	11
Transients	8.2E-6	9
LOCAs (small, medium, large)	6.8E-6	8
RPV Rupture	1.0E-6	1
Steam Generator Tube Rupture	4.1E-7	<1
ATWS	1.7E-7	<1
Interfacing systems LOCA	6.9E-9	<1
Total Internal	**2.6E-5**	**29**
Total CDF (Internal + External)	**8.9E-5**	**100**

- the external event models that form the basis for the December 1995 IPEEE submittal (Duke 1995)
- the analyses performed to translate fission product release frequencies from the Level 2 PRA model into offsite consequence measures.

The staff reviewed each of these analyses to determine the acceptability of Duke's risk estimates for the SAMA analysis, as summarized below.

The staff's review of the ONS IPE is described in an evaluation report dated April 1, 1993 (NRC 1993). In that review, the staff evaluated the methodology, models, data, and assumptions used to estimate CDF and characterize containment performance and fission product releases. The staff concluded that Duke's analysis met the intent of Generic Letter 88-20 (NRC 1988); that is, the IPE was of adequate quality to be used to look for design or operational vulnerabilities. Although the staff reviewed certain aspects of the IPE in more detail than others, the review primarily focused on the licensee's ability to examine ONS for severe accident vulnerabilities and not specifically on the detailed findings or

Table 5-4. Breakdown of Population Dose by Containment End-State (Total Dose = 4.92 person-rem per year)

Containment End-State	% of Total Dose Internal Initiators	% of Total Dose External Initiators	% of Total Dose All Initiators
Steam Generator Tube Rupture	2.7	<0.1	2.8
Interfacing System LOCA	0.8	24.4	5.2
Containment Isolation Failure	0.5	22.0	22.5
Early Containment Failure	3.7	6.5	10.2
Late Containment Failure	9.4	22.8	32.2
Basemat Melt Through	2.2	4.6	6.8
No Containment Failure	<0.1	0.2	0.3
Total	**19.3**	**80.7**	**100**

quantification estimates. However, ONS's risk profile and important IPE findings compare well to those of other Babcock & Wilcox plants (NUREG-1560) (NRC 1997a), and any differences are well understood. Overall, the staff believes that the ONS PRA is of adequate quality to be used as a tool in searching for areas with high potential for risk reduction and to assess such risk reductions, especially when the PRA models are used in conjunction with insights, such as those from risk importance, sensitivity, and uncertainty analyses.

The staff's review of the applicant's IPEEE is currently underway. The preliminary results did not identify any significant shortcomings or deficiencies. A limited review of the Duke submittal finds that the overall method, scope, and level of detail are generally comprehensive. The staff also notes that the Duke IPEEE has been subjected to both internal and external peer reviews. Based on these findings, the staff concludes that the external events portion of the ONS PRA provides an acceptable platform for identifying potential SAMAs and for assessing risk reductions.

The staff reviewed the process used by Duke to extend the containment performance (Level 2) portion of the IPE to the offsite consequence (Level 3) assessment. This included consideration of the source terms used to characterize fission product releases for each containment release category and the major input assumptions used in the offsite consequence analyses. This information is provided in Section 6.3 of Duke's IPE submittal. Duke used the Modular Accident Analysis Program code to analyze postulated accidents and develop radiological source terms for each of 35 containment release categories used to represent the containment end-states identified in Table 5-4. These source terms were incorporated as input to the CRAC2 analysis. The staff reviewed Duke's source term estimates for the major release categories and found these predictions to be in reasonable agreement with

estimates of NUREG-1150 (NRC 1990a) for the closest corresponding release scenarios. The staff concludes that the assignment of source terms is acceptable.

The CRAC2 code has been superceded by the Melcor Accident Consequence Code System (MACCS), which, among other advancements, incorporates more recent models for calculating health effects (e.g., latent cancers). Although MACCS represents a significant improvement over CRAC2, both codes use a straight line Gaussian plume dispersion and transport model and, for the same input assumptions, provide comparable estimates of population dose (person-rem). Thus, the CRAC2 code is considered acceptable for purposes of estimating population dose for a severe accident.

The CRAC2 input in PRA, Revision 2, used site-specific meteorological data processed from measurements taken during the mid-1970s. To assess the impact that data from two different time periods may have on offsite dose, Duke obtained more recent data from the ONS site for the period January 1, 1997, through December 31, 1997. Re-analysis of the Level 3 portion of the PRA using the 1997 meteorological data (Duke 1999) shows that the risk results are only slightly impacted (reduced by about 2 percent). The staff therefore considers the meteorological data in PRA, Revision 2, to be representative of the climate for the site.

The population distribution used in Revision 2 of the PRA is based on 1990 census data. The impact of population increases was not included in Revision 2 since the purpose of the PRA was to understand the risk associated with current operation of the plant. Based on information contained in NUREG-1437 (NRC 1996), the population within an 80-km (50-mi) radius of the ONS site is projected to increase by about 33 percent between the years 1990 and 2030. Since the population dose is roughly proportional to the total population, use of the increased population value would result in an increase in the total risk from all initiators of approximately 1.6 person-rem per year. This increase is small in absolute terms and does not have a significant impact on the conclusions of the SAMA analysis, as discussed later.

Evacuation modeling is based on site-specific evacuation studies carried out by Duke. It was assumed that only 95 percent of the people within the emergency planning zone (determined by the plume exposure pathway) would participate in the evacuation. The remaining 5 percent would delay evacuation for 24 hours. This assumption is conservative relative to the NUREG-1150 (NRC 1990a) study, which assumed evacuation of 99.5 percent of the population within the emergency planning zone.

Site-specific economic data were used in the CRAC2 code. However, as discussed later, the applicant based their assessment of offsite costs on generic cost estimates rather than CRAC2 code calculations.

The staff concludes that the methodology used by Duke to estimate the CDF and offsite consequences for ONS provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses reported by Duke.

5.2.3 Potential Design Improvements

This section discusses the process for identifying potential design improvements, the staff's evaluation of this process, and the design improvements evaluated in detail by Duke.

5.2.3.1 Process for Identifying Potential Design Improvements

Duke's process for identifying potential plant improvements consisted of the following three elements:

- The core damage cutsets from Revision 2 of the ONS PRA were reviewed to identify potential SAMAs that could reduce CDF.

- The Fussell-Vesely (F-V) importance measures were evaluated for the basic events (including initiating events, random failure events, human error events, and maintenance/testing unavailabilities), and the importance ranking was examined to identify any events of significant F-V importance.

- Potential enhancements to reduce containment failure modes of concern for ONS (including early containment failure, containment isolation failure, and containment bypass), were reviewed for possible implementation.

This included a review of recommendations from the ONS IPE and IPEEE (those that had not been implemented), results of other plant-specific SAMA analyses, and insights from the staff's report on the individual plant examination (NRC 1997a) for possible inclusion of these concepts as additional SAMAs.

As a starting point for the core damage cutset review, Duke developed a listing of the top 100 cutsets (severe accident sequences) based on internal initiators and the top 100 cutsets for external initiators. These 200 sequences include all potential core damage sequences with at least a 0.06-percent contribution to the total CDF. Duke reviewed the cutsets to identify potential SAMAs that could reduce CDF. Cutoff values of 4.5E-7 per year and 8.5E-7 per year were used to screen internal and external events, respectively. To account for the cumulative effect of cutsets below these cutoff values, the basic events importance measure was also used to identify potential enhancements, as discussed below.

For each seismic initiator cutset, Duke calculated the associated offsite risk based on the person-rem risk and CDF for the plant damage states (PDSs) attributable to the seismic initiator. Duke conserva-

tively assumed that the implementation of plant enhancements for seismic events would completely eliminate the seismic risk and calculated the present worth of the averted risk based on a $2000 per person-rem conversion factor, a discount factor of 7 percent, and a 20-year license renewal period. This process was repeated for each of the remaining seismic initiator cutsets above the cutoff frequency. The present worth of averted risk for all of the seismic cutsets combined was estimated to be about $51,000. Duke cited sensitivity studies performed previously as part of the IPEEE analysis, which show that most of the seismic upgrades to plant components would result in only a small reduction in CDF (less than 5E-6 per year). On the basis of the small risk reduction achievable and the large costs associated with substantial seismic upgrades, Duke eliminated seismic SAMAs from further consideration.

Duke reviewed the F-V Basic Event Importance Ranking presented in the ONS PRA report, Revision 2, and identified the top 30 basic events for further consideration. These included seismic-related events, initiating events, equipment failures, and human-error events. Seismic-related events were not evaluated further for reasons discussed above. Duke judged that all but one of the initiating events, such as tornado, dam failure, and fire events, could not be significantly impacted by SAMAs and that the remaining initiator (reactor trip initiator) is adequately addressed by their current ORAM-SENTINEL configuration management system. Based on a review of the remainder, Duke identified nine events/ sequences and a potential plant enhancement to address each event. The list of the potential enhancements to reduce CDF are presented in Table 5-5.

Duke also considered potential alternatives to reduce containment failure modes of concern for ONS. These alternatives included nine containment-related improvements evaluated as part of the staff's assessment of severe accident mitigation design alternatives for Watts Bar (NRC 1995a) and five containment-related improvements derived from the staff's report on the individual plant examination program (NRC 1997a). Duke eliminated those alternatives that are either (1) not applicable to ONS (e.g., containment air return fans used only in ice condenser containments), (2) related to control of hydrogen combustion (since the Level 2 PRA shows the ONS containment is capable of withstanding large hydrogen burns), or (3) already implemented at ONS, e.g., by inclusion either in emergency operating procedures, severe accident management guidelines, or the operator training program. Based on the screening, Duke designated seven of the containment related SAMAs for further study. The list of the potential enhancements to improve containment performance is presented in Table 5-6.

5.2.3.2 Staff Evaluation

Duke's effort to identify potential SAMAs focused on areas found to be risk-significant in the ONS PRA. The list of SAMAs generally coincide with accident categories that are dominant CDF contributors or with issues that tend to have a large impact on a number of accident sequences at ONS. Duke made

Table 5-5. Value-Impact Results for Potentially Cost-Beneficial SAMAs that Prevent Core Damage

SAMA	Sequences/Failures Addressed	Percent Reduction		Present Worth	Cost of Enhancement
		CDF[a]	P-Rem[b]		
Strengthen east and west penetration rooms and BWST[c] to withstand tornado winds	Tornado strikes that damage penetration room and BWST	2.1	14.6	74,000	>$1M
Man SSF[d] 24 hours a day with a trained operator	Operator failure to align SSF RCM[e] system in events with turbine building fire or failure of Jocassee Dam	1.4	10.0	49,500	>$5M
Install an automatic backup system to refill elevated water storage tank for HPI[f] cooling	Operator failure to refill elevated water storage tank during turbine building flood	6.5	8.7	230,000	>$1M
Install automatic swap of HPI to spent fuel pool	Operator failure to swap HPI to spent fuel pool during a flood	3.3	4.3	117,000	>$1M
Increase the height of the SSF flood barrier	Failures of the Jocassee Dam that result in flood levels exceeding 5-ft flood barrier	2.9	1.6	103,000	$500K
Install protective barrier around upper surge tanks	Tornado strikes that cause a LOCA[g] with failure of all power and upper surge tanks	6.0	8.1	212,000	>$1M
Upgrade 4160 switchgear in turbine building to withstand F4 intensity tornadoes	Tornado strikes that cause a LOCA with failure of all power and upper surge tanks	6.0	8.1	212,000	>$1M
Install automatic swap from injection to high pressure recirculation	Operator failure to initiate high pressure recirculation during LOCAs	4.6	6.3	163,000	>$1M
Replace reactor pressure vessel	Spontaneous failure of the reactor vessel	1.1	<0.1	37,100	>$1M

(a) Total CDF = 8.9E-5/year.
(b) Total offsite dose = 4.92 person-rem/year.
(c) BWST = borated water storage tank.
(d) SSF = standby shutdown facility.
(e) RCM = reactor coolant makeup.
(f) HPI = high pressure injection.
(g) LOCA = loss of coolant accident.

Table 5-6. Value-Impact Results for Potentially Cost-Beneficial SAMAs that Improve Containment Performance

SAMA	Sequences/Failures Addressed	Percent Reduction		Present Worth	Cost of Enhancement
		CDF [a]	P-Rem [b]		
Install independent containment spray systems	Late containment failure from over-temperature or steam over-pressure	NA	43.7	46,200	>$1M
Install filtered containment vent system	Late containment failure from over-pressure	NA	43.7	46,200	>$1M
Install additional containment bypass instrumentation	Inter-system LOCAs[c] that could be mitigated through improved detection capabilities	NA	25.2	27,300	>$1M
Add independent source of feedwater to reduce induced SGTR[d]	Induced steam generator tube failures in high pressure core melt sequences	NA	2.8	3100	>$1M
Install reactor depressurization system	Direct containment heating and induced steam generator tube failures in high pressure core melt sequences	NA	10.9	14,300	>$1M
Install reactor cavity flooding system	Basemat failure due to core-concrete interactions	NA	6.7	7300	>$1M
Install core retention device	Basemat failure due to core-concrete interactions	NA	6.7	7300	>$1M

(a) Total CDF = 8.9E-5/year.
(b) Total offsite dose = 4.92 person-rem/year.
(c) LOCA = loss of coolant accident.
(d) SGTR = steam generator tube rupture.

a reasonable effort to use the ONS PRA to search for potential SAMAs and to review insights from other plant-specific risk studies and previous SAMA analyses for potential applicability to ONS. The staff notes that Duke identified a number of recommendations for reducing risk as a result of the ONS IPE and IPEEE, and that many of these plant improvements have been implemented or are planned and being tracked for resolution (Duke 1998c; Duke 1999). For those recommendations that were not implemented, Duke provided justification as to why these improvements are not warranted.

The staff reviewed the set of potential enhancements considered in Duke's SAMA identification process. These include improvements oriented toward reducing the CDF and risk from major contributors specific to ONS, improvements identified as part of the NRC containment performance improvement program, accident management strategies identified by NRC in Generic Letter 88-20, Supplement 2 (NRC 1990b), and improvements identified in the previous severe accident mitigation design alternative review for Watts Bar (NRC 1995a) that would be applicable to ONS. The SAMAs also include a filtered containment vent and a bed-core retention device for flooded rubble, which are cited specifically in NUREG-0660 (NRC 1980) for evaluation as part of Three Mile Island Task Action Plan Item II.B.8.

The staff notes that most of the SAMAs involve major modifications and significant costs and that less expensive design improvements and procedure changes could conceivably provide similar levels of risk reduction. However, lower cost improvements are not expected to offer significant risk reduction, given that external events account for the majority (80 percent) of the risk. Much of this risk is due to postulated earthquakes with ground accelerations significantly greater than the ONS design-basis earthquake. As such, SAMAs that would significantly reduce overall risk would involve substantial upgrades in the seismic ruggedness of the plant and would be very costly.

It should be noted that Duke has made extensive use of PRA methods to gain insights regarding severe accidents at ONS. Risk insights from various ONS risk assessments, such as the ONS IPE, the ONS IPEEE, the Keowee PRA, and ONS HPI reliability study, have been identified and implemented to improve both the design and operation of the plant. For example, using the IPE process, Duke identified and implemented modifications to procedures to (1) isolate the high pressure service water (HPSW) to the condenser circulating water (CCW) pumps during a turbine building flooding event to extend the time the elevated water storage tank (EWST) inventory would last, (2) power the SSF from the Unit 2 main feeder bus, (3) terminate containment sprays to conserve the BWST inventory to enhance long-term HPI cooling following a flooding event in the turbine building, and (4) cope with common cause failure of both HPI suction valves. Examples of plant improvements that resulted from IPEEE findings and whose implementation is being planned by Duke are (1) the mounting of the combustible storage locker near the SSF diesel to prevent combustible materials from being spilled around the diesel during a seismic event or knocked over by personnel, and (2) the replacement of the deluge (open head) sprinklers in the Cable and Equipment Rooms with closed head sprinklers to reduce water damage to equipment important to safety during a fire. The implementation

of such improvements reduced the risk associated with the major contributors identified by the ONS PRA and contributed to the reduced number of candidate SAMAs identified as part of Duke's application for license renewal.

The staff concludes that Duke has used a systematic process for identifying potential design improvements for ONS and that the set of potential design improvements identified by Duke is reasonably comprehensive and, therefore, acceptable.

5.2.4 Risk Reduction Potential of Design Improvements

Section 4.3 of the ER describes the process used by Duke to determine the risk reduction potential for each enhancement.

For each seismic initiator cutset, Duke calculated the associated offsite risk based on the person-rem risk and CDF for the PDSs attributable to the seismic initiator. Implementation of the plant enhancement was assumed to completely eliminate the seismic risk associated with the cutset. For each (non-seismic) sequence/enhancement, Duke assigned a PDS based on the type of plant damage and potential containment release characteristics. In general, where an alternative impacted more than one PDS, Duke used the PDS with the highest conditional person-rem risk to characterize the associated risk and assumed that implementation of the alternative would completely eliminate the risk. For each containment-related improvement, Duke assumed that all of the person-rem risk associated with the release categories impacted by the SAMA would be eliminated. For those alternatives that benefit more than one containment failure mode (i.e., independent containment spray system, reactor depressurization system, and filtered containment vent), the total person-rem dose for all affected failure modes was assumed to be completely eliminated by implementing the alternative.

The staff notes that Duke evaluated the risk reduction potential for each SAMA in a bounding fashion; i.e., each SAMA was assumed to completely eliminate all sequences that the specific enhancement was intended to address. As a result, the benefits are generally over estimated and conservative. Accordingly, the staff based its estimates of averted risk for the various SAMAs on Duke's risk reduction estimates.

5.2.5 Cost Impacts of Candidate Design Improvements

Duke's estimated costs for each potential design enhancement are provided in Tables 4-2 and 5-1 of Attachment K to the ER. For most of the SAMAs, Duke estimated the cost of implementation to be greater than $1 million based on cost estimates developed in previous industry studies. For three SAMAs, Duke developed plant-specific cost estimates because there was no readily available information on the estimated cost to implement similar alternatives and because the basic events associated with these alternatives were found to have a high importance in the ONS PRA. These SAMAs involve (1) increasing the height of the SSF flood barrier, (2) manning the SSF 24 hours a day

with trained operators, and (3) installing a protective barrier for the upper surge tanks or upgrading the 4160 volt switchgear to withstand tornado winds. The costs to implement these SAMAs were estimated to be on the order of $500,000, $5 million, and $1 million, respectively. Because the safety benefits of the potential SAMAs were significantly less than their estimated implementation costs (by about a factor of five), none of the cost estimates were further refined.

The staff compared Duke's cost estimates with estimates developed elsewhere for similar improvements, including estimates developed as part of the evaluation of severe accident mitigation design alternatives for operating reactors and advanced LWRs. The staff notes that Duke's estimated implementation costs of $1 million dollars or greater are consistent with the values reported in previous analyses for changes of similar scope and are not unreasonable for the SAMAs under consideration, given that these enhancements involve major hardware changes and impact safety-related systems.

Although the applicant did not provide the underlying bases for its cost estimates, the staff views their cost estimates as reasonable for evaluating the SAMAs because the estimates are consistent with those developed by others and because the spread between the estimated costs and benefits is significant. Accordingly, the staff adopted Duke's cost estimates for the various candidate improvements.

5.2.6 Cost-Benefit Comparison

The following sections describe Duke's cost-benefit comparison and the staff's evaluation of the cost-benefit analysis.

5.2.6.1 Duke Evaluation

In the analysis provided in the ER, Duke did not include the following factors in its cost-benefit evaluation: averted onsite cleanup and decontamination cost, replacement power cost, and averted offsite property damage cost. In view of the significant impact of these averted costs on the estimated benefit for a SAMA, the staff requested that Duke include these factors in their cost-benefit analysis for each affected SAMA. In their response to the request for additional information, Duke updated the benefit estimates to include these factors for all SAMAs that reduce CDF. The methodology used by Duke was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997b), and NUREG/BR-0058, *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission* (NRC 1995b). The guidance involves determining the net value for each SAMA according to the following formula:

$$\text{Net Value} = (\text{APE} + \text{AOC} + \text{AOE} + \text{AOSC}) - \text{COE}$$

where APE = present value of averted public exposure ($)
AOC = present value of averted offsite property damage costs ($)
AOE = present value of averted occupational exposure ($)
AOSC = present value of averted onsite costs ($)
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 is not considered beneficial. Duke's derivation of each of the associated costs is summarized below.

Averted Public Exposure (APE)

Averted public exposure costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/reactor-year)
× monetary equivalent of unit dose
× present value conversion factor

Duke estimated the annual reduction in public exposure for each SAMA as discussed previously. The reduction in public exposure (person-rem per year) was converted to a monetary equivalent by applying NRC's conversion factor of $2000 per person-rem and then discounting the monetary equivalent to present value. A 20-year period for the license renewal period and a 7-percent real discount rate was assumed, resulting in a present value conversion factor of 10.76.

As stated in NUREG/BR-0184 (NRC 1997b), 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.

Averted Offsite Property Damage Costs

Averted offsite property damage costs were calculated using the following formula:

AOC = Annual CDF reduction
× offsite economic costs associated with a severe accident (on a per event basis)
× present value conversion factor

Duke determined the offsite economic costs for a severe accident based on the weighted costs for offsite property damage for the five NUREG-1150 plants (reported in Table 5.6 of NUREG/BR-0184). These costs were inflated to year 2000 dollars based on a 4-percent inflation rate, yielding a value of $364 million. Calculated values for offsite economic costs were discounted to present value in the same manner as for averted public exposure.

Averted Occupational Exposure

Averted occupational exposure was calculated using the following formula:

AOE = Annual CDF reduction
× occupational exposure per core-damage event
× present value conversion factor

Duke derived the values for averted occupational exposure based on information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997b). Best estimate values provided for immediate occupational dose (3,300 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 equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2000 per person-rem, a real discount rate of 7 percent, and a time period of 20 years to represent the license renewal period.

Averted Onsite Costs

AOSC includes averted cleanup and decontamination costs and averted power replacement costs. Duke derived the values for AOSC based on information provided in Section 5.7.6 of the regulatory analysis handbook (NRC 1997b).

Averted cleanup costs are calculated using the following formula:

ACC = Annual CDF reduction
× present value of cleanup costs per core-damage event
× present value conversion factor

The net present value for cleanup and decontamination of a severe accident (discounted over 10 years) is given as $1.1 billion in the handbook (NRC 1997b). Use of a discount factor of 10.76 to account for the 20-year license renewal period yields an integrated cleanup cost of $12 billion. This value was multiplied by the annual reduction in core damage frequency to obtain the averted cleanup costs portion of the AOSC.

Long-term replacement power costs (U_{RP}) are calculated as

U_{RP} = Annual CDF reduction
× present value of replacement power for a single event
× factor to account for remaining service years for which replacement power is required

In accordance with guidance provided in Section 5.7.6.2 of the handbook (NRC 1997b), Duke estimated the net present value of replacement power for a single event to be $1.23 billion, based on a replacement power cost for each ONS unit of $152 million (year 2000 dollars), a real discount rate of 7 percent, and a 20-year license renewal period. This value was multiplied by a factor of 8.1 to obtain a summation of the single-event costs over the entire license renewal period, yielding a replacement power cost of $10.0 billion. This value was multiplied by the annual reduction in core damage frequency to obtain the averted replacement costs portion of the AOSC.

The value-impact results for the 16 SAMAs are presented in Tables 5-5 and 5-6. All of the SAMAs have a negative net value, even when bounding risk reduction benefits are assumed, and AOSC is included. Duke concluded that implementation of SAMAs is not justified since the cost of implementation far exceeds the benefit of these SAMAs. As such, Duke has decided not to pursue any of these SAMAs further.

5.2.6.2 Staff Evaluation

The updated cost-benefit analysis provided by Duke (Duke 1999) was based primarily on NRC's Regulatory Analysis Technical Evaluation Handbook (NRC 1997b). The only noted deviation from the regulatory guidance was the omission of the averted offsite property damage cost component for those SAMAs that impact only containment performance. (A reduction in offsite consequences results in both averted public exposure and averted offsite property damage. Duke appropriately considered averted offsite property damage costs for the SAMAs that prevent core damage, but failed to include these averted costs for the SAMAs that improve containment performance.) The staff has evaluated the averted offsite property damage cost component for these SAMAs and found it to be small (less than $100,000 for the most effective mitigative SAMA identified) and well below the cost of the enhancements. Thus, the total present worth benefit for any of the containment-related SAMAs would be less than $150,000.

The staff concludes that the cost of implementing any of the 16 SAMAs would far exceed the estimated benefit, with a margin of about a factor of five. Based on its review, the staff notes the following:

- Averted onsite costs are the single most important factor in the cost-benefit analysis. However, no SAMAs are cost-beneficial when these costs are included in the analysis in accordance with NRC's regulatory analysis guidance.

- Use of a 3-percent discount rate in place of the 7-percent discount rate used in the base case analysis increases net values, but does not lead to identification of any cost-beneficial SAMAs.

- The effect of implementing the SAMA in the near term rather than delaying implementation until the start of the license renewal period (i.e., use of a 35-year rather than a 20-year period in the value impact analysis) is bounded by the sensitivity study, which assumed a 3-percent discount rate, and does not lead to identification of any cost-beneficial SAMAs.

5.2.7 Conclusions

Duke completed a comprehensive effort to identify and evaluate potential cost-beneficial plant enhancements to reduce the risk associated with severe accidents at ONS. As a result of this assessment, Duke concluded that no additional mitigation alternatives are cost-beneficial and warrant implementation at ONS.

Based on its review of SAMAs for ONS, the staff concurs that none of the candidate SAMAs are cost beneficial. This conclusion is consistent with the low residual level of risk indicated in the ONS PRA and the fact that Duke has already implemented many plant improvements identified from previous plant-specific risk studies. Both the conditional probability of an early release of fission products and the total offsite risk at ONS are already quite small (less than 4 percent and 5 person-rem per year, respectively). External events account for the majority (80 percent) of the risk, with much of this from postulated earthquakes with ground accelerations significantly greater than the ONS design-basis earthquake. Given the low level of residual risk and the large cost of seismic-related enhancements necessary to substantially reduce risk, cost-beneficial enhancements that can significantly reduce risk are unlikely and have not been identified. The margins in the analysis are considered ample to cover uncertainties in risk and cost estimates given that, in general, estimates for these factors were conservatively evaluated.

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 were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996; NRC 1999[a]). The GEIS included 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 offsite radiological impacts from the fuel cycle and from 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

This chapter addresses those issues that are related to the uranium fuel cycle and solid waste management during the license renewal term that are listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to ONS. The generic potential impacts of the radiological and non-radiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based 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(c), Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled

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

Nuclear Power Reactor." The GEIS also addresses the impacts from radon and technetium. There are no Category 2 issues for the uranium fuel cycle and solid waste management.

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 ONS from the uranium fuel cycle and solid waste management are listed in Table 6-1. Duke stated in its environmental report (ER) (Duke 1998) that it is not aware of any new and significant information

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 Sections
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
Offsite radiological impacts (spent fuel and high level waste disposal)	6.1; 6.2.2.1; 6.2.3; 6.2.4
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
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
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

associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and 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, 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

  > Offsite 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the 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, HLW, and spent fuel disposal is calculated to be about 14,800 person rem [148 person Sv], 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 United States. 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 judgement as to the regulatory NEPA implications of these matters should be made, and it makes no sense to repeat the same judgement 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no collective impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Offsite radiological impacts (spent fuel and HLW disposal): 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 radioactive nuclides 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 that will comply with such limits, peak doses to virtually all individuals will be 100 millirem (1 mSv) 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 100 millirem (1 mSv) 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 100 millirem (1 mSv) per year. The lifetime individual risk from 100 millirem (1 mSv) annual dose limit is about 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 DOE 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 HLW 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 the 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, 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 worldwide for a 100,000 metric tonne (MTHM) repository.

Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA implications of these matters should be made, and it makes no sense to repeat the same judgement 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.

The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no collective impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Nonradiological impacts of the uranium fuel cycle: 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the 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 onsite land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the 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 nonradiological 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the 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 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 onsite spent fuel impacts were determined to be SMALL. The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the 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 nonradiological waste impacts were determined to be SMALL. The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

- Transportation: Subsequent to the issuance of the draft SEIS, the Commission promulgated a final rule to amend the regulations governing the transportation issues of the environmental review requirements for renewal of nuclear power plant operating licenses. This transportation issue had been considered a Category 2 issue and was discussed in Section 6.1.1 of the draft SEIS. It is no longer considered a Category 2 issue and, therefore, Section 6.1.1 has been deleted. 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(c), 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.

  The transportation impacts were determined to be SMALL if fuel enrichment and burnup conditions set forth in the Addendum 1 to the GEIS are met. ONS meets the fuel enrichment and burnup conditions. The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

6.2 References

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.23, "Temporary storage of spent fuels after cessation of reactor operation—generic determination of no significant environmental impact."

10 CFR 51.51(b), Table S-3, "Uranium fuel cycle environmental data."

10 CFR 51.52(c), Table S-4, "Environmental effects of transportation of fuel and waste.

10 CFR Part 51, Subpart A, Appendix B, "Environmental effects of renewing the operating license of a nuclear power plant."

10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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

Duke Energy Corporation. 1998. Application for Renewed Operating Licenses. Oconee Nuclear Station Units 1, 2, and 3. Volume IV Environmental Report.

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

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

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plant (GEIS)*, NUREG-1437, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement to 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. NUREG-1437, Volume 1, Addendum 1. Washington, D.C.

7.0 Environmental Impacts of Decommissioning

Environmental issues associated with decommissioning resulting from continued plant operation during the renewal term were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants*, NUREG-1437 (NRC 1996). The GEIS included 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 offsite radiological impacts from the fuel cycle and from 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 not likely 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 of Category 1, and therefore, additional plant-specific review for these issues is required. There are no Category 2 issues related to decommissioning at ONS.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to ONS decommissioning following the renewal term are listed in Table 7-1. Duke stated in its Environmental Report (ER) (Duke 1998) that it is not aware of any new and significant information associated with the renewal of the Oconee operating licenses. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and 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 the ONS Following the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
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 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 (0.01 person-SV) caused by buildup of long-lived radionuclides during the license renewal term." The staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no radiation doses associated with decommissioning following license renewal 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comment on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of

public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of license renewal on air quality during decommissioning 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of the license renewal term on water quality during decommissioning 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of the license renewal term on ecological resources during decommissioning 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 staff has not identified any significant new information during its independent review of the Duke ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of license renewal on the socioeconomic impacts of decommissioning beyond those discussed in the GEIS.

7.1 References

10 CFR Part 51, Subpart A, Appendix B, "Environmental effect of renewing the operating license of a nuclear power plant."

Duke Energy Corporation. 1998. *Application for Renewed Operating Licenses—Oconee Nuclear Station, Units 1, 2 and 3.* Volume IV-Environmental Report.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plant (GEIS)*, NUREG-1437. Washington, D.C.

8.0 Environmental Impacts of Alternatives to License Renewal

This chapter examines the potential environmental impacts associated with denying a renewed operating license (i.e., the no-action alternative); the potential environmental impacts from electric generating sources other than renewal of the ONS operating licenses; the potential impacts from instituting additional conservation measures to reduce the total demand for power; and the potential impacts from power imports. The impacts are evaluated using a three-level standard of significance—SMALL, MODERATE, or LARGE—based on Council on Environmental Quality (CEQ) guidelines. These significance levels are 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.

8.1 No-Action Alternative

For license renewal, the no-action alternative refers to a scenario in which NRC would not renew the ONS operating licenses, and the applicant would then decommission ONS when plant operations cease. Replacement of ONS electricity generation capacity would be met either by demand-side management and energy conservation (perhaps supplied by an energy service company), imported power, some generating alternative other than ONS, or some combination of these. However, due to the influence of the ongoing deregulation of the retail market, Duke might not be the ultimate power supplier.

Duke will be required to comply with NRC decommissioning requirements whether or not the operating licenses are renewed. If the ONS operating licenses are renewed, decommissioning activities may be postponed for up to an additional 20 years. If the licenses are not renewed, then Duke would begin decommissioning activities when plant operations cease, beginning in 2013 or perhaps sooner. The impacts of decommissioning would occur concurrently with the impacts of supplying replacement power. The GEIS (NRC 1996) and the *Final Generic Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586 (NRC 1988) provide a description of decommissioning activities.

The environmental impacts associated with decommissioning under the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of the SEIS, and

NUREG-0586 (NRC 1988). The impacts of decommissioning after 60 years of operation generally would not be significantly different from those occurring after 40 years of operation.

- Socioeconomic: When ONS ceases operation, there will be a decrease in employment and tax revenues associated with the closure. This impact would be concentrated in Oconee County and to a lesser degree in Pickens, Anderson, and Greenville counties. Most secondary employment impacts and impacts on population would also be expected in these counties. Table 2.5 shows the current geographic distribution of the residences of ONS employees by county. Most of the tax revenue losses would occur in Oconee County. The no-action alternative results in the loss of these taxes and payrolls 20 years earlier than if the licenses are renewed (Table 8-1). Duke pays taxes on ONS of about $22 million per year to Oconee County, as stated in Section 2.2.8. This tax base would be lost in the no-action alternative. It is expected that energy costs in the area would also be higher in a regulated utility environment. It is not clear from the staff's interviews with local real estate agents and appraisers whether there would be a significant adverse impact on housing values as a result of closing ONS. While the loss of payrolls and workers would be substantial, particularly in Oconee County, future real estate values may be driven more by vacation/retirement home demand and the suburban growth surrounding Greenville.

Table 8-1. Summary of Environmental Impacts from No-Action Alternative

Impact Category	Impact	Comment
Socioeconomic	MODERATE to LARGE	Decrease in employment and tax revenues
Archaeological and Historical Resources	SMALL to LARGE	Sale or transfer of land within plant site leads to changes in land-use pattern
Environmental Justice	SMALL to MODERATE	Loss of employment opportunities and social programs

It is not clear that Duke's industrial recruitment efforts in the Tri-County region or their success would be maintained after closure of the Oconee plant. Duke's power costs would be expected to be higher without the plant, and there would be fewer incentives for Duke to assist in recruiting outside businesses into the region if its presence is significantly diminished.

The recreational property, lake, and hydroelectric facilities associated with the Keowee-Toxaway project are not likely to be affected by the closure of Oconee. However, there is one potential change that could be significant. In part, because of the need for clean water at the ONS, Duke has provided aggressive corporate, political, and technical leadership in maintaining high water quality in Jocasee and Keowee Lakes.. Hydroelectric facilities can tolerate much lower water quality and Crescent Resources (the real estate division of Duke Energy Corporation) may have divested enough holdings by 2013 that Duke will have fewer corporate incentives to keep water quality

exceptionally high if ONS closes. Therefore, the corporate and technical leadership and assistance that Duke voluntarily provides in the area of water quality monitoring may be less readily available.

- Archaeological and Historical Resources: The potential for future adverse impacts to known or unrecorded cultural resources at the ONS following decommissioning will depend on the future land use of the site. Known resources and activities include the current visitors' center and associated interpretative efforts that are funded and maintained by Duke. Eventual sale or transfer of the land within the plant site could result in adverse impacts to these resources should the land-use pattern change dramatically.

- Environmental Justice for No-Action: Current operations at ONS do not have disproportionate impacts on low-income and minority populations of the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Since closure would result in a decrease in employment and tax revenues in Oconee County, it is possible that the county's ability to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for the low-income or minority populations. There is some possibility of negative and disproportionate impacts on low-income or minority populations from this source under the no-action alternative.

8.2 Alternative Energy Sources

Nuclear power plants are commonly used for base-load generation; the GEIS indicates that coal-fired and gas-fired generation capacity are the feasible alternatives to nuclear power generating capacity, based on current (and expected) technological and cost factors. The alternatives of coal-fired generation and gas-fired generation are presented (Sections 8.2.1 and 8.2.2, respectively) as if such plants were constructed at the ONS site, using the existing water intake and discharge structures, switchyard, and transmission lines, or at an alternate location that could be either a current industrial site or an undisturbed, pristine site requiring a new generating building and facilities, new switchyard, and at least some new transmission lines. For purposes of this SEIS, a "greenfield" site is assumed to be an undisturbed, pristine site.

Depending on the location of an alternative site, it might also be necessary to provide a connection to the nearest gas pipeline (in the case of natural gas) or rail connection (in the case of coal). The requirement for these additional facilities also likely would increase the environmental impacts relative to those that would be experienced at the ONS site, although this is less certain.

The cooling water needs of a fossil-fired plant of equal capacity to the ONS facility would require the use of either a once-through cooling system located on a large body of water such as Lake Keowee or a closed cycle system using cooling towers.

The potential for using imported power is discussed in Section 8.2.3. Imported power is considered feasible, but would result in the transfer of environmental impacts from the current region in South Carolina to some other location in South Carolina, another state, or a Canadian province. Several other technologies were considered, but were determined not to be reasonable replacements for a nuclear power plant. These options included wind, solar, hydropower, geothermal, wood energy, municipal solid waste, oil, advanced nuclear, fuel cells, delayed retirement of other generating units, and utility-sponsored conservation as discussed in Section 8.2.4.

Some of the alternatives in this section are not inherently infeasible, but could not provide enough power on their own to replace the power from ONS. The final subsection considers the environmental consequences of a mix of alternatives. These impacts are the same or larger than the environmental consequences of relicensing.

8.2.1 Coal-Fired Generation

It was assumed that it would take 2500 MW(e) of coal-fired generation capacity to replace the approximately 2500-MW(e) ONS. The typical size [MW(e)] and configuration used by the electrical power industry in the application of coal-fired generation technology varies.

8.2.1.1 Once-Through Cooling System

Section 8.2.1.1 sets forth the environmental impacts of converting the current ONS site to a coal-fired generation facility with once-through cooling and building a similar facility on a greenfield site. Differences in impacts with closed-cycle cooling are covered in Section 8.2.1.2. Land use in the discussion that follows was based on two of Duke's current coal-fired generating plants: the four-unit, 2090-MW(e) Marshall Steam Station in Catawba County, North Carolina, which occupies 650 ha (1600 acres), and the 2-unit, 2370-MW(e) Belews Creek Steam Station in Stokes County, North Carolina, which occupies 280 ha (700 acres) (Duke 1999a). Environmental impacts were based on data in EPA (1995). The impacts are summarized in Table 8-2.

Construction of the coal-fired alternative would take approximately 5 years. The workforce during the construction period would be expected to average 1500, with a peak of 2500 (GEIS, adjusted for the larger scale of the ONS replacement plant) and during operations to average 500 (Duke 1998).

Additional water would be needed for controlling wet-scrubber sulfur dioxide emissions and for boiler makeup.

- **Land Use**

  Based on Duke's operating experience, approximately 900,000 MT (1,000,000 tons) of solid waste per year would be generated, including 630,000 MT (700,000 tons) of flyash and bottom ash,

selective catalytic reduction (SCR) catalyst (used for nitrogen oxides control), and sulfur oxide scrubber sludge/waste. Approximately 90 percent of the 630,000 MT (700,000 tons) of this ash would be flyash, and the remaining 10 percent would be bottom ash, depending on the type of coal burned and the type of emission control equipment used. The SCR catalyst would generate approximately 230 m^3 (8000 ft^3) of spent catalyst material per year. This catalyst material would have high concentrations of metals that are removed from the fly ash. A new coal-fired facility would also require sulfur oxides scrubbers to be installed as emission control equipment. This would result in the generation of approximately 350,000 MT (387,000 tons) per year of scrubber sludge. Facilities would be constructed to control and treat leachate from ash and scrubber waste

Table 8-2. Summary of Environmental Impacts from Coal Alternative—Once-Through Cooling

	Oconee Site		Alternative "Greenfield" Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	MODERATE	Uses another 220 ha (550 acres) within or adjacent to ONS site, plus 25 ha (60 acres) for 13–16 km (8–10 mi) rail line	MODERATE to LARGE	200 ha (500 acres) to 800 ha (2000 acres), including transmission lines
Ecology	MODERATE	Uses undeveloped areas in current ONS site plus other nearby land, plus rail corridor	MODERATE to LARGE	Impact will depend on ecology of site
Water Use and Quality				
- Surface Water	SMALL	Uses existing intake and discharge structures Volume 1 m^3/sec (16,000) gpm and temperature rise same as ONS	SMALL to MODERATE	Impact will depend on volume and other characteristics of receiving water
- Groundwater	SMALL	Little groundwater is currently used at ONS. This practice likely would continue	SMALL to LARGE	Impact will depend on site characteristics and availability of groundwater
Air Quality	MODERATE	Sulfur oxides –11,800 MT (13,000 tons)/yr –allowances required Nitrogen oxides –11,800 MT (13,000 tons)/yr –allowances required Particulate –1600 MT (1800 tons)/yr Carbon monoxide –1600 MT (1800 tons)/yr Carbon dioxide –16 million MT (18 million tons)/yr VOC –190 MT (210 tons)/yr Trace amounts of mercury, arsenic, chromium, beryllium, selenium	MODERATE	Same impacts as Oconee site, although pollution control standards may vary

Table 8-2. (contd)

Impact Category	Oconee Site		Alternative "Greenfield" Site	
	Impact	Comments	Impact	Comments
Waste	MODERATE	Total waste volume would be 900,000 MT (1,000,000 tons)/yr of ash and scrubber sludge	MODERATE	Same impacts as Oconee site; waste disposal constraints may vary
Human Health	SMALL	Impacts considered minor	SMALL	Same impact as Oconee site
Socioeconomics	MODERATE	1500 to 2500 additional workers during 5-year construction period, followed by reduction from current 1700 workforce to 500 persons	MODERATE TO LARGE	Construction impacts would be relocated. Community near ONS would still experience reduction from 1700 persons to 0 persons
Aesthetics	MODERATE to LARGE	Visual impact of large industrial facility and stacks would be significant	MODERATE to LARGE	Alternate locations could reduce aesthetic impact if siting is in an industrial area
Archeological and Historical Resources	SMALL	Affects previously developed parts of current ONS site, nearby land, and 13–16 km (8–10-mi) rail corridor	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	MODERATE	Impacts on low income and minority communities should be similar to those experienced by the population as a whole. Some impacts on housing are likely.	SMALL to LARGE	Impacts will vary depending on population distribution and make up

disposal areas and runoff from coal storage areas. These facilities are included in the land-use estimates. The existing switchyard and transmission system would be used. Duke assumed that between 220 ha (550 acres) and 800 ha (2000 acres) would be required based on the Marshall and Belews Creek Duke coal-fired power plants. It is assumed that coal-fired generation structures and facilities, including coal storage and waste disposal, would be located in one or more of the unused areas of the Oconee site and on adjacent Duke-owned land.

As described above, the coal-fired generation alternative would necessitate converting roughly an additional 220 ha (550 acres) of the Duke-owned land across Highway 130 or 183 from the ONS (the current site is only 207 ha [512 acres]) to industrial use (plant, coal storage, and ash and scrubber sludge disposal), expanding the altered area at the site from 200 ha (500) acres to over 400 ha (1000 acres). The land surrounding ONS is owned by one of Duke's subsidiaries and could most likely be made available.

In addition, a new rail line would have to be built between Newry and the ONS site (13 to 16 km [8 to 10 mi]) requiring approximately 25 ha (60 acres) to bring the coal to the site. The impact of coal-fired generation on land use is best characterized as MODERATE; its impact would be greater than the proposed action.

In contrast, land use for a coal-fired generation alternative using once-through cooling at an alternative greenfield site would require 4 ha (10 acres) for offices, roads, etc. This is in addition to up to 800 ha (2000 acres) for generating facilities and cooling structures, coal storage ash basin, and flyash disposal discussed previously. Additional land might be needed for transmission lines, depending on the location of the site relative to the nearest intertie connection. Depending on the transmission line routing, these alternatives could result in MODERATE or LARGE land-use impacts consistent with the GEIS characterization of land use at a greenfield site.

- **Ecology**

Locating an alternate energy source at the existing ONS site would noticeably alter ecological resources because of using additional undeveloped areas and modifying the existing intake and discharge system. The impact to the Lake Keowee ecology would be expected to remain unchanged because the once-through cooling system at ONS has not shown significant negative impact to the lake. The appropriate characterization of coal-fired generation ecological impacts of the ONS site would be MODERATE; its impact would be greater than the proposed action.

Constructing a coal-fired plant at a greenfield site, particularly one sited in a rural area with considerable natural habitat, would certainly alter the ecology and could impact any endangered or threatened species present at the site. These ecological impacts could be MODERATE to LARGE, consistent with the GEIS characterization of ecological impacts at a greenfield site.

- **Water Use and Quality**

Surface Water. The coal-fired generation alternative is assumed to use the existing ONS intake and discharge structures as part of a once-through cooling system. This alternative would minimize environmental impacts since minimal construction would be required to adapt the system to the coal-fired alternative. It is assumed that the coal-fired alternative cooling water volume (1 m^3/sec [16,000 gpm]) and temperature rise would be approximately the same as for the current nuclear plant. This temperature rise would comply with the existing ONS National Pollutant Discharge Elimination System (NPDES) permit. The GEIS analysis determined that surface water quality, hydrology, and use impacts for license renewal would be SMALL. Because the coal-fired generation alternative is assumed to have the same discharge characteristics as ONS, surface water impacts are expected to remain SMALL; the impacts would be so minor that they would not noticeably alter any important attribute of the resource.

For alternative greenfield sites, the impact to the surface water would depend on the volume associated with the cooling system and characteristics of the receiving body of water. The impacts would be SMALL or MODERATE.

Groundwater. No variation would be expected in the amount of groundwater used, since groundwater wells only are used to supply water for drinking and the restroom facility at the station baseball field, as well as to supply irrigation water for site landscaping during the summer months (June through September). However, the leachate from ash and scrubber waste disposal areas and runoff from coal storage areas would have to be controlled to avoid groundwater and surface water contamination. For this reason, the appropriate characterization of coal-fired generation groundwater impacts would be SMALL; the impacts would be so minor that they would not noticeably alter any important attribute of the resource.

For alternative greenfield sites, the impact to the groundwater would depend on the site characteristics, including the amount of groundwater available. The impacts would range between SMALL and LARGE.

- **Air Quality**

Air quality impacts of coal-fired generation vary considerably from those of nuclear power due to emissions of sulfur oxides, nitrogen oxides, particulates, and carbon monoxide. Although the entire State of South Carolina and the nearby areas of North Carolina and Georgia are currently in attainment for meeting National Ambient Air Quality Standards, the Oconee site is within 80 km (50 mi) of two Prevention of Significant Deterioration Class I areas (Great Smoky Mountains National Park and Shining Rock Wilderness Area) that would be of concern for a major coal-fired plant. Also, future economic and population growth may make future compliance more difficult.

Sulfur oxides emissions. Using current control technology for sulfur oxides emissions, the total annual stack emissions would include approximately 11,800 MT (13,000 tons) of sulfur oxides, most of which would be sulfur dioxide. Additional reductions could become necessary. The acid rain provision of the Clean Air Act (CAA) (Sections 403 and 404) capped the nation's sulfur dioxide emissions from power plants. Under the Act, affected fossil-fired steam units are allocated a number of sulfur dioxide emission allowances. To achieve compliance, each utility must hold enough allowances to cover its sulfur dioxide emissions annually or be subject to certain penalties. If the utility's sulfur dioxide emissions are less than its annually allocated emission allowances, then the utility may bank the surplus allowances for use in future years. A sulfur dioxide allowances market has been established for the buying and selling of allowances. Duke has sulfur dioxide allowances for its existing coal-fired plants; however, Duke would have to purchase additional allowances to operate an additional coal-fired plant (Duke 1999b). Because of allowances, any major new combustion facility in South Carolina would not add sulfur dioxide impacts on a regional basis, though it might do so locally.

Nitrogen oxides emissions. Using currently available control technology, the total annual nitrogen oxides emission would be approximately 11,800 MT (13,000 tons). Section 407 of the CAA establishes an annual reduction program for the nitrogen oxides emissions program. The new EPA

8-hour ozone standard, the new EPA $PM_{2.5}$ particulate standard, and Regional Haze rules create additional burdens on coal use. To cite one example, the South Carolina Department of Health and Environmental Control (SCDHEC) has identified several counties that may be impacted, including Anderson and Greenville Counties, as well as counties of concern, including Oconee and Anderson Counties (South Carolina Air Quality Annual Report Volume XVII, 1997 [SCDHEC 1998]). To implement a coal-fired alternative, Duke might be required to offset its corporate nitrogen oxides emissions through further reductions in nitrogen oxides emissions elsewhere by shutting other sources down or by back-fitting to reduce nitrogen oxides formation (e.g., installing over-fired air, low nitrogen oxides burners, flue gas re-circulation, and selective non-catalytic and catalytic reduction systems). Alternatively, offsets might be available for purchase on the open market. A major new combustion facility would not add to net regional emissions, although it might do so locally.

Particulate emissions. The total estimated annual stack emissions would include 1600 MT (1800 tons) of particulate matter having a diameter of 10 microns or less (PM_{10}). In addition, coal handling equipment would introduce fugitive particulate emissions.

Carbon monoxide emissions. The total carbon monoxide emissions would be approximately 1600 MT (1800 tons) per year.

Carbon dioxide emissions. The total carbon dioxide emissions would be approximately 16 million MT (18 million tons) per year.

Mercury. Coal-fired boilers account for nearly a third of mercury emissions in the United States. Technologies available to control mercury emissions have varying degrees of success. In response to growing concerns with mercury, the CAA Amendments of 1990 have required the EPA to identify mercury emission sources, evaluate the contributions of power plants and municipal incinerators, identify control technologies, and evaluate the toxicological effects from the consumption of mercury-contaminated fish. It is likely that these studies will lead to additional restrictions concerning mercury emissions associated with coal-fired power plants, as well as other sources of mercury emissions. Recent studies by the Maryland Power Plant Research Program have indicated that although coal-fired power plants contribute to mercury emissions, the resulting concentrations are not high enough to adversely affect humans or other organisms (Maryland Department of Natural Resources 1999). Therefore, the probable effect of trace mercury emissions on human health would be SMALL.

The GEIS analysis did not quantify coal-fired emissions, but implied that air impacts would be substantial and mentioned global warming and acid rain as potential impacts. Adverse human health effects from coal combustion have led to important Federal legislation in recent years, and public health risks, such as cancer and emphysema, have been associated with the products of coal combustion. Federal legislation and large-scale concerns, such as acid rain and global warming,

are indications of concerns about air resources. Sulfur oxide emission allowances, nitrogen oxide emission offsets, low nitrogen oxide burners, overfire air, selective catalytic reduction, fabric filters or electrostatic precipitators, and scrubbers may be required as mitigation measures. As such, the appropriate characterization of coal-fired generation air impacts would be MODERATE. The impacts would be clearly noticeable, but would not destabilize air quality.

Siting the coal-fired generation elsewhere would not significantly change air quality impacts, although it could result in installing more or less stringent pollution control equipment to meet applicable standards. Therefore, the impacts would be MODERATE.

- Waste

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash and scrubber sludge. Based on Duke experience at two coal-fired plants, approximately 900,000 MT (1,000,000 tons) of this waste would be generated annually for 40 years and disposed of onsite, accounting for between 60 percent and 40 percent of land used at the site (120 out of 200 ha to 160 out of 800 ha [300 out of 500 acres to 400 out of 2000 acres]). While only half of these values are directly attributable to the alternative to a 20-year ONS license renewal, the total values are pertinent as a cumulative impact. This impact could extend well after the 40-year operation life because revegetation management and groundwater monitoring for leachate contaminant impacts could be a permanent requirement.

The GEIS analysis concluded that large amounts of fly ash and scrubber sludge would be produced and would require constant management. Disposal of this waste could noticeably affect land use and groundwater quality, but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land would be available for other uses, and regulatory requirements would ensure groundwater protection. For these reasons, the appropriate characterization of impacts from waste generated from burning coal would be MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

Siting the facility on an alternate greenfield site would not alter waste generation, although other sites might have more constraints on disposal locations. Therefore, the impacts would be MODERATE.

- Human Health

Coal-fired power generation introduces worker risks from fuel and lime/limestone mining and worker and public risks from fuel and lime/limestone transportation and stack emissions inhalation. Stack impacts can be very widespread and health risks difficult to quantify. This alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

The GEIS analysis noted that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates, but did not identify the significance of this impact. Regulatory agencies, such as the EPA and SCDHEC, focus on air emissions and revise regulatory requirements or propose statutory changes, based on human health impacts. Such agencies also impose site-specific emission permit limits as needed to protect human health. Thus, human health impacts from inhaling toxins and particulates generated by burning coal would be SMALL.

Using the same logic, siting the facility at an alternate greenfield site would not alter the expected human health effects. Therefore, the impacts would be SMALL.

- **Socioeconomics**

Construction of the coal-fired alternative would take approximately 5 years. It is assumed that construction would take place concurrently while ONS continues operation and would be completed at the time ONS would cease operations. Thus, the workforce would be expected to average 1500 with a peak of 2500 additional workers during the 5-year construction period, based on estimates given in the GEIS (NRC 1996) and scaled for the large plant size. The surrounding communities would experience demands on housing and public services that could have large impacts. After construction, the communities would be impacted by the loss of jobs; construction workers would leave, the nuclear plant workforce (1700) would decline through a decommissioning period to a minimal maintenance size, and the coal-fired plant would introduce only 500 new jobs.

The GEIS analysis concluded that socioeconomic impacts at a rural site would be larger than at an urban site because more of the 1200 to 2500 peak construction workforce would need to move to the area to work. While the site is not rural within the meaning of the GEIS, the facility is roughly twice the size examined in the GEIS. Operational impacts could result in moderate socioeconomic benefits in the form of several hundred additional jobs, substantial tax revenues, and plant expenditures.

The size of the construction workforce for a coal-fired plant and plant-related spending during construction would be noticeable. However, due to the site's proximity to large labor pools in the Greenville and Spartanburg areas, significant numbers of construction workers would not be expected to move to the ONS area. Operational impacts would include an eventual loss of approximately 1200 jobs (1700 for three nuclear units down to 500 for the coal-fired plant), with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. The area's rapid population growth and the replacement industrial tax base resulting from the coal-fired power plant would prevent any destabilization of socioeconomic resources. For these reasons, the appropriate characterization of socioeconomic impacts for a coal-fired plant would be MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

Construction at another site would relocate some socioeconomic impacts, but would not eliminate them. The community around ONS would still experience the impact of ONS operational job loss, and the communities around the new site would have to absorb the impacts of a large, temporary workforce and a moderate, permanent workforce. Therefore, the impacts are MODERATE to LARGE, based on the adverse effects on the employment and the tax base in Oconee County, which would be similar to those of the no-action alternative.

- **Aesthetics**

Plant structures (the stacks) would be visible over intervening trees for kilometers around, particularly along Lake Keowee. This view would contrast strongly with what is otherwise a natural-appearing vacation-home and rural area, with woods and farming areas. Coal-fired generation would also introduce additional mechanical sources of noise (e.g., induced-draft fans and coal-handling equipment) that may be audible offsite due to their proximity to Lake Keowee.

The GEIS concluded that aesthetic impacts from such a large construction effort in a rural area could be substantial. Industrial structures that would be located at the Oconee site would tower above area vegetation and create a noticeable visual impact for a large area. Aesthetics is a significant attribute of Lake Keowee, given the predominantly natural-appearing rural viewscape from the lake and shoreline. A coal-fired generating station would contrast strongly with the existing resource. The aesthetics impacts would be MODERATE to LARGE, noticeable but not destabilizing.

Alternative locations could reduce the aesthetic impact of coal-fired generation if siting were in an area that was already industrialized. In such a case, however, the introduction of such tall stacks and cooling towers would probably still have a MODERATE incremental impact. Other sites could show a LARGE impact.

- **Archaeological and Historical Resources**

The GEIS analysis concluded that impacts to cultural resources would be relatively SMALL unless important site-specific resources were affected. Under this alternative, cultural resource inventories would be required for any lands that have not been previously disturbed to the extent that no archaeological or historical resources might remain. Other lands that are purchased to support the facility would also require an inventory of field cultural resources, identification and recording of extant archaeological and historical resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site. Therefore, the impacts would be SMALL.

Construction at another site would necessitate studies to identify, evaluate, and mitigate potential impacts of new plant construction on cultural resources. This would be required 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, or other rights-of-way). Impacts can generally be managed and maintained as SMALL.

- **Environmental Justice**

  No environmental pathways have been identified that would result in disproportionately high and adverse environmental impacts on low-income and minority populations if a replacement coal-fired plant were built at the ONS site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the low-income and minority populations. Impacts at other sites would depend upon the site chosen. These impacts would be MODERATE.

  If the replacement plant were built in Oconee County, the county's tax base would be largely maintained, and some potential negative socioeconomic impacts on the low-income or minority populations would be avoided. If the plant were built elsewhere, environmental justice impacts would be SMALL to LARGE, depending on the plant location and nearby population distribution.

8.2.1.2 Closed-Cycle Cooling System

This section describes the differences in impacts of using a mechanical draft closed-cycle cooling system at a coal-fired power plant that would replace ONS. These differences would be roughly the same at both the Oconee site and other greenfield sites. Mechanical draft cooling towers are 15 m (50 ft) to 30 m (100 ft) tall. Based on Duke's experience with similar cooling towers at the Catawba Nuclear Station, cooling water consumption would be approximately 1.5 m^3/s (24,000 gpm) (Duke 1999a) and land-use requirements would be 10 to 12 ha (25 to 30 acres). The closed-cycle cooling system would introduce cooling tower blowdown that would be much higher in dissolved solids in comparison to Lake Keowee. Cooling tower operation would require more electrical power than the once-through cooling system due to the modified pumping systems. The towers would discharge a plume of water vapor and a measurable amount of cooling tower drift.

The changes in environmental impacts from redesigning the site for cooling towers are listed in Table 8-3. The overall impacts are also discussed below.

- **Land Use**

  A closed-cycle cooling system alternative would impact an additional 10 to 12 ha (25 to 30 acres) for cooling tower construction at either the greenfield site or the ONS site (Duke 1999). These alternatives would result in a minor to moderate change above those already considered for the once-through cooling alternative. The overall impact would be MODERATE at ONS, MODERATE to LARGE elsewhere.

Table 8-3. Summary of Environmental Impacts from Alternate Cooling System (Cooling Towers with Closed-Cycle Cooling)

Impact Category	Change in Impact from ONS Once-Through Cooling	Comments
Land Use	Minor to moderate change	10–12 additional ha (25–30 acres) required
Ecology	Minor change	Additional impact to terrestrial ecology from cooling tower drift Reduced impact to aquatic ecology
Water Use and Quality		
Surface Water	Minor change	Blowdown has higher dissolved solids Reduced flow/Less thermal load
Groundwater	No change	None
Air Quality	No change	None
Waste	No change	None
Human Health	No change	None
Socioeconomics	No change	None
Aesthetics	Small change	Addition of 30-m (100-ft) high cooling towers Noise from mechanical draft towers and vapor plume
Archaeology and Historical Resources	Minor change	Minimal cultural studies possibly required
Environmental Justice	No change	None

- **Ecology**

  The closed-cycle cooling system alternative would further reduce operational aquatic ecology impacts, but would introduce risk to vegetation from salt drift. However, these ecological impacts result in minor changes above those for the once-through cooling alternative, resulting in MODERATE overall impacts at ONS and MODERATE to LARGE impacts elsewhere.

- **Water Use and Quality**

  Surface Water. Although surface water impacts are expected to remain small, the closed-cycle cooling system alternative would introduce cooling tower blowdown that would have higher dissolved solids. However, because of the reduced flow, changes that impact surface water quality would result in minor changes above those already considered for the once-through cooling alternative. Thermal load would be less than with a once-through cooling system. The overall impact would be SMALL at ONS.

  For alternative greenfield sites, the impact to the surface water would depend on the volume associated with the cooling system and characteristics of the receiving body of water. The impacts would be SMALL or MODERATE.

  Groundwater. The facility's use of groundwater would not be impacted as a result of the variation between a once-through cooling system and a cooling tower-based system. Overall impacts would be SMALL at ONS.

  For alternative greenfield sites, the impact to the groundwater would depend on the site characteristics, including the amount of groundwater available. The impacts would range between SMALL and LARGE.

- **Air Quality**

  The air quality would be the same whether a cooling tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be MODERATE at all locations.

- **Waste**

  The amount of waste and impacts resulting from waste disposal would be the same whether a cooling tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be MODERATE at all locations.

- **Human Health**

  Human health effects would be the same whether a cooling tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be SMALL at all locations.

- **Socioeconomics**

  Socioeconomic impacts would be the same whether a cooling tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be MODERATE at Oconee, MODERATE to LARGE elsewhere.

- **Aesthetics**

  The closed-cycle cooling system alternative would add 15-m (50-ft) to 30-m (100-ft) tall mechanical draft towers and associated plumes. Mechanical draft towers introduce another noise source. This would be a small incremental change. Overall impacts would be MODERATE to LARGE at all locations.

- **Archaeological and Historical Resources**

  Minimal amounts of additional cultural resource studies would be required before construction of cooling towers. If towers were constructed on land that had already had cultural resource studies, further studies would not be necessary. This would be a minor incremental change. Overall impacts would be SMALL at all locations.

- **Environmental Justice**

  Environmental justice impacts would be the same whether a cooling tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts are MODERATE at ONS, SMALL to MODERATE elsewhere.

8.2.2 Gas-Fired Generation

It was assumed that a replacement natural gas-fired plant would use combined cycle technology. In the 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 to generate additional electricity. The size, type, and configuration of gas-fired generation units and plants currently operational in the United States vary and include simple-cycle combustion and combined-cycle units that range in size from 25 MW to 600 MW (EPA 1994). As with coal-fired technology, units may be configured and combined at a location to produce the desired amount of megawatts, and construction can be phased to meet electrical power needs.

Section 8.2.2.1 discusses the environmental impacts of converting the current ONS site to a natural gas-fired generation facility with once-through cooling and building a similar facility on a greenfield site. Differences in impacts with closed-cycle cooling are discussed in Section 8.2.2.2.

8.2.2.1 Once-Through Cooling System

Providing 2500 MW of replacement power with a combined cycle would require a minimum of 5 units. Natural gas typically has an average heating value of 3.7×10^7 J/m^3 (1,000 Btu per cubic foot) (DOE 1996; EPA 1993), and it would be the primary fuel; the gas-fired alternative plant would burn approximately 1.24 J/m^3-s (100 billion cubic feet per year). Low-sulfur No. 2 fuel oil would be the backup fuel (Duke 1998), but due to the relatively high cost of fuel oil, would not be the primary fuel for this technology. The discussion in this section addresses some of the differences in the impacts between gas- and oil-fired combustion turbine/combined cycle power plants.

As a surrogate for a similar-sized gas-fired alternative plant, the staff used Baltimore Gas and Electric's Perryman Power Plant and Polk Power Plant (BGE 1989; EPA 1984). The staff assumes that each unit would be less than 30 m (100 feet) high and would be designed with dry, low nitrogen oxides combusters, water injection, and selective catalytic reduction.

Each unit would exhaust through a 70-m (230-foot) stack after passing through heat-recovery steam generators. This stack height is consistent with EPA regulations (40 CFR 51.100), which address requirements for determining the stack height of new emission sources.

Natural gas would have to be delivered via pipeline. Approximately 60 ha (150 acres) would be disturbed during pipeline construction. The nearest gas pipeline large enough to support a new combined cycle plant is at Anderson, near Interstate 85, approximately 40 km (25 mi) from the Oconee site. Construction cost of installing a gas line to Oconee averages approximately $1 million per mile (Duke 1999b). Duke believes that the installation of a gas line to the Oconee site would not be economical and would require an additional 60 ha (150 acres) of land (Duke 1999b). To the degree existing rights-of-way could be used, the level of impact could be reduced.

Environmental impacts of conversion to the gas-fired generation option at both ONS and a "greenfield" site are summarized in the following text and are listed in Table 8.4.

- **Land Use**

  Gas-fired generation at the Oconee site would require converting a minimum additional 24 ha (60 acres) of the site and adjacent land to industrial use. Almost all would be used for the power block. Some, if not all of the land, would require clearing of wooded or vegetated areas since the existing industrial wooded area on the site is too small to accommodate the entire facility. An additional 60 ha (150 acres) would be disturbed during pipeline construction. Some additional land would also be required for backup oil storage tanks. Gas-fired generation land-use impact at the existing ONS site is MODERATE; the impact would noticeably alter habitat, but it would not destabilize any important attribute of the resource.

Table 8-4. Summary of Environmental Impacts from Gas-Fired Generation–Once-Through Cooling Alternative

	Oconee Site		Alternative "Greenfield" Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	MODERATE	Additional 24 ha (60 acres) required for power block Additional 60 ha (150 acres) disturbed for pipeline construction Additional land for backup oil storage tanks	SMALL to MODERATE	Up to 200 ha (500 acres) required for site pipelines and an estimated 16-km (10-mi) transmission line connection. Additional land for backup oil storage tanks
Ecology	MODERATE	Constructed on land adjacent to Oconee site. Significant habitat loss due to pipeline construction	SMALL to MODERATE	Impact depends on location and ecology of the site
Water Use and Quality				
Surface Water	SMALL	70% reduction in water flow	SMALL to MODERATE	Impact depends on volume and characteristics of receiving body of water
Groundwater	SMALL	Reduced groundwater withdrawals due to reduced workforce	SMALL to LARGE	Groundwater would be used for potable water only
Air Quality	MODERATE	Primarily nitrogen oxides –4300 MT/yr (4,700 tons/yr) with gas –11,800 MT/yr (13,000 tons/yr) with fuel oil Sulfur dioxide –3600 MT/yr (4,000 tons per yr) with fuel oil, none with gas Particulates –2300 MT/yr (2,500 tons/yr) with fuel oil –280 MT/yr (310 tons/yr) with gas Carbon dioxide –11 million MT/yr (12.5 million tons/yr) with fuel oil –8 million MT/yr (9.2 million tons/yr) with gas	MODERATE	Same impacts as for Oconee site
Waste	SMALL	Waste generation is 230 m^3/yr, 2500 (ft^3/yr) of spent catalyst with fuel oil, minor with gas	SMALL	Same impacts as for Oconee site

Table 8-4. (contd)

	Oconee Site		Alternative "Greenfield" Site	
Impact Category	Impact	Comments	Impact	Comments
Human Health	SMALL	Impacts considered to be minor	SMALL	Same impacts as for Oconee site
Socioeconomics	SMALL to MODERATE	500 to 750 additional workers during 3-year construction period; followed by reduction from 1700 persons to 300 persons (400 if fuel oil is used)	MODERATE to LARGE	Construction impacts would be relocated. Community near ONS would still experience reduction from 1700 persons to 0 persons.
Aesthetics	SMALL to MODERATE	Visual impact of stacks and equipment would be noticeable, but not as significant as coal option	SMALL to MODERATE	Alternate locations could reduce the aesthetic impact if siting is in an industrial area.
Archaeological and Historical Resources	SMALL	Only previously disturbed and adjacent areas would likely be affected	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	SMALL to MODERATE	Impacts on low-income and minority populations should be similar to those experienced by the population as a whole. Impacts on housing are possible.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup

Construction at a greenfield site would impact approximately 8 ha (20 acres) to 20 ha (50 acres) for offices, roads, parking areas, and a switchyard. The power block would require 25 ha (60 acres). Some additional land would also be required for backup oil storage. In addition, it is assumed that another 170 ha (424 acres) would be necessary for transmission lines (assuming the plant is sited 16 km [10 mi] from the nearest intertie connection), although this is uncertain and would depend on the actual plant location. Plants of this type are usually built very close to existing natural gas pipelines. Including the land required for pipeline construction, a greenfield site would require approximately 200 ha (500 acres). Depending on the transmission line routing, the greenfield site alternative could result in SMALL to MODERATE land-use impacts.

The GEIS estimated that land-use requirements for a 1000-MW gas-fired plant at a greenfield site would be SMALL (approximately 45 ha [110 acres] for the plant site), and that co-locating with a retired nuclear plant would reduce these impacts. The Duke land-use estimate is about the same as the GEIS, even though the plant is larger. The land-use change should not noticeably alter the overall site pattern for natural land use. Therefore, the impacts would be SMALL to MODERATE, depending on the length and routing of required pipelines and transmission lines.

- **Ecology**

Siting gas-fired generation at the existing ONS site would have MODERATE ecological impact because the facility would be constructed partly on previously disturbed areas and would disturb relatively little acreage at the site. However, significant habitat (60 ha [150 acres]) would be disturbed by 40 km (25 miles) of pipeline construction (Duke 1999b). To the extent that existing rights-of-way could be used, the impact would be reduced. Ecological impacts would also be minimized by using the existing intake and discharge system. Past operational monitoring of the effects of once-through cooling at ONS have not shown significant negative impacts to Lake Keowee ecology, and this would be expected to remain unchanged. At the existing site, adding gas-fired generation would introduce construction impacts and new, albeit incremental, operational impacts.

The GEIS noted that land-dependent ecological impacts from construction would be SMALL unless site-specific factors should indicate a particular sensitivity and that operational impacts would be smaller than for other fossil fuel technologies of equal capacity. The staff has identified the gas pipeline as a site-specific factor that would make gas-fired alternative ecological impacts larger than for the license renewal. Therefore, in this case, the appropriate characterization of gas-fired generation ecological impacts would be MODERATE.

Construction at a greenfield site could alter the ecology of the site and could impact threatened and endangered species. These ecological impacts could be SMALL to MODERATE.

- **Water Use and Quality**

Surface Water. The plant would use the existing ONS intake and discharge structures as part of a once-through cooling system; however, because cooling requirements would be less (70 percent reduction; EPA 1994), water quality impacts would continue to be SMALL.

Water quality impacts from sedimentation during construction was another land-related impact that the GEIS categorized as SMALL. The GEIS also noted that operational water quality impacts would be similar to, or less than, those from other centralized generating technologies. The staff has concluded that water quality impacts from coal-fired generation would be SMALL, and gas-fired alternative water usage would be less than that for coal-fired generation. Surface water impacts would remain SMALL; the impacts would not be detectable or be so minor that they would not noticeably alter any important attribute of the resource.

For alternative greenfield sites, the impact on surface water would depend on the volume and other characteristics of the receiving body of water. The impacts would be SMALL to MODERATE.

Groundwater. No variation would be expected in the amount of groundwater used since groundwater wells only are used to supply water for drinking and the restroom facility at the station baseball field as well as to supply irrigation water for site landscaping during the summer months (June through September). The groundwater impacts would be SMALL; the impacts would be so minor that they would not noticeably alter any important resource.

For alternative greenfield sites, the impact to the groundwater would depend on the site characteristics, including the amount of groundwater available. The impacts would range between SMALL and LARGE.

- Air Quality

Natural gas is a relatively clean-burning fuel. Because the ONS is not or not nearly a nonattainment area for ozone, air quality impacts of gas-fired generation would not be of concern. Nitrogen oxides emissions from the gas-fired alternative would be 4300 MT (4700 tons) with gas to 11,800 MT (13,000 tons) with fuel oil per year.

The GEIS noted that gas-fired air quality impacts are less than other fossil technologies because fewer pollutants are emitted, and sulfur dioxide is not emitted at all. Emissions from the gas-fired alternative would be less than emissions from the coal-fired alternative. However, the gas-fired alternative would contribute nitrogen oxides emissions to an area that in the future may become a nonattainment area for ozone. Because nitrogen oxides contribute to ozone formation, the reduced nitrogen oxides emissions are still of future concern, and low nitrogen oxides combusters, water injection, and selective catalytic reduction could become regulatory-imposed mitigation measures.

For these reasons, the appropriate characterization of air impacts from a gas-fired plant would be MODERATE; the impacts, primarily nitrogen oxides, would be clearly noticeable, but would not be sufficient to destabilize air resources as a whole.

Siting the gas-fired plant elsewhere would not significantly change air quality impacts because the site could also be located in a greenfield area that was not a serious nonattainment area for ozone. In addition, the location could result in installing more or less stringent pollution control equipment to meet the regulations. Therefore, the impacts would be MODERATE.

- Waste

There will be only small amounts of solid waste products (i.e., ash) from burning natural gas fuel. The GEIS concluded that waste generation from gas-fired technology would be minimal. Gas-firing results in very little combustion byproducts because of the clean nature of the fuel. Waste

generation would be limited to typical office wastes. This impact would be SMALL; waste generation impacts would be so minor that they would not noticeably alter any important resource attribute.

Siting the facility at an alternate greenfield site would not alter the waste generation; therefore, the impacts would continue to be SMALL.

- **Human Health**

The GEIS analysis mentions potential gas-fired alternative health risks (cancer and emphysema). The risk may be attributable to nitrogen oxides emissions that contribute to ozone formation, which in turn contributes to health risks. As discussed in Section 8.2.1 for the coal-fired alternative, legislative and regulatory control of the nation's emissions and air quality are protective of human health, and the appropriate characterization of gas-fired generation human health impacts would be SMALL; that is, human health effects would not be detectable or would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

Siting of the facility at an alternate greenfield site would not alter the human health effects that would be expected. Therefore, the impacts would be SMALL.

- **Socioeconomics**

It is assumed that gas-fired construction would take place while ONS continues operation, with completion at the time that the nuclear plant would halt operations. Construction of the gas-fired alternative would take much less time than constructing other plants (NRC 1996). During the time of construction, the surrounding communities would experience demands on housing and public services that could have moderate impacts. After construction, the communities would be impacted by the loss of jobs; construction workers would leave, the nuclear plant workforce (1700) would decline through a decommissioning period to a minimal maintenance size, and the gas-fired plant would introduce a replacement tax base and about 300 (or for an oil-fired plant, 400) new jobs.

The GEIS concluded that socioeconomic impacts from constructing a gas-fired plant would not be very noticeable and that the small operational workforce would have the lowest socioeconomic impacts (local purchases and taxes) of any nonrenewable technology. Compared to the coal-fired alternative, the smaller size of the construction workforce, the shorter construction time frame, and the smaller size of the operations workforce would all reduce some of the socioeconomic impacts. For these reasons, gas-fired generation socioeconomic impacts would be SMALL to MODERATE; that is, depending on other growth in the area, socioeconomic effects could be noticed, but they would not destabilize any important attribute of the resource.

Construction at another site would relocate some socioeconomic impacts, but would not eliminate them. The community around the ONS site would still experience the impact of the loss of ONS operational jobs and the tax base. The communities around the new site would have to absorb the impacts of a moderate, temporary workforce and a small, permanent workforce. Therefore, the impacts would be MODERATE to LARGE, based on net job and tax base losses in the Oconee area. This impact is about the same in the Oconee area under the no-action alternative.

- **Aesthetics**

The combustion turbines and heat-recovery boilers would be relatively low structures and would be screened from most offsite vantage points by intervening woodlands. The steam turbine building would be taller, approximately 30 m (100 feet) in height, and together with 70-m (230-foot) exhaust stacks, would be visible offsite.

The GEIS analysis noted that land-related impacts, such as aesthetic impacts, would be small unless site-specific factors indicate a particular sensitivity. As in the case of the coal-fired alternative, aesthetic impacts from the gas-fired alternative would be noticeable. However, because the gas-fired structures are shorter than the coal-fired structures and more amenable to screening by vegetation, the staff determined that the aesthetic resources would not be destabilized by the gas-fired alternative. For these reasons, the appropriate characterization of aesthetic impacts from a gas-fired plant would be SMALL to MODERATE; the impacts would be clearly noticeable, but would not destabilize this important resource.

Alternative locations could reduce the aesthetic impact of gas-fired generation if siting were in an area that was already industrialized. In such a case, however, the introduction of the steam generator building, stacks, and cooling tower plumes would probably still have a SMALL to MODERATE incremental impact.

- **Archaeological and Historical**

The GEIS analysis noted, as for the coal-fired alternative, that gas-fired alternative cultural resource impacts would be small unless important site-specific resources were affected. Gas-fired alternative construction at the ONS site would affect a smaller area within the footprint of the coal-fired alternative. As discussed in 8.2.1, site knowledge minimizes the possibility of cultural resource impacts. Cultural resource impacts would be SMALL; that is, cultural resource effects would not be detectable or would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

Construction at another site could necessitate instituting cultural resource preservation measures, but impacts can generally be managed and maintained as SMALL. Cultural resource studies would be required for the pipeline construction and any other areas of ground disturbance associated with this alternative.

- **Environmental Justice**

  No environmental pathways have been identified that would result in disproportionately high and adverse environmental impacts on low-income and minority populations if a replacement gas-fired plant were built at the ONS site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the low-income or minority populations. The impacts would be SMALL to MODERATE. Impacts at other sites would depend upon the site chosen. If the replacement plant were built in Oconee County, the county's tax base would be largely maintained, and some potential negative socioeconomic impacts on the low-income or minority populations would be avoided. If the plant were built elsewhere, environmental justice impacts would be SMALL to MODERATE, depending on the population distribution.

8.2.2.2 Closed-Cycle Cooling System

Cooling for the gas-fired facility could also be accomplished by a closed-cycle system, which would also use the existing intake and discharge structures, but flow requirements would be 90 percent less than the once-through cooling system (Gilbert/Commonwealth 1996). This alternative would use mechanical draft cooling towers that are 15-m (50-ft) to 30-m (100-ft) tall. Based on Duke's experience with similar cooling towers at the Catawba Nuclear Station, cooling water consumption would be approximately 1.5 m^3/s (24,000 gpm) (Duke 1999a) and land-use requirements for the towers would be 10 to 12 ha (25 to 30 acres). The closed-cycle cooling system alternative would introduce a cooling tower blowdown that would be higher in dissolved solids in comparison to Lake Keowee. Cooling tower operation would require more electrical power than the once-through alternative due to the modified pumping systems. Cooling towers would discharge a plume of water vapor and a small amount of cooling tower drift. Thermal rise would be less than with once-through cooling.

The incremental environmental impacts of converting to a closed-cycle cooling system at a gas plant are essentially the same incremental impacts of converting to a closed-cycle cooling system at a coal-fired plant. The impacts are discussed in Section 8.2.1.2 and are listed in Table 8-5.

8.2.3 Imported Electrical Power

"Imported power" means power purchased and transmitted from electric generation plants that the applicant does not own and that are located elsewhere within the region, nation, or Canada. Duke purchases substantial amounts of capacity on the wholesale market. For example, requests for proposals in 1995 yielded numerous short- and long-term proposals, from which Duke purchased options for 250 MW of capacity from PECO Energy for the period 1998 through 2001 (Duke 1998). In theory, importing (purchasing) additional power is a feasible alternative to ONS license renewal.

Table 8-5. Summary of Environmental Impacts of Gas-Fired Generation with Alternate Cooling System (Cooling Towers with Closed-Cycle Cooling)

Impact Category	Change in Impact Oconee Once-Through Cooling	Comments
Land Use	Minor change	Uses an additional 10 to 12 ha (25 to 30 acres) for cooling tower construction
Ecology	Minor change	Additional impact to terrestrial ecology from cooling tower drift; Reduced impact to aquatic ecology
Water Use and Quality		
Surface Water	Minor change	Blowdown has higher dissolved solids ; Reduced flow
Groundwater	No change	None
Air Quality	No change	None
Waste	No change	None
Human Health	Small	Impacts considered minor
Socioeconomics	No change	None
Aesthetics	Minor change	Addition of 30-m (100-ft) high draft towers including noise and vapor plume
Archaeology and Historical Resources	Minor change	Minimal studies (if necessary) before construction of cooling towers
Environmental Justice	No change	None

However, Duke points out that there is no assurance that sufficient capacity or energy would be available in the 2013 through 2034 time frame to replace the 2500 MW(e) base load generation. More importantly, regardless of the technology used to generate imported power, the generating technology would be one of those described in this SEIS and in the GEIS (probably coal, natural gas, nuclear, or Canadian hydroelectric). The GEIS, Chapter 8, description of the environmental impacts of other technologies is representative of the imported electrical power alternative to ONS license renewal.

According to the Energy Information Administration's (EIA's) International Energy Outlook 1998 (EIA 1997),

> Hydro Quebec has targeted the U.S. market for future sales growth. Hydro Quebec currently owns Vermont Gas and has signed a deal with Enron to market electricity in the Northeast while selling Enron's gas in Quebec. In April 1997, Hydro Quebec petitioned the FERC (Federal Energy Regulatory Commission) to sell electricity in the United States. In return, it would allow U.S. competitors to wheel electricity into Quebec. In November 1997, Hydro Quebec received FERC approval to sell power in the United States at market-based rates.

Depending on transmission availability, relative power costs, whether Canadian environmental and aboriginal rights controversies over the hydroelectric James Bay Project in Northern Quebec could be solved, and appropriate transmission agreements and facilities could be put in place, Hydro Quebec could be a future source of imported power. However, there would be significant environmental impacts in Northern Quebec.

8.2.4 Other Alternatives

This section identifies alternatives to ONS license renewal that are not feasible as direct replacements for ONS and describes why the alternatives are not considered feasible.

8.2.4.1 Wind

Wind power in the northwest area of South Carolina averages less than 100 w/m^2 (9.3 w/ft^2) at 10 m (33 ft) elevation or 200 w/m^2 (18.6 w/ft^2) at 50 m (164 ft) per hour. This is the lowest class on the 7-point scale (Wind Energy Resource Atlas, PNL-3195 [Zabransky et al. 1981]). The National Wind Technology Center, a branch of the U.S. Department of Energy, classifies potential wind farm resource areas from Power Class 1 through Power Class 7. Areas designated as Class 4 or higher are considered as areas of potential wind farm development using advanced wind turbine technology under development today. Power Class 3 areas may be suitable for future generation technology. The average annual capacity factor was estimated by the applicant at 21 percent in 1995 and projected at 29 percent in 2010 (Duke 1998). This low capacity factor compared with current base load technologies (Oconee's capacity factor is 78 percent) results from the intermittency of the wind resource (DOE/EIA-0561). Current energy storage technologies are too expensive to permit wind power to serve as a large base load. Based on the GEIS land-use estimate for wind power (the GEIS, Section 8.3.1, estimates 60,750 ha [150,000 acres] per 1000 MW(e) for wind power), replacement of ONS generating capacity, even assuming ideal wind conditions, would require dedication of almost 150,000 ha (375,000 acres) in the area in which ONS is located. Given the amount of land required, a large greenfield site would be necessary, which would result in a LARGE environmental impact.

8.2.4.2 Solar

Solar power technologies, photovoltaic and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to high costs per kilowatt of capacity (DOE 1995). The average capacity factor of photovoltaic cells is about 25 percent, and the capacity factor for solar thermal systems is about 25 percent to 40 percent. Energy storage requirements prevent the use of solar energy systems as base load. According to the GEIS, land requirements are also high— 14,000 ha (35,000 acres) per 1000 MW(e) for photovoltaic and 6000 ha (14,000 acres) per 1000 MW(e) for solar thermal systems. Neither type of solar electric system would fit at the ONS site, and either would have large environmental impacts at a greenfield site.

8.2.4.3 Hydropower

Hydroelectric power has an average annual capacity factor of 46 percent. As GEIS, Section 8.3.4, points out, hydropower's percentage of the country's generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over flooding, destruction of natural habitat, and destruction of natural river courses. GEIS, Section 8.3.4, estimates land use of 400,000 ha (1 million acres) per 1000 MW(e) for hydroelectric power. Based on this estimate, replacement of ONS generating capacity would require flooding more than 6700 km^2 (2600 mi^2), a LARGE impact on land use. Due to the lack of locations for siting a hydroelectric facility large enough to replace ONS, local hydropower is not a feasible alternative to ONS license renewal on its own. See Section 8.2.3 for a discussion of Canadian hydropower.

8.2.4.4 Geothermal

Geothermal has an average capacity factor of 90 percent and can be used for baseload power where available. However, as illustrated by the GEIS, Figure 8.4, geothermal plants might be located in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent, but there is no feasible location for 2500 MW(e) of geothermal capacity to serve as an alternative to ONS license renewal.

8.2.4.5 Wood Energy

A wood burning facility can provide base load power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (GEIS, Section 8.3.6). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered fuel cost. States with significant wood resources, such as California, Maine, Georgia, Minnesota, Oregon, Washington, and Michigan, benefit from using local resources. The pulp, paper, and paperboard industries, which consume large quantities of electricity, are the largest consumer of wood and wood waste for energy, benefitting from the use of waste materials that could otherwise represent a disposal problem. The larger wood waste power plants are only 40 to

50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact should 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. Duke estimates that a rough construction cost for a 2500 MW(e) plant in the Oconee area would be about $2400/KW, which would not be competitive for baseload power (Duke 1998).

8.2.4.6 Municipal Solid Waste

The initial capital costs for municipal solid waste plants are greater than for comparable steam turbine technology at wood waste facilities. This is due to the need with municipal solid waste for specialized waste separation and handling equipment. 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; however, it is unlikely that many landfills will begin converting waste to energy because of unfavorable economics, particularly with electricity prices declining (DOE 1995). Therefore, municipal solid waste would not be a feasible alternative to ONS license renewal, particularly at the scale required.

8.2.4.7 Other Biomass-Derived Fuels

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators, including burning energy crops, converting crops to a liquid fuel such as ethanol (ethanol is primarily used as a gasoline additive for automotive fuel), and gasifying energy crops (including wood waste). The GEIS 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 ONS. For these reasons, such fuels do not offer a feasible alternative to ONS license renewal. In addition, these systems have LARGE impacts on land use.

8.2.4.8 Oil

Oil is not considered a stand-alone fuel because it is not cost-competitive when natural gas is available. The cost of oil-fired operation is about eight times as expensive as nuclear and coal-fired operation. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation (DOE 1996). For these reasons, oil-fired generation is not a feasible alternative to ONS license renewal nor is it likely to be included in a mix with other resources, except as a back-up fuel.

8.2.4.9 Advanced Nuclear Power

Work on advanced reactor designs has continued, and nuclear plant construction continues overseas. However, the cost of building a new nuclear plant and the political uncertainties that have historically

surrounded many nuclear plant construction projects are among the factors that have led energy forecasters such as EIA to predict no new domestic orders for the duration of current forecasts (through the year 2010 [DOE 1996]). For these reasons, new nuclear plant construction is not considered a feasible alternative to ONS license renewal.

8.2.4.10 Fuel Cells

Phosphoric acid fuel cells are the most mature fuel cell technology, but they are only in the initial stages of commercialization. Two-hundred turnkey plants have been installed in the United States, Europe, and Japan. Recent estimates suggest that a company would have to produce about 100 MW of fuel cell stacks annually to achieve a price of $1000 to $1500 per kilowatt (DOE 1999). However, the current production capacity of all fuel cell manufacturers only totals about 60 MW per year. Therefore, the staff considers fuel cells not to be a feasible alternative to license renewal at this time.

8.2.4.11 Delayed Retirement

Duke's 1997 Integrated Resource Plan (IRP) (Duke 1998) discusses the strategy for meeting overall energy needs for the next 15 years. The IRP discusses decision dates (as opposed to retirement dates) for the following proposed combustion turbine generating requirements: 303 MW(e) in 2004; 88 MW(e) in 2005; 85 MW(e) in 2006. The IRP also discusses retirement of the following fossil generation: 276 MW(e) in 2010 and 438 MW(e) in 2011. The period of time evaluated for the IRP does not extend to the retirement dates for Oconee.

However, the delayed retirement of the above generation resources could not be used to replace the 2500 MW(e) generated at Oconee. In part because of their high operating cost, combustion turbines and small fossil units are used for peaking and intermediate generation. Therefore, it would not be feasible for the combustion turbines and small fossil plants listed above to replace base load generation. Additionally, it is unlikely that these fossil units could operate economically for an additional 20 years after the current decision dates. Duke does not have any plans to retire any of its base load units. Therefore, delayed retirement of base load fossil units could not be used as an alternative to license renewal.

8.2.4.12 Utility-Sponsored Conservation

Demand-side measures have been included in the past IRPs, and Duke currently has several general demand-side actions in their current plan (Duke 1998). These measures are discussed below.

Focus on Education – to help maintain competitive electricity rates, Duke is shifting the energy efficiency focus from an emphasis on energy efficiency options that are large, high-cost, and incentive-based to less costly education-based options.

Implementation of Demand-Side Competitive Bidding – Duke assessed the potential benefits of paying a third-party or customer to design and/or market demand-side resource options. Duke has entered into contracts with four bidders for a total projected resource of 4.7 MW(e).

Demand-side options currently used at Duke include the following:

Energy efficiency – High energy (HE) compressed air systems and HE motor systems and replacements

Interruptibles – Residential load control ride: A/C and water heating, power service rider, generator control rider

Load shifts – Residential water heating, controlled/submerged

Strategic Sales – Electrotechnology strategy, HE food service appliance, nonresidential space heating

Energy Efficiency and Strategic Sales – New residential housing program, existing residential housing program, and nonresidential heat pump program.

Currently, the demand side measures are expected to account for 950 MW(e) in 1999. This number is projected to decrease to 750 MW(e) in 2004. In addition, the demand side measures already are included in the applicant's growth projections. The applicant considers it unlikely that another cost-effective 2500 MW(e) can be found to replace ONS. Therefore, the conservation option is not considered a reasonable replacement for the license renewal alternative.

8.2.4.13 Combination of Alternatives

Even though individual alternatives to ONS might not be sufficient on their own to replace ONS due to the small size of the resource (hydro) or lack of cost-effective opportunities (e.g., for conservation), it is conceivable that a mix of alternatives might be cost-effective. For example, if some additional cost-effective conservation opportunities could be found and combined with a smaller imported power or natural gas-fired alternative, it might be possible to reduce some of the key environmental impacts of alternatives. However, it is unlikely that the environmental impact of such a hypothetical mix could be reduced below SMALL (see Table 8-6). In comparison, the impacts of renewing the ONS licenses are SMALL on all dimensions.

Table 8-6. Summary of Environmental Impacts of 500 MW(e) Demand-Side Measures, Plus 1200 MW(e) Gas-Fired Generation (Once-Through Cooling)

	Oconee Site		Alternative "Greenfield" Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	SMALL	Additional 24 ha (60 acres) required for power block Additional 60 ha (150 acres) disturbed for pipeline construction Additional land for backup oil storage	SMALL to MODERATE	Up to 200 ha (500 acres) required for site plus transmission line, backup fuel tanks, pipeline
Ecology	SMALL	Constructed on land adjacent to Oconee site. Significant habitat loss due to pipeline construction	SMALL to MODERATE	Impact depends on location and ecology of the site
Water Use and Quality				
Surface Water	SMALL	>70% reduction in water flow	SMALL to MODERATE	Impact depends on receiving body of water
Groundwater	SMALL	Reduced groundwater withdrawals due to reduced workforce	SMALL to MODERATE	Groundwater would be used for potable water only
Air Quality	SMALL to MODERATE	Primarily nitrogen oxides	SMALL to MODERATE	Same impacts as for Oconee site
Waste	SMALL	Minor waste generation with gas (oil not evaluated)	SMALL	Same impacts as for Oconee site
Human Health	SMALL	Impacts considered to be minor (see discussion of gas-fired alternative)	SMALL	Same impacts as for Oconee site
Socioeconomics	SMALL to MODERATE	500 to 750 additional workers during 3-year construction period; followed by a reduction in employment from 1700 persons at ONS to 300 persons (499 if fuel oil is used)	MODERATE to LARGE	Construction impacts would be relocated. Community near ONS would still experience reduction from 1700 workers to 0. Other community gains 300 workers
Aesthetics	SMALL to MODERATE	Visual impact of stacks would be noticeable, but less so than for the gas-fired alternative	SMALL to MODERATE	Alternate locations could reduce aesthetic impact if siting is in an industrial area

Table 8-6. (contd)

Impact Category	Oconee Site		Alternative "Greenfield" Site	
	Impact	Comments	Impact	Comments
Archaeological and Historic Resources	SMALL	Only previously disturbed and adjacent areas would likely be affected	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	SMALL to MODERATE	Impacts on low-income and minority populations should be similar to those experienced by the population as a whole. Impacts on housing are possible.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup

8.3 References

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40 CFR 50.10, "Postconstruction environmental reports."

40 CFR 51.100, "Definitions."

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9.0 Summary and Conclusions

By letter dated July 7, 1998, Duke Energy Corporation (Duke 1998) submitted an application to the NRC to renew the Oconee Nuclear Station (ONS) Units 1, 2, and 3 operating licenses for an additional 20-year period. If the operating licenses are renewed, Federal (other than NRC) decisionmakers, 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. If the operating licenses are not renewed, the plant will be shut down at or before the expiration of the current operating licenses, which are February 6, 2013, for Unit 1, October 6, 2013, for Unit 2, and July 19, 2014, for Unit 3.

Under the National Environmental Policy Act (NEPA) (42 USC 4321-4370d), an environmental impact statement (EIS) is required for major Federal actions significantly affecting the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. 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 operating license; 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS),[a] NUREG-1437 (NRC 1996, 1999a).

Upon acceptance of the Duke 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 (63 FR 50257). The staff visited the ONS site in October 1998 and held public scoping meetings on October 19, 1998, in Clemson, South Carolina (NRC 1999b). The staff reviewed the Duke environmental report (ER) and compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in the draft *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 1999c).

The staff then issued a draft of the supplemental environmental impact statement (SEIS) for public comment on May 24, 1999, which contained the preliminary results of its evaluation and recommendation. In addition, the staff held two public meetings during the comment period for this report on July 8, 1999. When the comment period ended on August 16, 1999, the staff considered and dispositioned all of the comments received, as discussed in Appendix A of this report. Modifications were made to this report to address certain comments, where appropriate, as described in Appendix A.

This SEIS presents the staff's analysis of the environmental impacts of renewal of the ONS operating licenses. The analysis considers and weighs the environmental effects of the proposed action, the

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

environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse impacts. It also includes the staff's final 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) decisionmakers.

The goal of the 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 decisionmakers 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 operating licenses.

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 operations–generic determination of no significant environmental impact"] and in accordance with § 51.23(b).[a]

(a) The title of 10 CFR 51.23 is "Temporary storage of spent fuel after cessation of reactor operations–generic determination of no significant environmental impact."

The GEIS contains the results of a systematic evaluation of the consequences of renewing an operating license and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the following three-level standard of significance—SMALL, MODERATE, or LARGE—based on Council on Environmental Quality guidelines:

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 shows

(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 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 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 significant new information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated Category 1 in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

Of the 23 issues not meeting 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 also 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 SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The 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 ONS operating licenses) and alternative methods of power generation. Among the alternative methods of power generation, coal-fired and gas-fired generation appear the most likely if the power from ONS is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the ONS site or an unspecified "greenfield" site.

9.1 Environmental Impacts of the Proposed Action - License Renewal

Duke and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Duke nor the staff has identified any significant new information related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither Duke nor the staff has identified any new issue applicable to the ONS that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all 69 Category 1 issues.

Duke's license renewal application presents analyses of the Category 2 issues. The staff has reviewed the Duke analysis for each issue and has conducted an independent review of each issue. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at ONS. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Duke (1998) has stated that their 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 Oconee beyond the end of the existing operating licenses. 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 FES for ONS.

Twelve Category 2 issues, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. Four of the Category 2 issues apply to both refurbishment and to operation during the renewal term and are only discussed in this SEIS in relation to operation during the renewal term. For all 12 Category 2 issues and environmental justice, the 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 staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for ONS, the staff concludes that none of the candidate SAMAs are cost-beneficial.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

The following subsections 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 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 identified are considered to be of SMALL significance, and none warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives in the event that ONS ceases operation at or before the expiration of the current operating license will not be smaller than those associated with continued operation of ONS, 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 ONS during its current license period was made when the plant was built. The resource commitments to be considered in this 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 most significant resource commitments related to operation during the renewal term are the fuel and the permanent storage space. The ONS replaces approximately 60 fuel assemblies in each of the three units during every refueling outage, which occurs on an 18-month cycle. Assuming no change in use rate, about 2400 spent fuel assemblies would be required for operation during a 20-year license renewal period.

The likely power generation alternatives in the event ONS ceases operation on or before the expiration of the current operating licenses 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 ONS site was set when the plants were approved and construction began. That balance is now well established. Renewal of the ONS operating licenses and continued operation of the plants will not alter the existing balance, but it may postpone the availability of the site for other uses. Denial of the application to renew the operating licenses will lead to shutdown of the plants and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the ONS 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 operating licenses for Oconee Nuclear Station Units 1, 2, and 3. Chapter 2 describes the ONS and the environment in the vicinity of the plant. Chapters 4 through 7 discuss environmental issues associated with renewal of the operating licenses. Environmental issues associated with the no-action alternative, and alternatives involving power generation are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the operating licenses), the no-action alternative (denial of the application), alternatives involving coal and gas-fired generation of power at the ONS site and an unspecified "greenfield site," and a combination of alternatives are compared in Table 9-1. Continued use of the ONS once-through cooling system is assumed for Table 9-1. Substitution of a cooling tower for the once-through cooling system in the evaluation of the coal-fired and gas-fired generation alternatives would result in somewhat greater environmental impacts in some impact categories.

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for all impact categories. The alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

9.3 Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants*, NUREG-1437, (2) the ER submitted by Duke, (3) consultation with other Federal, State, and local agencies, (4) the staff's own independent review, and (5) the staff's consideration of public comments, the staff recommends that the Commission determine that the adverse environmental impacts of license renewal for Oconee Nuclear Station Units 1, 2, and 3 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and Alternative Methods of Generation (Including a Combination of Alternatives) Assuming a Once-Through Cooling System

	Proposed Action	No-Action Alternative	Coal-Fired Generation		Gas-Fired Generation		Combination	
Impact Category	License Renewal	Denial of Renewal	ONS Site	"Greenfield Site"	ONS Site	"Greenfield Site"	ONS Site	"Greenfield Site"
Land Use	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	SMALL to MODERATE	SMALL	SMALL to MODERATE
Ecology	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Quality — Surface Water	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Quality — Groundwater	SMALL	SMALL	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	MODERATE to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE
Aesthetics	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Archaeological and Historical Resources	SMALL	SMALL to LARGE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL to MODERATE	MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE

9.4 References

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.20, "Criteria for and identification of licensing and regulatory actions requiring environmental impact statements."

10 CFR 51.23, "Temporary storage of spent fuel after cessation of reactor operation—generic determination of no significant environmental impact."

10 CFR 51.71, "Draft environmental impact statement—contents."

10 CFR 51.95, "Supplement to final environmental impact statement."

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effect of renewing the operating license of a nuclear power plant."

10 CFR 54.21, "Contents of application–technical information."

63 FR 50257, "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." September 21, 1998.

Duke Energy Corporation. 1998. *Application for Renewed Operating Licenses - Oconee Nuclear Station, Units 1, 2 and 3.* Volume IV, Environmental Report.

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

U.S. Nuclear Regulatory Commission (NRC). 1999a. *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.* NUREG-1437, Vol. 1, Addendum 1. Washington, D.C. National Environmental Policy Act of 1969, as amended, 42 USC 4321-4370d.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *Environmental Impact Statement Scoping Progress: Summary Report–Oconee Nuclear Station Units 1, 2, and 3. Oconee County, South Carolina.* Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999c. *Standard Review Plans for Environmental*

Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal, NUREG-1555, Supplement 1. Washington, D.C.

Appendix A

Discussion of Comments on the Draft Supplement

Appendix A

Discussion of Comments on the Draft Supplement

Pursuant to 10 CFR Part 51, the staff transmitted the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Oconee Nuclear Station, Draft Report for Comment* (NUREG-1437, Supplement 2, referred to as the draft SEIS) (NRC 1996) to Federal, State, and local government agencies as well as interested members of the public. As part of the process to solicit public comments on the draft SEIS, the staff

- placed a copy of the draft SEIS into the NRC Public Document Room and the Oconee County Library, 501 West South Broad Street, in Walhalla, South Carolina
- sent copies of the draft SEIS to the applicant and certain Federal, State, and local agencies
- published a notice of availability of the draft SEIS in the Federal Register on May 27, 1999 (64 FR 28843)
- issued public announcements, such as advertisements in local newspapers and postings in public places, of the availability of the draft SEIS
- announced and held two public meetings in Clemson, South Carolina, on July 8, 1999, to describe the results of the environmental review and answer related questions
- issued press releases announcing the issuance of the draft SEIS, the public meetings, and instructions on how to comment on the draft SEIS
- established a website to receive comments on the draft SEIS through the Internet.

During the comment period, the staff received a total of 10 comment letters and e-mail messages in addition to the comments received during the public meetings.

The staff has reviewed the public meeting transcripts and the 10 comment letters and e-mail messages that are part of the docket file for the application, all of which are available in the NRC Public Document Room. Excerpts of the transcripts that contained comments or questions are reproduced in this appendix along with each of the 10 comment letters and e-mail messages. No written statements were provided by members of the public during the public meetings. Table A-1 lists (1) the speakers at the meetings in speaking order along with the page of the transcript excerpts in this report on which the comment appears (these comments are identified by the letter "A" followed by a number that identifies each comment in the chronological order the comments were made), and (2) the authors of the comment letters or e-mail messages. The comment letters and e-mail messages are identified by

letters "B" through "K." An additional alpha-numeric identifier distinguishes among comments within a letter.[a] The staff response for each issue is provided in Section A.1 of this report. Related issues have been grouped together.

The staff addressed each comment by considering whether it was

(1) a comment about a Category 1 issue, and whether it

(a) provided significant new information that required evaluation during the review, or
(b) provided no new information

(2) a comment about a Category 2 issue, and whether it

(a) provided information that required evaluation during the review, or
(b) provided no such information

(3) a comment that raised an environmental issue not addressed in the GEIS or the draft SEIS

(4) a comment on safety issues pertaining to 10 CFR Part 54, or

(5) a comment outside the scope of license renewal (not related to 10 CFR Parts 51 or 54).

There was no significant, new information on Category 1 issues [(1)(a) above]. If the comment provided new information for a Category 2 issue [(2)(a)], then the staff evaluated the information and modified the SEIS, as appropriate. If the comment provided no new information for either Category 1 or 2 issues [(1)(b) or (2)(b)], then the GEIS and draft SEIS remained valid and bounding, and no further evaluation was performed.

Comments without a supporting technical basis or that did not provide any new information are addressed in this Appendix, providing relevant references that address the issues within the regulatory authority of the NRC, where appropriate. These references can be obtained from the NRC Public Document Room.

Subsections A.1.1 through A.1.18 correspond generally to the subject matter in the text of the supplement (purpose and scope, conclusions, site description, refurbishment, ecology, human health, socioeconomics, archaeology and historic resources, postulated accidents, uranium fuel cycle and solid waste management, decommissioning, alternatives to the proposed action, and summary and conclusions). Within each section, similar comments are grouped together for ease of reference, and a

(a) Comments provided by Duke in Letter K were already numbered 1 through 82; therefore, the two comments appearing in the cover letter were given the designation Ka and Kb.

summary description of the comments is given, followed by the staff's response. Where the comment or question resulted in a change in the text of the draft report, the corresponding response refers the reader to the appropriate section of this report where the change was made. All revisions to the text, whether substantive (including those made in response to comments) or editorial, are designated by vertical lines beside the text.

Section A.2 provides relevant portions of the public meeting transcripts and the 10 letters and e-mail messages that were received in response to the draft SEIS. Each comment identified by the staff was assigned a specific alpha-numeric identifier (marker). That identifier is typed in the margin of the transcript, letter, or e-mail message at the beginning of the discussion of the comment. In addition, to assist the reader in finding the response to the comment, the section number(s) where the comment is addressed in Section A.1 of this report is also listed in the margin next to the identifier. A cross-reference of the alpha-numeric identifiers, the speaker or author of the comment, the page where the comment can be found, and the section(s) of this report in which the comment is addressed is provided in Table A-1.

Table A-1. Oconee Nuclear Station SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A1	C. Tims	Afternoon Meeting Transcript (7/8/99)	A-35	A.1.4
A2	C. Tims	Afternoon Meeting Transcript (7/8/99)	A-35	A.1.17
A3	M. Thompson	Afternoon Meeting Transcript (7/8/99)	A-36	A.1.17
A4	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-37	A.1.15
A5	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-37	A.1.15
A6	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-37	A.1.15
A7	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-37	A.1.14
A8	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-37	A.1.14
A9	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-37	A.1.4
A10	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-38	A.1.4
A11	B. Williams	Afternoon Meeting Transcript (7/8/99)	A-39	A.1.4
A12	C. Tims	Afternoon Meeting Transcript (7/8/99)	A-39	A.1.17
A13	M. Thompson	Afternoon Meeting Transcript (7/8/99)	A-40	A.1.8
A14	J. Cudworth	Afternoon Meeting Transcript (7/8/99)	A-40	A.1.10
A15	D. Wehmire	Afternoon Meeting Transcript (7/8/99)	A-41	A.1.19

Table A.1. (contd)

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A16	D. Wehmire	Afternoon Meeting Transcript (7/8/99)	A-41	A.1.12
A17	N. Stancill	Afternoon Meeting Transcript (7/8/99)	A-42	A.1.14
A18	F. Plotnik	Afternoon Meeting Transcript (7/8/99)	A-43	A.1.4
A19	W. McCollum	Afternoon Meeting Transcript (7/8/99)	A-43	A.1.3
A20	D. Wehmire	Afternoon Meeting Transcript (7/8/99)	A-44	A.1.19
A21	D. Wehmire	Afternoon Meeting Transcript (7/8/99)	A-44	A.1.1
A22	D. Walters	Afternoon Meeting Transcript (7/8/99)	A-44	A.1.1
A23	D. Walters	Afternoon Meeting Transcript (7/8/99)	A-44	A.1.1
A24	T. Harper	Afternoon Meeting Transcript (7/8/99)	A-45	A.1.8
A25	N. Haylor	Evening Meeting Transcript (7/8/99)	A-47	A.1.4
A26	N. Haylor	Evening Meeting Transcript (7/8/99)	A-47	A.1.4
A27	N. Haylor	Evening Meeting Transcript (7/8/99)	A-47	A.1.4
A28	D. Sanders	Evening Meeting Transcript (7/8/99)	A-48	A.1.17
A29	D. Sanders	Evening Meeting Transcript (7/8/99)	A-48	A.1.17
A30	D. Mangrum	Evening Meeting Transcript (7/8/99)	A-49	A.1.4
A31	N. Haylor	Evening Meeting Transcript (7/10/99)	A-49	A.1.6
A32	N. Haylor	Evening Meeting Transcript (7/8/99)	A-49	A.1.4
A33	N. Haylor	Evening Meeting Transcript (7/8/99)	A-50	A.1.4
A34	N. Haylor	Evening Meeting Transcript (7/8/99)	A-50	A.1.15
A35	N. Haylor	Evening Meeting Transcript (7/8/99)	A-50	A.1.13
A36	N. Haylor	Evening Meeting Transcript (7/8/99)	A-50	A.1.15
A37	N. Haylor	Evening Meeting Transcript (7/8/99)	A-51	A.1.15
A38	N. Haylor	Evening Meeting Transcript (7/8/99)	A-51	A.1.15
A39	N. Haylor	Evening Meeting Transcript (7/8/99)	A-51	A.1.14
A40	N. Haylor	Evening Meeting Transcript (7/8/99)	A-51	A.1.14
A41	N. Haylor	Evening Meeting Transcript (7/8/99)	A-51	A.1.14
A42	N. Haylor	Evening Meeting Transcript (7/8/99)	A-52	A.1.14

Table A.1. (contd)

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A43	N. Haylor	Evening Meeting Transcript (7/8/99)	A-52	A.1.14
A44	N. Haylor	Evening Meeting Transcript (78/99)	A-52	A.1.13
A45	D. Sanders	Evening Meeting Transcript (7/8/99)	A-53	A.1.14
A46	N. Haylor	Evening Meeting Transcript (7/8/99)	A-55	A.1.16
A47	N. Haylor	Evening Meeting Transcript (7/8/99)	A-55	A.1.16
A48	N. Haylor	Evening Meeting Transcript (7/8/99)	A-56	A.1.9
A49	M. Thompson	Evening Meeting Transcript (7/8/99)	A-57	A.1.8
A50	M. Thompson	Evening Meeting Transcript (7/8/99)	A-57	A.1.8
A51	M. Thompson	Evening Meeting Transcript (7/8/99)	A-58	A.1.5
A52	N. Haylor	Evening Meeting Transcript (7/8/99)	A-59	A.1.4
A53	N. Haylor	Evening Meeting Transcript (7/8/99)	A-59	A.1.4
A54	G. Robison	Evening Meeting Transcript (7/8/99)	A-60	A.1.3
A55	D. Walters	Evening Meeting Transcript (7/8/99)	A-61	A.1.16
A56	D. Walters	Evening Meeting Transcript (7/8/99)	A-61	A.1.1
A57	D. Walters	Evening Meeting Transcript (7/8/99)	A-61	A.1.4
A58	D. Walters	Evening Meeting Transcript (7/8/99)	A-62	A.1.1
A59	D. Walters	Evening Meeting Transcript (7/8/99)	A-62	A.1.1
B	N. Brock	May 27, 1999 Letter	A-65	A.1.11
C	P.S. League	August 12, 1999 Letter	A-65	A.1.17
D1	H.J. Mueller	August 16, 1999 Letter	A-67	A.1.19
D2	H.J. Mueller	August 16, 1999 Letter	A-67	A.1.4
D3	H.J. Mueller	August 16, 1999 Letter	A-67	A.1.16
D4	H.J. Mueller	August 16, 1999 Letter	A-67	A.1.9
E	J.H. Lee	July 19, 1999 Letter	A-68	A.1.17
F	V. Autry, SCDHEC	August 11, 1999 Letter	A-68	A.1.8
G1	C.L. Gilbert, Jr.	August 13, 1999 Letter	A-69	A.1.2
G2	C.L. Gilbert, Jr.	August 13, 1999 Letter	A-69	A.1.13

Table A.1. (contd)

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
G3	C.L. Gilbert, Jr.	August 13, 1999 Letter	A-69	A.1.17
H	W.F. Squires	July 9, 1999 E-mail Message	A-72	A.1.1
I	R. Carnes	July 10, 1999 E-mail Message	A-72	A.1.1
J	J. Cudworth	July 12, 1999 E-mail Message	A-73	A.1.7
K	Duke Energy	August 17, 1999 Letter	A-75 to A-86	A.1.3., A.1.7, A.1.8, A.1.18, A.1.19, Table A.2

A.1 Comments and Responses

A.1.1 General Comments in Support of Nuclear Energy and License Renewal

The record of the public meetings and comment letters contains eight comments that express general support for license renewal (A21, A22, A23, A56, A58, A59, H, and I). Four of the comments express support in general (A22, A23, A56, and A59), and four specifically mention Oconee Nuclear Station (A21, A58, H and I). Reasons for supporting license renewal included

- nuclear power is an environmentally sound way to produce electricity and meet energy needs - A21, A22, A23, A56, A58, A59, H, I
- nuclear power is less expensive than building new electric generation capacity - A23, A59
- there will be economic benefits to the community as a result of renewing the licenses and hardship if ONS is shut down - A23, A59.

These comments are general in nature and do not provide new information. Therefore, no further evaluation was required, and no changes to the SEIS were made as a result of these comments.

A.1.2 General Comments in Opposition to License Renewal

The record contains one comment that expressed general opposition to nuclear power and license renewal (G1). Reasons for opposing license renewal include

- economic concerns

- concerns regarding nuclear waste.

This comment is general in nature and does not provide new information. Therefore, no further evaluation was required, and no changes to the SEIS were made as a result of this comment.

A.1.3 General Comments on Adequacy of the Review and Analysis

The record contains three comments that expressed general opinions related to the staff's environmental review that was summarized in the draft SEIS, NUREG-1437, Supplement 2, Draft for Comment (A19, A54, and Ka). Two of the comments (A19 and A54) reflected positively on the draft SEIS. One comment (Ka) agreed with the conclusions stated in the draft SEIS that "Current measures to mitigate environmental impacts of plant operation were found to be adequate, and that no additional mitigation measures were deemed sufficiently beneficial to be warranted," and that "...the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of ONS."

These comments are general in nature, and do not provide new information. Therefore, no further evaluation was required, and no changes to the SEIS were made as a result of these comments.

A.1.4 License Renewal Review Process

The record contains 15 comments and questions related to the license renewal process (A1, A9, A10, A11, A18, A25, A26, A27, A30, A32, A33, A52, A53, A57, and D2). One comment (A57) described the open nature of the review process. Two questions are related to the process that would occur after a determination is made about whether or not to renew the licenses (A1 and A18). Four questions are related to the schedule for the final inspection and the Commission's decision on license renewal (A25, A26, A27, and A30). Four comments were also made regarding the standing of the public and the Chattooga Watershed Coalition (A10, A11, A32, and A53). One comment related to the status and timing of the National Pollutant Discharge Elimination System (NPDES) permit renewal (A50). One comment related to the staff's consideration of public comments (A52). One question related to the involvement of the public during scoping or comment meetings (D2). Two comments stated that either issues were only partially being resolved through the relicensing process or that they were not being resolved and that it was unfair to the public and almost certainly illegal to proceed to a decision regarding license renewal in the absence of having answers to many open ended questions (A9 and A33).

The adequacy of the license renewal process is not within the scope of the environmental review related to the ONS license renewal. The license renewal process was established by rulemaking that included public notice and comment. Any new challenge to the process is outside the scope of this plant-specific environmental review.

The specific comments are addressed below.

Comment

Two of the comments were specific questions related to the license review process. One of the questions (A1) related to the process following the denial or refusal of the application (or in cases

where the licensee does not apply for a license renewal). Another (A18) asked about the process that would be used if the license extension were granted, but then unanticipated problems developed at the site during the 15 years before the initial license period had expired.

Response

In the event that the license renewal application is denied, the current license will continue in effect until it expires. The Commission's regulations limit the duration of the operating license for a nuclear power facility to 40 years. Regulations require that upon the expiration of the original license, the utility has to initiate the decommissioning process. Decommissioning must be completed before the facility's license can be terminated. Decommissioning is defined as the safe removal of a facility from service and reduction of residual radioactivity to a level that permits termination of the NRC license.

The process that is being used by the NRC to monitor and oversee the current operating license will continue to be used if the license is renewed. If, at any time, a concern arises which affects the public health and safety, the NRC has the authority to issue orders which would require the licensee to take action to resolve that concern.

These comments did not result in modification of the SEIS text.

Comment

Three comments were related to the timing of the final inspection (A25, A26, and A27) in relationship to the final decision on the license renewal. One comment was related to the timing of the actual vote by the Commissioners to renew the license (A30).

Response

The license renewal inspection program consists of three separate inspections to support the decision on an application for license renewal. At a minimum, a scoping inspection and aging management inspection are conducted. An optional third inspection will be performed, if needed, to verify items identified by the staff, Advisory Committee on Reactor Safeguards, and regional administrator that are needed to close open items from the technical review of the application or previous inspections. This final inspection would be performed prior to the staff's recommendation regarding the approval or disapproval of the application. The inspection reports will be available to the public through the NRC's Public Document Room in Washington, D.C. before the Commission makes its decision. The Commission's decision on the renewal application is scheduled to be made by August 2000. The transcript of any Commission meetings on the application will also be available.

These comments did not result in modification of the SEIS text.

Comment

Four comments (A10, A11, A32, and A53) related to the standing or participation of the Chattooga River Watershed Coalition.

Response

The Chattooga River Watershed Coalition was the only organization that petitioned to intervene in a proceeding related to the Oconee license renewal application. The Atomic Safety and Licensing Board found that the Coalition had standing to intervene in the proceeding (that is, the action of renewing the operating license for the Oconee plants). However, the issues presented by the Chattooga River Watershed Coalition were not considered by the Atomic Safety and Licensing Board to be admissible as contentions. Upon appeal, the Commission came to the same conclusion. Nonetheless, the Commission has acknowledged the concerns that were expressed by the Chattooga River Watershed Coalition, and the staff is considering them during its review.

These comments did not result in modification of the SEIS text.

Comment

One comment (A52) related to the staff's consideration of public comments.

Response

The staff has listened to and is addressing the concerns that the public brought forth as comments on the draft SEIS for license renewal just as it did for comments provided during the scoping phase. The comments that were presented during the public meetings or by e-mail or letter are addressed in this Appendix. Comments received after the comment period ended were accommodated in this Appendix as time constraints allowed. Members of the public who do not believe that their concerns have been adequately addressed are always free to communicate their concerns to the NRC.

This comment did not result in modification of the SEIS text.

Comment

One comment (D2) noted the Notice of Availability for related documents available to the public, but asked whether public meetings would be held within the affected communities.

Response

Two public scoping meetings were held in Clemson, South Carolina, on October 19, 1998. Two additional meetings presenting the draft SEIS were held in Clemson, South Carolina, on July 8, 1999. The complete transcripts for these meetings can be found in meeting summaries issued on November 5, 1998, and August 27, 1999. A partial transcript of the July 8, 1999, meetings and the response to questions and comments made at those meetings are given in this Appendix.

Clemson, South Carolina was selected as the location for these meetings because of its geographical proximity to the effected communities.

All of these meetings were announced in the Federal Register, in an NRC press release, on the NRC web page, and in posters placed on community bulletin boards in commercial establishments in the vicinity of ONS.

This comment did not result in modification of the SEIS text.

Comment

One comment (A57) commended the NRC for the open and thorough public process that was used to develop the generic environmental impact statement, which helps ensure that the process that was used during license renewal did not overlook or leave unexplored important issues and also makes the process more efficient and effective.

Response

This comment did not result in modification of the SEIS text.

Comment

Two comments (A9 and A33) stated that some concerns (related to plant operation for the reactor coolant system and not specifically defined) are still unresolved at this point and that it is unfair to the public and almost certainly illegal to proceed to a decision regarding license renewal in the absence of having answers to many open-ended questions.

Response

This SEIS addresses the environmental impact of the renewal of the licenses for the ONS units. There are no open issues in the environmental area. Concerns related to the safety aspects of the license renewal process are outside the scope of the staff's review of the environmental effects; therefore, they have been referred to the NRC license renewal safety project manager for disposition. The staff's review of the safety aspects of the renewal application is ongoing, and the staff's conclusions will be documented in the staff's safety evaluation. The comments regarding current operation are also outside the scope of license renewal. However, these concerns have been referred to the NRC Project Manager for the ONS.

These comments did not result in modification of the SEIS text.

A.1.5 Refurbishment

The transcript contains one comment related to refurbishment (A51).

Comment

The comment asked for an explanation of the difference between component replacement and refurbishment and further asked if the public would get information about component replacement.

Response

For the purpose of the environmental impact review, refurbishment describes an activity or change in a facility that is needed to support operations during the renewal term, but that was not previously considered in an environmental document. Duke's evaluation of structures and components as required by 10 CFR 54.21 did not identify any major plant refurbishment activities or modifications necessary to support the continued operation of ONS beyond the end of the existing term of the operating licenses.

Refurbishment in the context of license renewal does not refer to routine activities at the component level, such as repairs, replacement, or reconditioning of individual components, pipe segments, and concrete walls. These activities will continue during the initial license period and are anticipated to occur during the 20-year license renewal period.

Information on component replacement must be made publicly available only in certain circumstances under NRC rules and regulations. To the extent licensees are required to discuss component replacement when requesting NRC approval of plant changes pursuant to 10 CFR 50.90 or 50.92, such information will be available to the public. However, there is no requirement for a licensee to routinely provide information to the public about component replacement.

This comment did not result in the modification of the SEIS text.

A.1.6 Ecology

The record contains one comment related to ecology (A31).

Comment

One comment (A31) was a statement that in the event of a major radiological accident at the ONS, the Chattooga Watershed, which lies within the 50-mile evacuation zone, would be greatly impacted.

Response

The staff recognizes that a major radiological accident at a nuclear power plant would have the potential to greatly impact the population living near and the environment surrounding the nuclear facility. For this reason, the NRC requires a number of safety systems that will either prevent or mitigate the consequences of a major accident. In addition, a 16-km (10-mile) and an 80-km (50-mile) radius surrounding each nuclear facility are designated as emergency planning zones in the event of an accident. Emergency planning zones are defined as the areas for which planning is

needed to ensure that prompt and effective actions can be taken to protect the public in the event of an accident.

The consequences of design basis accidents have been evaluated in the staff's safety evaluation supporting initial licensing of ONS.

This comment did not result in modification of the SEIS text.

A.1.7 Transmission Lines

The record contains three comments related to the level of review of the impacts of the transmission lines (J, Kb, and K24).

Comment

Three comments (J, Kb, and K24) indicated that the transmission lines that should be considered within the scope of the proposed action are those that run from the Oconee Turbine Building to the 230 kV and 525 kV switchyards. One comment (J) further suggested that the section on transmission line impacts should be deleted because the proposed action has no impact on electric shock since the lines will remain energized whether or not the Oconee licenses are renewed.

Response

The staff is required under the regulations in 10 CFR 51.53(c)(3)(ii)(H) to review the environmental impacts from transmission lines for the Category 2 issue concerning electric shock. The transmission lines to be evaluated are those that were constructed for the specific purpose of connecting the plant to the transmission system. The NRC staff identified these lines by reviewing Duke Power Company's original environmental report, *Environmental Quality Features of Keowee-Toxaway Project*, submitted to the Atomic Energy Commission (AEC), NRC's predecessor, on July 10, 1970, and supplemented in October 1971.

The staff has documented their position related to the scope of the transmission line impact assessment in a May 10, 1999, letter to Duke Energy (Subject: Determination of the scope of transmission line impact assessment for Oconee License Renewal). The comments provide no information that was not previously considered by the NRC staff that led to the determination in the May 10, 1999, letter. Therefore, the staff's position remains unchanged.

Because the basis for determining the scope of transmission lines is defined as those lines originally constructed for the specific purpose of connecting the plant to the transmission system, the statement that the transmission lines will remain energized irrespective of Oconee operation is not germane.

These comments did not result in modification of the SEIS text.

A.1.8 Water Quality and Use

The record contains ten comments related to water quality and use (A13, A24, A49, A50, F, K3, K6, K30, K40, and K79). The staff's responses to these comments follow.

Comment

Nine of the comments (A13, A49, A50, F, K3, K6, K30, K40, and K79) relate to the current status of the NPDES permit.

Response

The draft SEIS discussed the NPDES permit as "currently being renewed" by the South Carolina Department of Health and Environmental Control (SCDHEC). At the time that the draft SEIS was written and at the time of the public meetings in July, 1999, a toxicity compliance issue was outstanding and required completion before final approval and issuance of the NPDES permit. The compliance issue was resolved, and the SCDHEC issued the NPDES permit to Duke Energy on September 29, 1999. The current permit expires on September 30, 2003. A copy of the front page of the permit is contained in Appendix E of this report.

These comments did not result in modification of the SEIS text. However, the text of the SEIS has been changed to be consistent with the issuance of the current NPDES permit.

Comment

One comment (A24) requested the licensee make a strong commitment to making available a site on Lake Jocassee for a source of drinking water.

Response

The NRC's obligation under NEPA is specific to the action that is being taken and requires mitigative actions be taken only when such actions are required. In this case, there is no technical reason resulting from operation of ONS that would preclude municipalities from using water in Lake Keowee, such that they need to consider the use of an alternate location (such as Lake Jocassee) for drinking water intakes.

This comment did not result in a modification of the SEIS text.

A.1.9 Human Health

There are two comments in the record related to human health (A48 and D4). The staff's responses to these comments follow.

Comment

One comment (A48) requested information on nationwide systematic studies of the potential health effects within a specific radius around U.S. nuclear power plants. The comment specifically asked if the Centers for Disease Control (CDC) had ever done a study.

Response

The staff is not aware of any studies conducted by the CDC concerning potential health effects within a specific radius around U.S. nuclear power plants. However, the National Cancer Institute published a study, "Cancer in Populations Living Near Nuclear Facilities," in 1990, that examined cancer mortality between 1950 and 1984 at 62 nuclear facilities (Jablon 1990). The study did not find higher risks of leukemia or other cancers.

This comment did not result in a modification of the SEIS text.

Comment

The second comment (D4) specifically addressed the radiological impacts of the uranium fuel cycle on human populations and the definition of "tiny" doses referred to in Section 6.1, Page 6-3, as well as the type of impact that these doses may have on human populations. The comment suggested that the NRC provide clarification of the collective impact that these doses may have on human populations and requested a definition for "tiny."

Response

The comment discussed a section of the draft SEIS that quotes the findings in the Generic Environmental Impact Statement (GEIS) for License Renewal (NRC 1996). The statement was made that science cannot rule out the possibility that there will be no cancer fatalities from tiny doses. The same paragraph previously stated that tiny doses have some statistical adverse health effects. The quote from the GEIS indicates that "tiny" doses are "very small fractions of the regulatory limits and even smaller fractions of natural background exposure to the same populations." For the purposes of assessing radiological impacts, the Commission in the GEIS for license renewal (NRC 1996) has concluded that impacts are of small significance if doses and releases do not exceed permissible levels in the Commission's regulations. This determination of "small" applies to occupational doses as well as to doses to individual members of the public.

This comment did not result in a modification of the SEIS text.

A.1.10 Socioeconomics

The record contains one question related to the socioeconomic analysis that was conducted for the draft SEIS (A14). The comment is addressed below.

Comment

The comment asked what types of questions were asked and what kind of information was conveyed in the meetings with county, State, and Federal agencies during the staff's site visit in October 1999.

Response

The team met with the economic development departments of Seneca, Anderson, and Pickens Counties in South Carolina and asked questions regarding the transportation systems, public infrastructure concerns or problems, and the location and make-up of minority or low-income populations for Oconee County. They also discussed the tax base provided by ONS and the importance of that tax base to the Counties' finances. Finally, they discussed the likelihood of the Counties attracting new economic activity to the area.

The meetings with State and Federal agencies were specific to the issues that were under the purview of those agencies. For instance, discussions with the South Carolina State Historic Preservation Office related directly to historical and archaeological resources in and around the ONS. The discussions with the U.S. Fish and Wildlife Service addressed environmental issues and, specifically, endangered and threatened species.

This comment did not result in modification of the SEIS text.

A.1.11 Archaeology and Human Resources

The record contains one comment (B) related to archaeology and historic resources. The comment is addressed below.

Comment

The South Carolina State Historic Preservation Office states that relicenses with no new construction or land disturbance should have no effect on any properties included in or eligible for inclusion in the National Register of Historic Places. However, there might be unidentified archaeological sites within the plant area, and any future construction or land management activities could affect archaeological sites. The licensee may want to address the issue of future identification and management of cultural resources in the plant area as part of its continued operation.

Response

Duke, in their comment letter dated August 17, 1999 (Duke 1999), recommended that the following statement be added into the SEIS in Section 4.4.5:

To ensure that care is taken to protect cultural resources that may be encountered during construction or other land disturbing activities, the ONS site environmental work practices have been revised. If archaeological sites are identified during land disturbing activities, land

disturbing activities will stop and the State Historic [P]reservation Office will be contacted to determine the appropriate steps to be taken prior to resuming the activities.

This statement has been added to the SEIS in Section 4.4.5.

A.1.12 Severe Accident Mitigation Alternatives

The record contains one comment related to severe accident mitigation alternatives (SAMAs) (A16). The comment is addressed below.

Comment

The comment asked whether any relative comparisons in the SAMA section were made, such as comparing the risk from ONS to driving a mile on a highway?

Response

No relative comparisons, such as relating the risk from ONS to driving on highways, were included in the draft SEIS. However, the Commission has established a policy statement ("Safety Goals for the Operation of Nuclear Power Plants; Policy Statement," 51 FR 30028) related to safety goals for the operation of nuclear power plants that provides qualitative and quantitative safety goals. As part of the policy statement, there were two quantitative objectives established to be used in determining achievement of the Commission's safety goals: (1) the risk of prompt fatality to an average individual in the vicinity of a nuclear power plant that might result from reactor accidents should not exceed 1/10 of 1% of the sum of prompt fatality risks resulting from other accidents to which members of the population are generally exposed, and (2) the risk to the population in the area near the nuclear power plant of cancer fatalities that might result should not exceed 1/10 of 1% of the sum of cancer fatality risks from all other causes. Based on the Oconee Probabilistic Risk Assessment and the Oconee Individual Plant Examination, the plant, by nature of its low estimated core damage frequency and robust containment design, meets these objectives. Thus, the risk associated with operation of the Oconee plant would represent less than 1/10th of 1percent of the risk to the public from all other causes.

This comment did not result in modification of the SEIS text.

A.1.13 Operational Safety Issues

The record contains three comments related to operational safety issues (A35, A44, and G2). The issues relate to (1) the temperature limits in the spent fuel pool and whether they minimize the probability of cracking of the spent fuel pool and subsequent leakage of the pool water into the groundwater and (2) the problems and inadequacies in the operation of the reactor cooling systems. These comments involve concerns that are relevant to current ONS operation. In accordance with 10 CFR 54.30, these issues are outside the scope of license renewal. They have been referred to the NRC operating plant project manager for disposition. These comments did not result in modification of the SEIS text.

A.1.14 Age-Related Safety Issues

The record contains eight comments associated with age-related safety issues (A7, A8, A17, A39, A40, A41, A42, and A43). A ninth comment was made that the SEIS does not appear to be the place for safety-related comments, but inquired as to where safety issues were addressed (A45). Five of the comments (A7, A39, A40, A41, and A43) specifically address embrittlement, fatigue, or toughness of key systems. One comment was related to embrittlement of the reactor vessel and internals (A17). Two comments (A8 and A42) dealt with the reactor building cooling units and their ability to remove heat due to degradation of the system from aging. These age-related safety issue comments are outside of the scope of the staff's review of the environmental effects of renewing the ONS licenses. However, they involve concerns that are relevant to the extended operation of the facility and have been referred to the NRC license renewal safety project manager for disposition. These comments did not result in modifications of the SEIS text.

A.1.15 Spent Nuclear Fuel

The record includes seven comments related to spent nuclear fuel storage or transportation (A4, A5, A6, A34, A36, A37, and A38). Five of the comments (A4, A6, A34, A37, and A38) address high-level waste (HLW) storage and disposal and the associated environmental impacts. The remaining two comments (A5 and A36) relate to the lack of a site-specific review of environmental impacts of transportation of HLW. The comments are addressed below.

Comment

The record contains five comments (A4, A6, A34, A37, and A38) that address offsite HLW storage and disposal and the environmental impacts and cost of offsite HLW disposal.

Response

Onsite storage of spent nuclear fuel is a Category 1 issue. The comments provide no new and significant information.

The environmental effects of long-term storage of spent fuel onsite have been evaluated by the NRC. As set forth in the Waste Confidence Rule (see 10 CFR 51.23), the NRC generically determined that such storage can be accomplished without significant environmental impact. In the Waste Confidence Rule, the Commission determined that spent fuel can be stored onsite for at least 30 years beyond the licensed operating life, which may include the term of a renewed license.

Siting of a HLW repository is a separate regulatory action involving the U.S. Department of Energy (DOE). Characterization of the site under review is projected to be complete by 2002, and a geologic repository is not expected to be ready before 2010 (NRC 1996). In the interim, onsite spent fuel storage in pools and in dry cask storage facilities continues in accordance with NRC regulations. NRC has a certification process for such casks, as set forth in 10 CFR Part 72. Consequently, these comments did not result in modification of the SEIS text.

Comment

There were two comments or questions (A5 and A36) related to the review of the environmental impacts of transportation of HLW and the fact that there was no site-specific review of the environmental impacts of transportation of HLW.

Response

The NRC addressed the questions concerning the status and background behind the change in classification of HLW transportation from a Category 2 issue to a Category 1 issue at the July 8, 1999, public meeting. The staff indicated that the proposed rule was an NRC initiative. The draft SEIS addressed this issue in Section 6.1.1, "Transportation of Radiological Waste," because the rule had not been finalized. Now that the rule has been amended, as discussed in detail below, the issue is a Category 1 issue and, therefore, need not be addressed on a plant-specific basis. Section 6.1 of this report now reflects this reclassification.

The Commission previously revised its environmental protection regulations (10 CFR Part 51) for license renewal on December 18, 1996 (61 FR 66537). The amendment was based on the analyses and conclusions reported in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (NRC 1996). In response to the comments received on a proposed version of the rule published on June 5, 1996 (61 FR 28467), the Commission made the following statement:

> As part of its effort to develop regulatory guidance for this rule, the Commission will consider whether further changes to the rule are desirable to generically address: (1) the issue of cumulative transportation impacts and (2) the implications that the use of higher burnup fuel have for the conclusions in Table S-4. After consideration of these issues, the Commission will determine whether the issue of transportation impacts should be changed to Category 1.

In SECY-97-279, entitled "Generic and Cumulative Environmental Impacts of Transportation of High-Level Waste (HLW) in the Vicinity of a HLW Repository," dated December 3, 1997, the NRC staff informed the Commission that it was the staff's preliminary view that the supplemental analyses of the generic and cumulative impacts of the transportation of HLW and of the implications of higher fuel burnup for transportation impacts supports a reasonable technical and legal determination that transportation of HLW is a Category 1 issue and may be generically resolved and adopted in a license renewal application. In a Staff Requirements Memorandum (SRM) dated January 13, 1998, the Commission directed the NRC staff to proceed with rulemaking to amend 10 CFR 51.53(c)(3)(ii)(M) to categorize the impacts of transportation of HLW as a Category 1 issue. In a memorandum dated July 1, 1998, the NRC staff informed the Commission of its plans for amending 10 CFR Part 51.

The Commission published the proposed rule for a 60-day public comment period on February 26, 1999 (64 FR 9884). The Commission also published a Notice of Availability of NUREG-1437, Vol. 1, Addendum 1, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants: Main Report Section 6.3 - 'Transportation,' Table 9.1 'Summary of findings on NEPA issues for license renewal of nuclear power plants,' Draft for Comment," (February 1999)

(64 FR 9889) (Addendum 1 to the GEIS). Although the public comment period for the proposed rule and the draft addendum to the GEIS ended on April 27, 1999, the staff considered comments dated as late as June 25, 1999, (and received in early July 1999) in developing the final rule and final version of Addendum 1 to the GEIS. The staff made this accommodation in response to concerns expressed by stakeholders about the length of the comment period.

In the SRM to SECY-99-202, "Final Rule – Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (10 CFR Part 51)," dated August 3, 1999, the Commission approved issuance of the final rule and release of the supporting Addendum 1 to the GEIS. The Commission revised the environmental protection regulations on September 3, 1999 (64 FR 48496), and the rule became effective on October 4, 1999. The Notice of Filing of the Final Addendum 1 to the GEIS was published on September 17, 1999 (64 FR 50507). Accordingly, the Commission has resolved these issues on a generic basis, and no site-specific analysis is necessary in the absence of new and significant information.

These comments did not result in modification of the SEIS text. However, the text of the SEIS has been changed to be consistent with the final rule.

A.1.16 Alternatives

The record contains four comments directly related to alternatives (A46, A47, A55, and D3). Two of the comments (A46 and A55) related to the consideration of combinations of alternative energy sources. One comment (A47) was a question about whether energy reduction (conservation) measures had been considered. The fourth comment (D3) indicated appreciation that all reasonable energy resource alternatives had been evaluated.

These comments are addressed below:

Comment

One comment (A46) questioned whether a combination of alternative energy sources had been considered as an alternative to ONS license renewal. A second comment (A55) responded to the first comment.

Response

A combination of alternatives had not been discussed in the draft SEIS. Even though individual alternatives to ONS might not be sufficient on their own to replace ONS due to the small size of the resource (a hydroelectric power plant) or lack of cost-effective opportunities (e.g., for conservation), it is conceivable that a mix of alternatives might be cost-effective. For example, if some *additional* cost-effective conservation opportunities could be found and combined with a smaller imported power or natural gas-fired power plant alternative, it might be possible to reduce some of the key environmental impacts of alternatives. However, it is unlikely that the environmental impact of such a hypothetical mix could be reduced so that they are SMALL (that is the environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resources). The impacts of renewing the ONS licenses are SMALL in all aspects.

Therefore, the combination of alternatives would likely not reduce environmental impacts below those of the proposed action.

As a result of these comments, a new section (Section 8.2.4.13) was added to appropriately discuss the impacts of a combination of alternatives.

Comment

The question was asked (A47) whether energy-reduction measures and conservation measures were included in the SEIS analysis.

Response

Section 8.2.4.12 of both the draft and the final ONS SEIS discuss utility-sponsored conservation.

This comment did not result in modification of the SEIS text.

Comment

One comment (D3) expressed appreciation for the consideration of all reasonable energy resource alternatives in addition to relicensing and the no-action alternative

Response

This comment did not result in modification of the SEIS text.

A.1.17 Miscellaneous

The record contains eight comments that do not fall within any of other categories (A2, A3, A12, A28, A29, C, E, and G3). One of the comments asked about the makeup of the Commission (A2). One was related to the location of the public document rooms (A3). One requested the educational background and employment history of the NRC project manager (A12). Three were questions about MOX fuel (A28, A29, and G3). One was a request to submit comments after the date given in the Federal Register Notice (C) and one (E) was a statement that they had no comments on the draft SEIS.

These comments are addressed below:

Comment

One comment (A2) asked about the makeup of the Commission and specifically who the members were, if they were appointed by the President, if they are approved by the House or the Senate, and how long the terms of the appointments are.

Response

Commissioners are nominated by the President and confirmed by the Senate for an appointment of up to 5 years. The current Commission makeup consists of Chairman Meserve and Commissioners Dicus, Diaz, McGaffigan, and Merrifield. Additional information can be found at the NRC website: http://www.nrc.gov/NRC/contents.

This comment did not result in modification of the SEIS text.

Comment

Comment (A3) requested the location of the public document room in the vicinity of the ONS site.

Response

When this issue was raised at the public meeting, the staff responded that the NRC local public document room (LPDR) for the Oconee plant was the Public Library at 501 West South Broad Street, Walhalla, South Carolina. On November 1, 1999, the NRC implemented a nationwide electronic records architecture and discontinued support for LPDRs. Nevertheless, the staff understands that the Oconee-related material already in the library in Walhalla will be maintained. However, there have been no acquisitions related to Oconee after November 1, 1999. This SEIS will be forwarded to the public library to ensure that the complete environmental record is available at the former LPDR.

This comment did not result in modification of the SEIS text.

Comment

A question was asked (A12) at the public meeting regarding the educational background and employment history of the NRC Project Manager for the environmental review.

Response

The Project Manager responded at the public meeting and provided a description of his 20 years involvement in environmental matters at the NRC.

This comment did not result in modification of the SEIS text.

Comment

Three comments (A28, A29, and G3) related to questions regarding mixed-oxide (MOX) fuel and expressed concerns regarding the environmental impact of reprocessing the MOX fuel or asked whether MOX fuel was a factor in the relicensing process or whether the public could give input on the process for making decisions on the MOX fuel.

Response

MOX fuel is not currently being used at ONS. Any licensee seeking to use MOX fuel, whether during the current license term or during the license renewal term, will need to seek NRC approval for such use by submitting a license amendment pursuant to 10 CFR 50.90 to 50.92. An opportunity for a hearing would be associated with any such amendment.

These comments are outside of the scope of the staff's review of the environmental effects of renewing the ONS licenses. Therefore, these comments did not result in modification of the SEIS text.

Comment

One comment (C) was a request to submit comments after the date given in the Federal Register Notice. The NRC staff informed the commenter that the NRC would consider additional comments, if it was practical to do so. No further comments were received from the commenter. A second letter (E) indicated that the author had no comments. These comments did not result in modification of the SEIS text.

A.1.18 Technical Clarifications and Corrections

The list of specific comments included with Comment Letter K includes 54 comments that are technical enhancements or correction of information such as plant dimensions, document dates, and plant-specific terminology. Of the specific comments provided, those in the following list fit this category (K1, K2, K4, K5, K13, K14, K15, K16, K17, K18, K19, K20, K21, K22, K23, K25, K26, K27, K28, K31, K32, K33, K34, K35, K39, K41, K42, K43, K44, K45, K47, K50, K53, K56, K57, K58, K59, K60, K61, K62, K63, K64, K65, K66, K67, K68, K69, K70, K71, K72, K76, K77, K78, and K80).

A separate log of Duke's specific comments and the NRC responses is attached as Table A.2.

A.1.19 Format and Presentation (Spelling, Grammar, References, Clarity, etc.)

There were 18 comments that suggested changes for clarification or accuracy and correction of typographical errors (A15, A20, D1, K7, K8, K10, K11, K12, K29, K38, K51, K52, K54, K55, K73, K74, K75, and K82). Two comments related to the format of the document (A15 and A20), specifically to the location of the conclusions. One comment (D1) related to the title of the document. The specific comments from Duke and the NRC responses are included in Table A.2. The remaining three comments are addressed as follows:

Comment

Two comments (A15 and A20) either requested clarification of the location of the conclusion in the EIS or recommended that the conclusions be placed closer to the front of the report and made clearer.

Response

While the conclusions are given in Chapter 9 of the report, they are repeated both in the Executive Summary and in the Abstract that are presented at the front of the report.

This comment did not result in modification of the SEIS text.

Comment

One comment (D1) stated that the word "Generic" in this document is misleading since the document is site-specific to the Oconee Nuclear Station relicensing application.

Response

Under the National Environmental Policy Act (NEPA), an environmental impact statement (EIS) is required for major Federal actions significantly affecting the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. 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 operating license. Furthermore, 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437. Moreover, the NRC staff is obliged to integrate its conclusions as amplified in the GEIS for all issues. Every supplement relies upon the conclusions in the GEIS and efficiencies are realized using this consistent regulatory framework. Therefore, the title of this document retains the original title of the GEIS, but includes the statement that it is the supplement that pertains to Oconee Nuclear Station (in this case, Supplement 2).

This comment did not result in modification of the SEIS text.

Table A-2. Duke's Comments and Staff Response

No.	Page	Line Nos.	Comment[a]	Disposition
1.	xvii	14	CCW should be "Condenser Circulating Water"	Corrected as suggested
2.	1-8	Table 1-1	The following permit should be added (Reference ER Table 7.2-1): Agency: SCDHEC Authority: RCRA, Section 3005 Requirement: Permit Permit Number: SCD043979822 Permit Issued: 3/9/1998 Activity Covered: Part A Hazardous Waste Permit, Interim Storage Facility for Mixed Wastes	Permit information added
3.	1-8	11	Current NPDES permit is being in the process of being renewed. Line 11 should be revised to state: "The permit is currently being renewed."[a]	This item is discussed in Section A.1.8
4.	1-8	8	"ONS has two permits for drinking water wells in protected area" is not a correct statement. ONS has one drinking water well for the restroom facilities at the Site Softball Field. The permit number for this well is 202098Al. (Note that the Duke ER had supplied the information on the wells. During the review of this draft SEIS, Duke found that the site has only one well permitted as a drinking water well).	Clarified as suggested.
5.	1-8	11	Permit Number for SCDHEC FWPCA is incorrect. The correct permit number is SC0000515.	Clarified as suggested
6.	1-8	40	Revise footnote (a) to state: "A NPDES permit renewal application was submitted by Duke on March 27, 1998. The draft permit will be issued in mid-August for a 30-day public comment period. See Section 2.2.3."	This item is discussed in Section A.1.8
7.	2-1	9	Should be "Babcock & Wilcox."	Corrected
8.	2-5	1	Revise sentence to state: "ONS is located on the shores of Lake Keowee. The main bodies of the lake lie to the north and to the southwest of the site."	Clarified as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
9.	2-5	32	Several of the amenities at the Visitor's Center (lakeside picnic center and landscaped grounds) are mentioned, but the nice nature trail is not mentioned. This trail is used extensively by civic organizations and schools and is a great place for wildflower tours.	Clarified as suggested
10.	2-6	Figure 2-4	Figure 2-4 appears to list the ONS 525 kV switchyard as the "825 kv Switchyard." Also the standard abbreviation for kilovolt is kV, not kv, as is used in this figure.	Corrected
11.	2-7	12	Line 12 should be revised to state: "But because of their distance from the site, these zones ..."	Clarified as suggested
12.	2-7	29	Should be "Babcock & Wilcox."	Corrected
13.	2-7	34	ONS can use fuel up to 5% enrichment. Line should be revised to state: "ONS fuel is low enriched (up to 5 percent by weight)..."	Clarified as suggested
14.	2-8	23-25	Oconee License Renewal SER Section 2.2.3.6.3.2.1 (Page 2-102) Intake Structure within Scope of License Renewal and Subject to an Aging Management Review states that: "...the licensing basis does not rely on the underwater weir nor recirculation of the intake canal water for decay heat removal after a loss of Lake Keowee event. Based on the above documentation, the staff agrees with the applicant's determination that the underwater weir is not within the scope of license renewal." Therefore, the description of the function of this weir on Lines 23-25 is not applicable. It is appropriate to describe the weir and its location, but the description of the function should be deleted. Delete the sentence beginning: "The purpose of this dam is to retain..."	Clarified as suggested
15.	2-8	27	The sentence refers to Figure 2-4, showing the location of such intake features like the skimmer wall, intake structure, submerged dam, and the outfall. The location of the submerged dam is not shown on the figure.	Clarified as suggested
16.	2-9	19	Evaporation is not a waste processing method; therefore, evaporator concentrates are not produced.	Clarified as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
17.	2-10	18 – 20	The Radwaste Facility processes high-activity wastes, low-activity wastes, and miscellaneous wastes from the Auxiliary Building, not the opposite as currently stated in lines 18 through 20.	Clarified as suggested
18.	2-10	26	Dilution is not considered part of processing. The waste is released prior to any dilution. However, hydro dilution flow is used in determining the release rate. Delete statement: "(diluted to meet the permissible concentration limits for discharge)...."	Clarified as suggested
19.	2-10	35	The value "28,343 m^3 (944,773 ft^3) per year" is the potential waste generation rate. The liquid waste holdup capacity is approximately 80,000 gallons.	Corrected
20.	2-11	10	Gases are also produced in tanks and piping other than those holding liquid wastes (e.g., Letdown Storage Tank, Core Flood Tank). Line should be revised to state: "...by the evolution of gases in liquids contained in tanks and piping."	Clarified as suggested
21.	2-11	30	The word "limit" should be inserted after "rate."	Clarified as suggested
22.	2-12	14-15	Change to "reactor coolant system make-up water, steam generator make-up water..."	Clarified as suggested
23.	2-12	15 – 18	These lines should be changed to state: "... and deborating demineralizers. Non-sanitary, nonradioactive wastes are neutralized and sent to the holding ponds, eventually being discharged to the Keowee River, downstream from the Keowee Hydroelectric Station. Sanitary wastes are routed to an aerated sewage lagoon. The effluents are treated by chlorination. Prior to discharge, the treated effluents from the sanitary waste treatment system are dechlorinated."	Clarified as suggested
24.	2-13	7-28	As stated in the Duke response to RAI 11, the lines that were constructed for the specific purpose of connecting the plant to the transmission system are those lines that run from the Oconee Turbine Building to the 230 kV and 525 kV switchyards.	Discussed in Section A.1.7

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
25.	2-15	32-33	Revise line to state: "...provide once-through condenser circulating water (CCW)."	Clarified as suggested
26.	2-15	35	The amount of water supplied from the Seneca water treatment plant and used for potable water is 120 m^3/d [0.03 million gpd]. Revise line to state: "...treatment plant (120 m^3/d [0.3 million gpd]) is used for potable water."	Corrected
27.	2-16	Figure 2-7	The average flow through Keowee Hydroelectric Station is listed as 1632 cfs. The correct value is 1032 cfs.	Corrected
28.	2-16	8-12	Revise to state: "There are a total of seven groundwater wells at the Oconee site. One of these wells is used to supply the site baseball field with drinking water and with water for a restroom facility. This well is also used for seasonal irrigation at the site baseball field and has a pumping capacity of 0.0019m^3/s (30 gpm). The well at the baseball field is the only groundwater well on site permitted to supply drinking water. There are two groundwater wells used to supply seasonal irrigation for landscaping at a training building and an office complex. The other four wells are used infrequently as low volume, non-potable water sources. The estimated combined pumping rate for all groundwater wells at the Oconee site is less than 0.068 m^3/s (100 gpm)."	Revised as suggested
29.	2-17	24	Insert "state" in front of agency.	Clarified as suggested
30.	2-17	26	The 1998 toxicity issue has been resolved. The sentence referring to this issue should be deleted. Line 26 should be revised to state: "The permit is currently being renewed. A NPDES permit renewal application was submitted by Duke on March 27, 1998. The draft permit will be issued in mid-August for a 30-day public comment period."	Discussed in Appendix A.1.8

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
31.	2-18	18	Add footnote stating: "In May 1999 the Federal Court of Appeals (D.C. Circuit) remanded EPA's revisions to the ground-level ozone and particulate matter standards. The court held that there was no basis for either revision, and that the revised ozone standard was unconstitutional. Therefore, future implementation of revisions to these standards is uncertain."	Paragraph deleted. Footnote not necessary
32.	2-18	23-24	Add Ellicott Rock Wilderness Area and Middle Prong Wilderness Areas.	No change. Areas not listed in 40 CFR Part 81, Subpart D
33.	2-19	16	Delete the word "aquatic."	Clarified as suggested
34.	2-23	10	Insert "Hartwell Reservoir" following "Lake Keowee" in the list of aquatic environments.	Clarified as suggested
35.	2-41	7 - 10	The reference to the location of these sites should be deleted to protect these areas from unauthorized excavation. It should be sufficient to mention that two sites exist, southwest of the plant and that these sites are categorized as having nondescript lithic scatter.	Deleted as suggested
36.	3-3	14	This line lists "Public services: public utilities." This appears to be a single issue. 10 CFR Part 51, Subpart A, Table B-1 lists these as two separate issues. This should be corrected by listing these two issues separately.	No change made
37.	3-3	20	This table lists Environmental Justice as a Category 2 issue related to refurbishment. GEIS Table 9.1 does not list Environmental Justice as a Category 2 issue. The footnote used in GEIS Table 9.1 should be referenced to this issue in Table 3.2.	No change made
38.	4-2	12	The appropriate GEIS reference sections for the issue "Altered thermal stratification of lakes" are sections 4.2.1.2.3 and 4.4.2.2. Line 12 incorrectly lists GEIS Section 4.2.1.2.2 as a reference section. This should be corrected.	Revised as suggested
39.	4-8	2	It is stated that the NPDES permit governs the release of effluents by Oconee Nuclear Station into the receiving waters of "Lake Keowee." The permit also governs discharges that go into Keowee Hydro's tailrace. Therefore it is recommended that the wording be changed to also include "and to the Keowee Hydro Station's tailrace."	Clarified as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
40.	4-8	4	The 1998 toxicity issue has been resolved. The sentence referring to this issue should be deleted. Line 4 should be revised to state: "The permit is currently being renewed. The draft permit will be issued in mid-August for a 30 day public comment period."	Discussed in A.1.8
41.	4-9	7	It is stated that the NPDES permit governs the release of effluents by Oconee Nuclear Station into the receiving waters of "Lake Keowee." The permit also governs discharges that go into Keowee Hydro's tailrace. Therefore it is recommended that the wording be changed to also include "and to the Keowee Hydro Station's tailrace."	Clarified as suggested
42.	4-10	18	Draft states "Although the 316(b) demonstration was not formally approved...." Duke is not aware of any correspondence indicating that the 316(b) demonstration was not formally approved. This portion of the sentence should be deleted or the sentence should be revised to state "No correspondence could be located indicating EPA's formal approval of the study. However, the EPA issued a modified NPDES permit on August 30, 1976, that deleted..."	Clarified as suggested
43.	4-11	37	It is stated that Duke submitted a reapplication in "April" 1998. This should be replaced to state "March, 1998."	Revised as suggested
44.	4-12	9	10 CFR 51.53(c)(3)(ii)(G) states 9×10^{10} m^3 /year, not 9×10^{12} m^3 /year as stated in the document. Revise Line 9 to state: "that is lower than the $9 \times 10^{10} m^3$ per year..."	Corrected
45.	4-12	8 – 12	The following revision is suggested: "The combined flow rate for the Keowee and Little Rivers is lower than the 9×10^{10} m^3/year (3.15×10^{12} ft^3/year) specified in the 10 CFR 51.53 (c)(3)(ii)(G). This low flowrate raises a concern from the standpoint of the potential for enhancement of thermophylic microorganisms such as *Naegleria fowleri*. These type of organisms could be a potential health concern for members of the public swimming in the cooling source (Duke 1998a)."	Clarified as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
46.	4-15	41	The conclusion for GEIS Section 4.5.4.2.3 states: "If NRC finds that a consensus has been reached by appropriate federal health agencies that there are adverse health effects, all license renewal applicants will have to address the health effects in the license renewal process." SEIS Section 4.2.2 states that on this issue "evidence is inconclusive." To ensure closure on this issue, Line 41 should be revised to add: "Therefore, no further review is required for this issue in this SEIS."	Revised based on a recent report by the National Institute of Environmental Health Sciences
47.	4-22	26	Lines 22 through 26 discuss the need to take additional care during normal operation and maintenance activities on site to protect cultural resources. To ensure this protection occurs, Duke has revised the ONS site work practices on land disturbing activities. Revise Line 26 to add: "To ensure that care is taken to protect cultural resources that may be encountered during construction or other land disturbing activities, the ONS site environmental work practices have been revised. If archeological sites are identified during land disturbing activities, land disturbing activities will stop and the State Historic preservation Office will be contacted to determine the appropriate steps to be taken prior to resuming the activities."	Clarified as suggested
48.	4-28	23-31	References to "preliminary" analysis and "preliminary" determination should be changed to final once the USFWS concurs with the NRC staff biological assessment conclusions, if that occurs prior to the issuance of the Final SEIS.	Revised based on current status of consultation with FWS
49.	4-28	28	Line should be revised to state: "conducting surveys of sensitive habitats prior to initiation of construction activities for new transmission lines."	Sentence in question was deleted based on current status of consultation with FWS

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
50.	4-29	22	The following statement should be added at the end of Line 22: "Therefore, no evaluation of this issue is required."	Clarified as suggested
51.	4-29	35	The citation reference "(Should come with RAI)", needs to be clarified.	Parenthetical statement deleted
52.	4-30	20	The correct reference is "Letter from M.S. Tuckman..."	Corrected
53.	5-13	24	"component cooling water" should be changed to "condenser circulating water"	Corrected as suggested
54.	6-6	18	Reference is made to the Baltimore Gas and Electric (BGE) ER. This Draft SEIS is written for Duke Energy Corporation's Oconee plant. The correct reference is "the Oconee ER."	Corrected
55.	6-6	29	Reference for identification of new and significant information is made to the BGE ER. This Draft SEIS is written for Duke Energy Corporation's Oconee plant. The correct reference is "the Oconee ER."	Corrected
56.	8-2	40-43	Water quality on Lake Keowee is affected by many factors other than the factors that Duke has an influence over by the operation of the Duke plants or by the operation of its subsidiaries. Duke is proud to provide corporate and technical assistance to various entities in the region concerned with water quality issues. However, SCDHEC is the state agency responsible for water quality on South Carolina lakes, rivers, and streams. Revise Line 40 to state: "... exceptionally high if Oconee closes. Therefore, the corporate and technical leadership and assistance that Duke voluntarily provides in the area of water quality monitoring may be less readily available." Delete the sentence beginning:" If water quality begins to decline,..."	Clarified as suggested
57.	8-4	22	Revise to state "sulfur dioxide emissions ..."	Clarified as suggested
58.	8-4	30	Line should be clarified by revising to state: "Approximately 90 percent of the 700,000 tons of ash would be flyash, and the remaining 10 percent would be bottom ash."	Clarified as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
59.	8-4	36	Revise to state: "Facilities would be constructed to control and treat leachate from ash and scrubber waste disposal areas and runoff from coal storage areas."	Clarified as suggested
60.	8-5	15	Revise to state: "Total waste volume would be 900,000 MT (1,000,000 tons)/yr. of ash and scrubber sludge."	Clarified as suggested
61.	8-7	31	Revise line to state: "However, leachate from ash and scrubber waste disposal areas and runoff from coal storage areas would have to be controlled to avoid groundwater and surface water contamination."	Clarified as suggested
62.	8-9	36	Revise to state "approximately 900,000 MT (1,000,000 tons)/yr. of this waste..."	Clarified as suggested
63.	8-12	33	The Duke ER supplied information on use of forced draft cooling towers. Duke would not likely use natural draft cooling towers due to the aesthetic difference between natural draft and forced draft cooling towers. Recommend removing the first sentence.	Clarified as suggested
64.	8-12	37-38	This line reads as if Catawba has a natural draft cooling tower. Catawba has forced draft cooling towers. Duke would not likely use natural draft cooling towers.	Corrected as suggested
65.	8-13	1	Remove first sentence. Duke does not consider natural cooling towers as an option.	Corrected as suggested
66.	8-13	29	Add "Addition of 30 M (100 ft) tall cooling towers or...."	Corrected as suggested
67.	8-15	13	Duke would not likely use natural draft cooling towers due to the aesthetic difference between natural draft and forced draft cooling towers. Remove reference to natural draft cooling towers.	Corrected as suggested
68.	8-17	23	Units for waste should be units of volume, not area. Duke estimates the volume for this waste would be "2500 ft^3/yr of spent catalyst...."	Corrected as suggested
69.	8-22	23-26	Duke would not likely use natural draft cooling towers due to the aesthetic difference between natural draft and forced draft cooling towers. Remove this sentence and reference. Catawba uses forced draft cooling towers.	Corrected as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
70.	8-23	23	Add statement: "Addition of 30-M (100-ft) high mechanical draft cooling towers."	Corrected as suggested
71.	8-29	1	The date of the reference is May 13, 1999. The letter is from M. S. Tuckman.	Corrected as suggested
72.	9-3	25	Add statement: "Therefore, no further analysis of the chronic effects of electromagnetic fields is required."	Clarified as suggested
73.	9-4	13	The fifth word on the line reads 'bonds.' This should be revised to "bounds."	Corrected
74.	9-6	16	Wording "preliminary" should be deleted upon release of final document.	Revised
75.	C-2	5	The date of the reference is May 13, 1999. The letter is from M. S. Tuckman.	Corrected
76.	D-2	11	Should be Asheville, not Charlotte.	Corrected as suggested
77.	D-2	13	Should be Charleston, not Columbia.	Corrected as suggested
78.	E-2	Table E-1	The following permit should be added (Reference ER Table 7.2-1): Agency: SCDHEC Authority: RCRA, Section 3005 Requirement: Permit Permit Number: SCD043979822 Activity Covered: Part A Hazardous Waste Permit, Interim Storage Facility for Mixed Wastes	Included as suggested
79.	E-2	16	Add footnote to Line 16. Line 16 should state: "being revised"[a] Footnote (a) should be added to end of Table E-1 to state: "A NPDES permit renewal application was submitted by Duke on March 27, 1998. The draft permit will be issued in mid-August for a 30 day public comment period. See Section 2.2.3."	This item is discussed in Section A.1.8

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

Table A-2. (contd)

No.	Page	Line Nos.	Comment[a]	Disposition
80.	E-2	30	"ONS has two permits for drinking water wells in protected area" is not a correct statement. ONS has one drinking water well for the restroom facilities at the Site Softball Field. The permit number for this well is 202098AI. (Note that the Duke ER had supplied the information on the wells. During the review of this draft SEIS, Duke found that the site has only one well permitted as a drinking water well).	Clarified as suggested
81.	F-1, F-2	N/A	The GEIS issues related to impacts from refurbishment activities are not listed in this section. There are nine Category 1 issues and nine Category 2 issues that are related to refurbishment activities (Reference Table 3-1 and 3-2). These should be repeated in this table. An alternative to listing these issues in Appendix F would be to change the title to "Appendix F GEIS Environmental Issues Not Applicable to the Oconee Nuclear Station Because of Plant or Site Characteristics."	No change
82.	F-1	28	The appropriate GEIS reference sections for the issue listed on lines 28 – 30 is 4.8.1.3. Lines 28 – 29 incorrectly list GEIS Sections 4.3.2.1 and 4.4.2.1 as the GEIS sections for this issue.	Corrected as suggested

(a) The comments in this column were extracted directly from Comment Letter K from Duke.

A.2 Public Meeting Transcript Excerpts and Comment Letters

LETTER A (Transcript)

Transcript of the Afternoon Public Meeting on July 10, 1999 in Clemson, South Carolina

[Introduction by Mr. Cameron]
[Presentation by Ms. Carpenter]
[Presentation by Mr. Grimes]
[Discussion]

Mr. Tims: My name is Chuck Tims and I'm a member of the Oconee County Council. I've got a couple questions. I know that some nuclear power plants may not seek renewal, and of course some are denied. Now, in the processes that we've had in the past, what is the process used to - once the application is refused or denied, or voluntarily denied, do you dis-establish these power plants and briefly, what is the process? Are you required to dis-establish them? A1, A.1.4

Mr. Grimes: In the event that the license renewal application is denied, then the current forty year license will continue and regulations require that prior to the expiration of the forty year license the utility has to submit a de-commissioning plan and go through a formal process of de-commissioning in order to essentially dismantle the facility or to put it in what's called safe store, a condition which will ensure that even a non-operating facility is maintained in a safe state. In any event, any existing nuclear power plant has to go through a decommissioning process in order to make sure, regardless of whether it operates, it's maintained in a safe condition.

Mr. Tims: The other question regards to the composition of the Commission. How many members of the Commission are there and can you identify those members today? A2, A.1.17

Mr. Grimes: Yes, I can. There are five commissioners that are appointed by the President. We just lost Chairman Shirley Jackson whose term ended on June 30th and she has now gone on to become the President of Rennselaer Polytechnic Institute. We have four remaining commissioners and a vacancy that the administration will propose a nomination for. The four commissioners that remain are Greta Dicus, who is the newly appointed chairman, Edward McGaffigan, Neils Diaz and Jeffrey Merrifield.

Mr. Tims: And they are appointed by the President? A2, A.1.17

Mr. Grimes: Each of those are appointed by the President and each has a background of either law or they come from congressional staff. In Chairman Dicus's case, she was head of the Arkansas State Emergency Planning and --

A2, A.1.17 **Mr. Tims:** Do they have to be approved by the House or the Senate?

Mr. Grimes: Yes, they do. The President nominates them and then Congress affirms or denies the nomination.

A2, A.1.17 **Mr. Tims:** What are the terms of the appointees?

Mr. Grimes: I believe the terms are for five years.

Mr. Tims: Thank you.

Mr. Cameron: All right, thank you Mr. Tims. Are there other questions? We have one right over here.

Ms. Thompson: My name is Margaret Thompson. I used to be a Federal government lawyer and now, in South Carolina, I teach law classes at both Clemson and sometimes U of South
A3, A.1.17 Carolina Law School. This is a quick academic question. You mentioned the availability of a public document repository but you didn't tell us where it is?

Mr. Cameron: A good point.

Mr. Grimes: It's in Walhalla. A public library at Walhalla.

Mr. Cameron: Okay, do you need any other information?

Ms. Thompson: Not at this time. I go to your website but not everybody could.

Mr. Grimes: I believe the website also has a listing of all the public document rooms. There's one in the vicinity of each major or each nuclear power plant or major nuclear facility.

Ms. Thompson: The website looks great, so far. I'm excited that you're updating it but I don't think everybody in the room has access to the web.

Mr. Grimes: That's why I mentioned the public document room. We also have a public document room in Washington that has all of the NRC's documents. We send the documents related to the major facilities to the local public document room.

Mr. Cameron: Okay, thank you. We have a comment or a question over here.

Mr. Williams: The Watershed Coalition, I'm the executive director, my name is Buzz Williams and, as you mentioned earlier, we had some questions and concerns earlier and we're becoming increasing and even more concerned as these proceedings move forward towards a decision. There's so many open-ended questions. Concerning the environmental impact statement draft report supplement to Oconee Nuclear Station - for example, regarding off-site radiological impact, spent fuel and high level waste disposal on Page 6 and 4, I think it is - reference to radioactive doses to individuals it says, and I quote: "However, while the Commission has reasonable confidence that these assumptions will prove correct, there's considerable uncertainty (and I want to underscore that word uncertainty), since the limits are yet to be developed, no repository application has been completed or reviewed and uncertainty (again that word crops up), is inherent in the models used to evaluate possible pathways to the human environment." "Concerning estimating cumulative doses to populations over thousands of years is more problematic." This is a quote, too. "Since estimates would involve very great uncertainties, (there it goes again), especially with respect to cumulative doses to populations." That's the end of that quote. Just a footnote, high level waste remains toxic for two hundred thousand years and there's currently about forty thousand tons stockpiled around the country at various nuclear plants on site. I assume everyone here has read the thousands of documents involved in this so you're probably familiar with this. We had to really dig this out. Regarding transportation of radiological waste, Page 6 and 7. Quote; "-- did not provide a site specific review of the environmental impacts and transportation of high level waste." Another point that I'd like to add to that is the Federal government, you the taxpayers, will bear the huge expense of storage of high level waste on-site in any future national repository which I would point out is very much in question at this time, whether or not Yucca Mountain will even be environmental safe to use as a repository. Concerning the safety evaluation report, which you mentioned earlier, it discusses critical issues concerning nuclear reactor operating systems. Again, it contains many open items and unresolved items. Some examples are:

A4, A.1.15

A5, A.1.15

A6, A.1.15

Questions remain about detecting thermal and neutron radiation embrittlement of the reactor vessel internal components and subsequent aging management programs. Also questions remain about ways to detect loss of fractured toughness, structure toughness. I think earlier that you had mentioned that the NRC had determined that all these things could be replaced and so the life expectancy of these plants might be indefinite. I would maintain that I don't think you're going to be replacing the actual reactor vessel so I would maintain to you that you've missed a very important part in making that decision when you don't analyze these potential embrittlement problems. Regarding the reactor building cooling units, questions remain about determining the heat removal capacity given degradation of the system due to aging. Meanwhile Oconee Nuclear Station has been cited by the Nuclear Regulatory Commission for problems, inadequacies in operating of the reactor coolant system. According to the research that I've done, under certain circumstances with cooling systems that inadequately function, some of these reactor vessels that might be embrittled could literally shatter like glass. I'm not saying that's the case with Oconee, it's a very well run plant. What I'm saying is that proceeding towards a decision, in the absence of handling or having the answers to these open ended

A7, A.1.14

A8, A.1.14

A9, A.1.4

A10, A.1.4

questions, very clearly might prejudice any decision that might be made and therefore I think it's unfair to the public, it's unfair because of their right to know and it might possibly - frankly, almost certainly, it surely is illegal. Another, and final point, is that in the future as Duke and NRC address these open questions and decisions are made, the Public is invited but I would maintain that they do not have standing. Because of the morass of procedures that you have to go to have legal standing to do anything about it, surely you will listen, I have all confidence, but for the Public to have any legal recourse or way to intervene in our judicial system, I maintain that at that point they will be out of the loop. So, they're going to listen to you but you won't be able to do anything about it and I think you ought to be able to know that, you should know that. Those are my comments and I appreciate your time.

Mr. Cameron: Okay, thank you very much, Buzz. We sort of deviated from our script there because he has another meeting so he read the statement. Chris, did you have anything - there was a lot there, do you have anything to say before Buzz leaves?

Mr. Grimes: All I can say, at this point, is I understand the reason for his concerns, we do use that term unlikely because there are some areas where we've tried to abound things, with certain assumptions. Clearly, there's a national interest in what will happen with a high level waste repository and we're proceeding on the basis, and an expectation, that there will be a national resolution of that issue and if there isn't, in time, then we will have to act on that and do something different. Regarding the concerns related to the reactor vessel embrittlement, we did pay particular attention to that in the safety evaluation. There are open items that need to be resolved. We didn't say that the resolution of open items was going to be easy but I do want to point out that there are studies that have demonstrated how one can go about replacing a reactor vessel. At this point in time it's considered economically infeasible but it's not technically infeasible. In addition, our safety evaluation identifies those programs that we would rely upon to measure fracture toughness of the vessel and all other important parts of the reactor coolant system and the reactor coolant pressure boundary and we're going to continue to pursue those issues. If there are still residual concerns, those concerns can be presented to the Commission. Buzz is right, they may or may not listen to you, they're certainly going to hear you but they might not necessarily act on it but that, routinely, results in us being hauled into Court, and we get hauled into Court regularly, to defend our positions. That recourse is still available to you but I admit, it is a cumbersome and bureaucratic process.

Mr. Cameron: Okay, thank you very much. I guess we'll try to keep the coalition informed of what's going on with open issues.

Mr. Grimes: We did put the Chattooga River Watershed Coalition on our distribution for all renewal related documents and we'll continue to keep Buzz informed about meetings. If others of you are interested, we can make arrangements to keep you informed as well.

Mr. Cameron: Okay, thank you very much, Chris.

Mr. Williams: I'm glad you concur about the future public meetings where people can come where they may or may not listen. The fact that we may see you in Federal Court has something to do with our standing but again, I want to underscore, the Public will not be able to have standing because it's my concern that we're the only ones that have been acknowledged to have standing. I think it's important that they know we're basically carrying the ball. They can contact us and if they have concerns, if it gets that far, hopefully we'll be able to express the concerns and interest of the public through that procedure. A11, A.1.4

Mr. Grimes: I appreciate that and we do acknowledge that Chattooga was the only organization that petitioned to intervene and to represent Public interest for the Oconee License Renewal application. From my perspective, I would hope that we would be able to resolve any concerns that you have on an informal basis and we'll continue to try to do that, even though the Licensing Board and the Commission concluded that litigation of those issues was not warranted. We understand your concerns and we're going to continue to try to address them on an informal basis.

Mr. Cameron: Okay, thank you very much. Thanks Chris. Do we have other questions or comments for Chris, before we move on?
(No audible response.)

I just want to remind everybody who is up here at this particular microphone, you really need to get close and speak up. Next we're going to have Jim Wilson who's going to talk about the NEPA process, Jim?

[Presentation by Mr. Wilson]

Mr. Tims: Mr. Wilson, I just have a general question. Could you give your educational background and a brief synopsis of your - a history of your employment? A12, A.1.17

Mr. Wilson: Okay. I was hired back in 1976 at the NRC as an environmental scientist. I have a Master's Degree in Zoology and I've done doctorate work, all but the dissertation, at Virginia Polytechnic Institute and State University. I've worked at the staff for twenty-three years now and I'm familiar with all stages of licensing, from initial licensing to license amendments and now I'm working on license renewal.

[Discussion]

[Presentation by Ms. Hickey]

[Discussion]

Ms. Thompson: Again, this is Margaret Thompson. I studied the generic statement that was mailed out to some of us on the mailing list and I have a question about the current status of the NPDES permit. I notice that at the time you published this in April the permit was under review and the review hadn't been completed yet so the status was interim or up in the air. What's the progress on that?

A13, A.1.8

Ms. Hickey: As of last week, when we checked, the permit was still in review so they are currently working under the previous permit.

Mr. Cameron: Okay, I believe there's a question back here. Yes, sir.

Mr. Cudworth: My name is Jon Cudworth, I'm with Tetratech, we're an environmental consulting firm. Eva, earlier you talked about meeting with county and State and Federal regulatory agencies, could you give us an idea of the kinds of questions you asked them or the kinds of information that you conveyed to them?

A14, A.1.10

Ms. Hickey: Are you interested in a specific area. We did it differently for - well let me have our socioeconomic person talk to what type of questions they asked.

Mr. Cameron: All right.

Mr. Scott: I'm Mike Scott with Pacific Northwest National Laboratories. I'm the socioeconomist on the project. We met with several of the - well, all three counties economic development departments and, in general, the kinds of questions - kinds of information we were seeking from them were issues like what's your transportation system like, what are the specific problems or conditions you're having with your public infrastructure, what are the locations and the make-up of any minority or low-income populations in the area, where are they located - what other kinds of questions did we ask. Oh, in particular for Oconee County, there's the question of the tax base provided by the plant and we talked, at some length, with them about the importance of that to the County finances and subsequently, of course, to their ability to attract new economic activity to the area, if that was their desire. That was the nature of the thing that we asked in that. I'll let some of the other staff, I guess, talk about some of the other agencies.

Mr. Cameron: Anybody else want to chime in on this one?

(No audible response.) I think - are we done answering this question?

Ms. Hickey: Are you happy with that answer?

Ms. Thompson: Yes.

Ms. Hickey: Okay.

Facilitator Cameron: Okay, and as I said, the staff over here and the PNL people will be here if you want to explore that in more detail. Yes, sir?

Mr. Wehmire: I'm David Wehmire. I am a local resident. I live about two miles away from the plant. A quick question. Your conclusion that you have on the Board at the present time, is that located anyplace except on Page 9.6 in the EIS? A15, A.1.19

Ms. Hickey: I don't know the answer to that question. I believe it is but -

Mr. Cameron: The intent of the question, I guess, is there more of an elaboration on that so where can he find more information on this issue in the draft?

Ms. Hickey: The overall conclusion, you mean. I guess what is considered is that if you look at Chapter 4, that's where it talks about all of the issues in total and I don't know that we came to a conclusion in that chapter that's why it's all rolled up in Section 9. The summary is in Chapter 4.

[Discussion]

[Presentation by Mr. Palla]

[Discussion]

Mr. Wehmire: A quick question. Did you make any relative comparisons that would be understandable, more generally, to the general public such as comparing the risk from the Oconee plant to driving a mile on one of our local highways? A16, A.1.12

Mr. Palla: No I didn't. It's probably a good idea. One could do that. I'm not quite sure how it would compare. What I can say is from - at a higher level the Commission has established safety goals for nuclear powerplants that essentially, if one is in compliance with the safety goals, the risk from the plant operation is a small fraction of the risk from all other risks that the population would get through other sources. That fraction is like a tenth of a percent. What one can say is - associated with those goals is a core damage frequency of one times ten to the minus four or one in ten thousand. The Oconee plant is below that goal. If one is below that goal you could be assured that your level of risk from the plant is a tenth of a percent of what would come from other sources.

Mr. Cameron: Does that answer your question?

Mr. Wehmire: Yes.

Mr. Cameron: Anybody else in the audience have a question about the severe accident part of the draft environmental impact statement?

Ms. Stancill: Nancy Stancill. Regarding the core damage, I wonder if you could follow-up on what Mr. Williams said about core embrittlement and what kind of a potential problem that might be with continuing to use the reactor?

A17, A.1.14

Mr. Cameron: Thanks Nancy.

Mr. Palla: From the point of view of modeling of an accident, if one would postulate an accident being the spontaneous rupture of the reactor vessel, there is a - it's called an initiating event frequency in PRA jargon but the probability assigned to the rupture of the vessel occurring spontaneously, this begins the accident. Those kind of sequences would generally progress to core damage. The number that is typically assigned, and I'm not certain what number was used in the Oconee PRA but it would be on the order of one times ten to the minus six or - it might be less. I've seen numbers that are several orders of magnitude lower than that. I'm not sure what was used here. I don't believe there was any adjustment made to the number to reflect an increased likelihood of a spontaneous rupture of the vessel but I don't believe that an adjustment would need to be necessary if the vessel is maintained, you know, controlled through other mechanisms. The aging management process should assure that the likelihood of that event would remain low.

Mr. Grimes: This is Chris Grimes. We treat the embrittlement of the reactor vessel and the loss of fracture toughness in the reactor vessel in the safety evaluation report. As Bob mentioned, that's an explicit part of the review that we did for the aging management programs. At present there's a design analysis for the Oconee vessels that demonstrate their capability to go out to forty-eight effective full power years, that's sixty real years. In addition, we have some open items related to cracking a vessel internals and we're looking at inspection programs to monitor for any evidence of cracking of the vessel internals that could cause a loss of core configuration. That's a very important part of the aging management programs that we're going to rely on in order to maintain the plant design basis that Bob relies on in his analysis.

Mr. Palla: Let me mention one other thing and that is should core damage occur in such an event, it does not mean that there would be a release to the population because containment integrity is very likely to be maintained through that event. The situation would be some degree of core damage but contained within the containment, which is a robust large dry containment structure for Oconee.

[Discussion]

[Presentation by Mr. Wilson]

[Discussion]

Ms. Plotnik: My name is Frances Plotnik. I have a question about the remaining fifteen years on the initial license period. The extension will be granted, of course, before this fifteen years is completed. If some unanticipated problem develops during this fifteen years, what happens? A18, A.1.4

Mr. Grimes: The process that we employ in monitoring and overseeing the license for forty years is the same as it is for sixty years. If an issue comes up tomorrow or next month or next year, fifteen years from now or beyond that causes us to be concerned about public health and safety, we'll issue an order for the plant to shut down until that problem is rectified and that is our usual practice. The significance of this licensing action is for the NRC to make clear to the Utility what the plant operating conditions, what plant operating conditions have to be maintained for a sixty year license. Otherwise, we would do the same thing in the remaining fifteen years that we would do beyond that point in terms of taking whatever action is necessary, that might come up during a licensed term.

Mr. Cameron: Okay, any other questions before we go to comments and before we go to Mr. Wehmire, I would like Bill McCollum from Duke has some comments to make on this and you can use this or -

Mr. McCollum: Thanks. My name is Bill McCollum. I work for Duke Energy Corporation. I'm Vice President in charge of the Oconee site. I just wanted to take a minute to say that I appreciate and thank the NRC members and their contractors for the thorough review thus far in the environmental portion of the licensing renewal application process. I think this has been a good solid, thorough review thus far and I appreciate the effort that's gone into that. I also would like to publicly thank the efforts of the Duke Power and Duke Energy employees, both those that have worked hard in this license renewal application process and in providing the information and response to a number of questions on the part of the staff, those folks for their efforts in this license renewal process as well as thanking the employees at the Oconee Nuclear site whose hard work and efforts, over the last twenty-six years, have built what I think is an admirable record of operation that stands well in terms of projecting our operation for the next thirty-something years at Oconee. The folks that work at Oconee and who live in this area are friends and neighbors of those of the rest of us who get to live in a great part of the country here and I think it's worth noting that nobody, not anybody is more concerned about the safety and reliability of operation and the maintenance of a high quality environment in this area than the folks that work at the Oconee station. I think that's shown by the efforts that those employees have undertaken over the years to maintain a high standard of good operation as well as the time and effort and energy that employees at Oconee have put in over those years to projects, maybe conducted on their own time, which have been recognized, in a number of ways, as having a beneficial impact on the environment. I won't go through trying to list numerous awards and recognition that Oconee employees have received for their efforts and projects that they've undertaken to protect and enhance the environment for the wildlife around the Oconee site area and around the general area but they are numerous. I want to thank those employees for their efforts. The last thing I wanted to say to our friends and neighbors in the Oconee area, I just A19, A.1.3

want to thank - and all of us as employees at Oconee want to thank those folks in the area for the continued support that we've received over the last twenty-six years and the support that we're receiving in pursuing an extension of our license to continue to be your friends and neighbors here for many years to come. That support is extremely important to us and we appreciate the good and positive support that we've received throughout the years and that we continue to receive today from our friends and neighbors in Oconee and the surrounding area. Thank you.

Mr. Cameron: Thank you Bill. Mr. Wehmire?

Mr. Wehmire: My name is David Wehmire. I'm a local resident. I live about two miles from the plant, I mentioned this before but I wanted to make a general comment on the conclusions of the study. I hope, when they get through with this and come out with a final report, that they will put the conclusions near the front of the report and make them fairly clear. The important thing that I think the general public needs to understand is that the need for electricity in our country, both in this century and in the next century, is an absolute. We need the electricity in order to maintain our way of life. The report here is showing, rather clearly, that the generation of the electricity, through the use of nuclear power, is the safest and environmentally best way of handling the generation of electricity. The Oconee Station has made the environment their concern, we all live in an area that is one of the most beautiful areas of the entire eastern part of the United States and we want to maintain that and the continued operation of the nuclear power plant will not only assure that we do have the electricity but that the environment is maintained in the way that we have learned works very well. I just wanted everybody to understand that. Thank you.

A20, A.1.19

A21, A.1.1

Mr. Cameron: Thank you Mr. Wehmire. Doug Walters from the Nuclear Energy Institute. Doug, do you want to speak from there or do you want to come up front? It's entirely up to you.

Mr. Walters: Thank you Chip. My name is Doug Walters, I'm with the Nuclear Energy Institute in Washington, D. C. Just for your information, NEI as we're known, has about two hundred and seventy-five members, U.S. and International, all involved in the energy business. We have every utility in the country that has a nuclear power plant as a member as well. We're here today to talk about the environmental impact statement for Oconee. As you heard, there was an extensive review done on the significant impacts for the plant and the conclusion was, I shouldn't have said significant, perhaps, but they reviewed the impacts for the plant and found that there were none of any significance. You also heard that the impacts that they looked at included things like its interactions with the water and the land around the plant, the socioeconomic factors, aquatic species, threatened and endangered species and many other issues. They also evaluated, as you heard, alternative sources of energy and I'll talk briefly to that in just one second. I want to emphasize the renewal of nuclear power plants is very important to the nation's energy mix. You may be aware that as a nation we're having difficulty now meeting the clean air standards. If we don't pursue renewal we're in more trouble, I think, in

A22, A.1.1

that regard. The Agency started preparing for renewal some time ago and in particular the environmental aspects of renewal. It's been a very open and public process. I think this rule making goes back probably to 1991. There were a number of regional workshops and the end result was the rule that was published in 1996. Certainly the NRC plays a vital role in license renewal but they're not the sole determiner of whether the plant will continue to operate. Their obligation is to evaluate the safety aspects and determine whether the plant may continue to operate. It's important to have, for the licensee, to have that option available. If the plant shuts down and the region decides, for example in this area, that they need emissions free generation it's too late. Again, that's why we need to be able to preserve the option of extending the license or operating for another twenty years. There's also a couple of other benefits for plant license renewal. One, it allows the U.S. to maintain an economic electric generating capacity, it doesn't produce greenhouse effects, gases or other pollutants. License renewal preserves jobs. There's a lot of people employed, not only at the Oconee Station but at the McGuire Station, Catawba Station and if you consider all the employees at the nuclear utilities around the country that's a lot of jobs. So, it preserves jobs. Third, at least in our assessment, renewal is a lot cheaper than building new capacity and that's extremely important as well. Let me just briefly mention that when we look at other sources of energy, and I'll emphasize emissions free generation, nuclear power represents about 64.5% of our nation's emission free generation. Hydro is second. It's about 35%, photovoltaic cells and windpower represent less than .1% and geothermal contributes a bit more, it's about .6%. A23, A.1.1

In closing BG&E and Oconee, as you know, are the first two utilities in the country to go through the renewal process. There are others that are lined up. Entergy will be filing an application at the end of this year for their Arkansas Nuclear One Plant. Southern Nuclear will file an application in the first quarter of 2000 for Plant Hatch. Florida Power and Light plans to file an application around the end of 2000. So with that, let me just say that nuclear energy provides an important benefit to the U.S. and the communities where these plants are located. Provides vast amounts of energy on demand to support continued economic growth and our high standard of living and it does all that without polluting air. Thank you very much.

Mr. Cameron: Thank you, Doug. Tom Harper, do you want to speak from there?

Mr. Harper: My name is Tom Harper, I'm a resident of Oconee County and I'm in the water treatment field as an operator, a shift operator, but I'm here just as a private individual. Right now you'll are licensing, relicensing the nuclear plant which is outstanding. Also, in Oconee County, two municipalities are considering, in the near future, and I don't know the time table for building new facilities. Seneca, I believe is committed to building a new one on Lake Keowee and I think that's great. I have a high level of confidence in Duke Power, extremely high in fact. However, Duke Power also has Lake Jocassee which is geographically above the nuclear plant and quite a distance from the nuclear plant as well. I guess what I would like to ask that is part of the licensing process that maybe Duke would make a strong commitment to making available a site on Lake Jocassee for a source of drinking water. I'm not technically sophisticated enough A24, A.1.8

to know what possible contamination could happen to Keowee or whatever but I think that due to the fact that the relicensing is taking place now and these utilities are considering new plants that this would be a good time for Duke to make that commitment and I think they would need a little pressure and this might be a good way to go. One other thing. I'm not really - I guess the minutes are being taken of this meeting or whatever and I would hope to see that issue addressed in the minutes and the response. Thank you very much.

Mr. Cameron: It definitely will show up on the transcript so you will see it there. I'm not sure that it's within the bailiwick of the Nuclear Regulatory Commission in terms of the environmental impact statement, in terms of response, but people are here from Duke Energy to consider that. Chris, anybody up there have anything to add on this? I'm not asking you to I just want to make sure that if you do want to say something that you have the opportunity.

Mr. Grimes: NRC's obligations, under the National Environmental Policy Act, we typically don't have any kind of leverage with respect to what things are good things for the environment but I'm sure Mr. McCollum heard the opportunity that Duke has to reach out to the public. And, to the extent that we offer a forum for you to bring those kinds of things to Duke's attention will do what we can.

Mr. Cameron: Just one footnote that is that sometimes when you do the environmental impact statement there surfaces the need for some sort of mitigating action that might have to be taken by the licensee as a result of the NRC review. Any other comments out there before we adjourn? (No audible response.) Anybody else have anything to add? (No audible response.)

Mr. Cameron: Okay, well the staff is going to be here right after the meeting so if you have further questions for anybody, including the people from PNNL that did the study, please feel free to come up and thank you for being here today.

[Whereupon, the meeting was concluded.]

Transcript of the Evening Public Meeting on July 10, 1999 in Clemson, South Carolina

[Introduction by Mr. Cameron]
[Presentation by Ms. Carpenter]
[Presentation by Mr. Grimes]
[Discussion]

Ms. Haylor: My name is Nicole Haylor, I'm with the group that was referred to earlier, the Chattooga River Watershed Coalition.

I've read in some of the literature that the final inspection will occur as close as thirty days before the final decision on the license renewal. Is that correct? A25, A.1.4

Mr. Grimes: That's correct. There's actually a set of three inspections that will be conducted. The first two inspections are the inspections of scoping and aging management programs that correspond to particular parts of the renewal application that we want the inspectors to verify in order to develop their inspection finding.

But then we have a third close out inspection, the last inspection is the opportunity for the Regional Administrator, who has to form a separate recommendation for the Commission to confirm any of the resolution of open items or any particular items that the Region believes would be of interest to the Commission making their decision.

Ms. Haylor: And if there were, some of the open items were say, possibly unresolved at this thirty day inspection period, how would this information be conveyed to the Public and how would that effect the schedule for the decision which, under my understanding, is on a very rigid time line. A26, A.1.4

Mr. Grimes: We are working to a very specific schedule and we intend that all of the open and confirmatory items would have to be resolved before we would take a recommendation to the Commission. In the event that any of the open items are unresolved then the schedule would have be slipped. But, at this point, we're working on a schedule with anticipation that we would have complete responses from Duke by October so that we could complete a safety evaluation in November in order to time a final inspection before a Commission decision.

Ms. Haylor: I guess again, I'd like to ask, how would that information be conveyed to the Public, just thirty days before the final decision, if there were open items that were still unresolved? A27, A.1.4

Mr. Grimes: It would be conveyed - we would put the final inspection report, as well as the final safety evaluation and the final environmental impact statement would all be accessible to the

Public. I would intend on putting those on the Web as well as in the Public document room before the Commission gets the recommendation from the staff and then the Public would have the same thirty days to review those materials that the Commission would have, plus the opportunity to hear the explanation of how the issues have been addressed at the Commission meeting.

Ms. Haylor: Thank you.

Mr. Cameron: All right, this gentleman up here. Please state your name.

Mr. Sanders: My name is Don Sanders, I'm a resident of Oconee County and I belong to some of the conservation groups here in the area.

I was concerned about what the safety review, how it addresses the storage of the spent fuels and another point is, I've been reading and hearing about the MOX fuel, a mixture of uranium and plutonium. Is that a factor in the renewal of this license to be used here?

A28, A.1.17

Mr. Grimes: No, sir, actually the MOX fuel is a concept that would be addressed by an amendment to the current license to permit the use of such fuel at any time. In fact, the issue concerning spent fuel storage and high level waste storage a national repository. All of the waste issues are issues that apply to the current license, the existing license and they're being addressed through specific rule makings and activities associated with spent fuel storage.

The Oconee facility has a spent fuel storage facility that has been licensed and is part of the current licensing basis. If they chose to expand that spent fuel storage capacity that would be through an amendment to the existing license or the extended license, whichever - at whatever time that might occur.

In addition, the Department of Energy is pursuing its plans to develop an application to submit to the NRC to license a high level waste repository and that issue is also being addressed as a separate effort that is associated with what is referred to as the high level waste confidence pact.

So DOE's obligation to develop a national repository is being developed separately from this.

Did I answer your questions?

Mr. Sanders: The only part I was not clear about was these items that you mentioned. Will these be open to the public?

A29, A.1.17

Mr. Grimes: Yes. All of those activities, amendments to the existing license, the DOE effort to develop a high level waste repository, we put all those materials out there as information

available on the NRC webpage that addresses spent fuel storage, high level waste storage and the status of those activities and we hold meetings on the current license activities the same way we do for license renewal.

You just have to look at a different icon on the webpage to find some of those other matters.

Mr. Cameron: Yes, sir.

Mr. Mangrum: Dick Mangrum from WGOG, Walhalla. Did you say that the NRC will formally vote in August 2000 whether to renew the license? A30, A.1.4

Mr. Grimes: Yes, sir, that's the present schedule. The resolution of the open items by Duke is scheduled for October and I may have mis-spoke before because I've got two schedules in my head. The Staff's final safety evaluation and the final environmental impact statement are scheduled for February 2000 and our Commission decision by August.

As we approach those dates we would keep information about how we're progressing towards those milestones is also accessible on the web and in the Public document room.

The Commission meeting would be noticed at least thirty days in advance.

Mr. Cameron: Okay. Chris I think Nicole Haylor from *Chattooga is going to make a statement now that's mostly relevant to your topic. Nicole?

Ms. Haylor: Once again my name is Nicole Haylor. The Chattooga River Watershed Coalition is small, non-profit, conservation organization. Our office is based in Clayton, Georgia which is approximately thirty miles from the Oconee Nuclear Station. The entire Chattooga Watershed lies within the fifty mile evacuation zone from the Oconee Nuclear Station and as such would be greatly impacted if there were a major radiological accident there. A31, A.1.6

I personally am a resident of the State of South Carolina, I live in Oconee County, my residence is approximately twenty miles from the Oconee Nuclear Stations so you see I have various aspects, both personal and professional, as it were, in the safe operation and the relicensing decision of the Oconee Nuclear Station.

The Chattooga River Watershed Coalition as was noted before, has participated in the relicensing proceedings from the get go. We do have standing, as it were, in the proceedings although our concerns have not been recognized, have not been recognized for a Hearing by the Nuclear Regulatory Commission. A32, A.1.4

A33, A.1.4 However, we do think that we have some important concerns and these concerns are being addressed somewhat through the relicensing process, however, a lot of these are simply unresolved at this point.

The whole relicensing technical issues are very involved and for the sake of streamlining some of our concerns or what I have to say now is it can be divided into basically three major categories.

A34, A.1.15 No. 1 is the issue of the storage of high level waste. Everyone is probably aware that most of the high level waste for the Oconee Nuclear Station, or all of it as far as I know, is stored on site in spent fuel pools that are nearing capacity. Those who track what's going on in Congress are probably aware that the storage and management of high level waste is a very controversial issue that is currently - or has been the subject of on-going management strategies and what do we do with this very toxic waste that will remain toxic for approximately two hundred thousand years.

There are about forty thousand tons of this waste distributed around the United States at various nuclear power stations and there's basically nowhere to put it right now other than on-site in various storage mechanisms that sometimes work and sometimes don't work. I would say probably for the most part work at least for the time period that they've been used but for two hundred thousand years, it's simply an engineering problem that has not been solved yet.

It's relevant to note here also, and this is from the safety evaluation report, which is not necessarily the topic of conversation for this meeting, but it is very much a part of the relicensing process.

A35, A.1.13 In the safety evaluation report the Nuclear Regulatory Commission offers the opinion or the judgement that regarding the actual spent fuel pool temperatures at Oconee Nuclear Station, the temperature limits do not guard against additional cracking of these spent fuel containment facility. This, of course, is an obvious concern to everyone, I would think, that lives within Oconee County and nearby. Obviously if there's leakage it gets into ground water and it's a very important concern.

A36, A.1.15 Regarding the transportation of radiological waste, it's obvious that at some point this waste will need to be transferred away from the Oconee Nuclear Station possibly to the Yucca Mountain site if and when it's ever approved, which is also a very controversial subject right now.

Duke did not provide a site specific review of the environmental impacts from the transportation of high level waste. These words are the Nuclear Regulatory Commission's so there has been a void in the application regarding this subject.

Regarding the potential storage facility at Yucca Mountain, as I've said there seems to be - it's a very controversial subject. We don't know if this place will be approved and if it's appropriate it lies in a major earthquake zone and ground water - there have been studies by some individuals that show the ground water raises, periodically, through the mountain. It's against the law in the State of Nevada to pollute ground water so these are some major stumbling blocks that still have to be resolved regarding the Yucca Mountain site.

A37, A.1.15

Regarding if that site is used the environmental impact there, potential peak radiation, radioactive doses to individuals. Quoting the environmental impact statement, specific to the Oconee Nuclear Station, Nuclear Regulatory Commission Office:

A38, A.1.15

While the Commission has reasonable confidence that these assumptions will prove correct about the potential radioactive doses being okay, 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.

Estimating cumulative doses to populations over thousands of years is more problematic. Such estimates would involve very great uncertainty, especially with respect to cumulative doses to the population.

Moving on to some of our concerns regarding the safety evaluation report, this will be the last formal public meeting where the public is invited, at several occasions, to hear a presentation from the Nuclear Regulatory Commission. These other meetings that were referred to are not exactly the same format so I'd like to introduce some concerns about the safety evaluation point at this meeting here.

The safety evaluation report does contain a fair number of open items. These items are unresolved at this point. While the relicensing decision moves forward, there are a number of very important open items that are unresolved and I'll just mention a few of them. I have all the page numbers if interested in checking my citations here.

Basically questions and uncertainty remain about detecting thermal and neutron irradiation embrittlement of the reactor vessel internal components and aging management programs for these components.

A39, A.1.14

Also questions and uncertainty remain about ways to detect loss of fracture toughness. One of our primary concerns, of course, is the actual integrity of the reactor vessel given the fact that it is - will be over forty years old if the license renewal is approved.

A40, A.1.14

The issue of embrittlement is a very important issue regarding the renewal process and is, to date, largely unresolved.

A41, A.1.14

A42, A.1.14 Regarding the reactor building cooling unit, questions remain about determining the heat removal capacity given the degradation of the systems due to aging.

A43, A.1.14 Regarding the reactor coolant system, "The NRC staff concludes that the applicant's time limited aging analysis of the reactor coolant system is not adequate to address the fatigue concerns for operation beyond the current design life of forty years."

A44, A.1.13 Meanwhile, it's common knowledge that the Oconee Nuclear Station has been cited by the Nuclear Regulatory Commission, on more than one occasion, for problems and inadequacies in the operation of the reactor cooling systems. Of course if the cooling system doesn't work then the reactor could potentially melt down. That's, of course, a very extreme scenario there are mechanisms in place to shut down the operation supposedly under controlled methods but, nevertheless, that's sort of the end result if the cooling systems fail.

Briefly, those are some of our concerns. We are tracking some of the other issues and we intend to keep tracking the unfolding of the open items as well as all the other aspects having to do with the license renewal process for the Oconee Nuclear Station.

Thank you very much.

Mr. Cameron: Thank you, Nicole. There's just a couple of things that I wanted to give Chris Grimes, perhaps, the opportunity to comment on.

One was Nicole's comments in terms of the SER quote on spent fuel. A second is, maybe just elaborate on the waste transportation aspect or have someone do that which Nicole referred to, which I think is being handled by the NRC rather than the licensee.

Just to give people an idea again about how some of the open items that Nicole mentioned are going to be resolved.

Mr. Grimes: Thank you Chip. I'll cover the safety evaluation items. Actually I'd like to thank you - I'm glad somebody reads these things. We go to a lot of trouble to write them.

Nicole properly characterized some of the open items that are reflected in the safety evaluation. There was a question about the appropriate temperature assumptions for determining the extent of cracking in the spent fuel pool. That specifically gets to managing aging effects for the pool liner. The safety evaluation does not elaborate but we are, we do know that -- monitoring systems to determine if cracking occurs. The safety evaluation is focusing on aging management programs that will try to prevent cracking so that we don't need to be concerned about any leakage from the pool but if leakage occurs it can be detected.

There are questions about embrittlement of reactor vessel internals. That's a matter that's being addressed. Pressurized water reactors at the present time but it's a specific area of interest that the staff addressed in the safety evaluation and we know that there are inspection activities that are being developed that can find cracking, should it occur, and correct it.

With respect to the reactor coolant system time limited aging analysis for fatigue, that is an issue that's related to calculational techniques. The staff did not think that the calculational techniques that Duke offered were sufficient. Duke is going to address the fatigue issue but there's also an industry-wide effort to address the fatigue calculational techniques, it's referred to as generic safety issue 190. We need to address that before we forward a recommendation to the Commission.

That's sort of a general reaction to some of the comments about the quotes from the SER which I don't need to know the page numbers, I pretty well know about where we said those things and those were fairly reasonable quotes of the safety evaluation and we need to have those issues resolved before we complete a renewal recommendation.

With respect to the high level waste issues, I'm going to let Cindy address those.

Ms. Carpenter: You're right, the disposition of high level waste is still an unresolved issue and correctly Oconee - Duke Energy did not address, in a site specific analysis, what to do with the transportation of high level waste. The reason for that is that the Agency has determined that the transportation of high level waste is really a generic issue that faces all of the nuclear power plants and therefore we're addressing that on a generic basis.

We're in the process right now of a rulemaking to look at the transportation of high level waste and at this moment in time the Public comment period has closed and we're in the process of reviewing the Public comments and resolving this.

[Discussion]

[Presentation by Mr. Wilson]

[Discussion]

Mr. Sanders: Don Sanders again. I guess the environmental impact statement is just not the place for the safety issue but that's not clear here, to me, and it may not be to others. You might want to say where the safety issue and some of these others - unable to hear. A45, A.1.14

Mr. Cameron: Did you guys hear that question?

Mr. Grimes: I heard the question and you're correct. The environmental impact statement doesn't address the safety issues. The safety issues are addressed, as I explained in the introduction, either through a formal public participation process which involves Hearings and a petition to intervene, or informally by attending meetings or calling us. If you have a particular question about the staff safety evaluation.

I'll give you my name and address and if you've got any safety questions you want answered I'll answer them.

Mr. Cameron: Chris, I think maybe you should just repeat and Jim might talk about it a little bit later on, but could you just talk about how the - there's the environmental impact statement process, which is the main focus tonight. There's the safety evaluation process - how do those all come together again, just so that people understand.

Mr. Grimes: Upon receipt of a license renewal application the safety review is the review that is conducted in accordance with Part 54 and that results in a safety evaluation report. As shown on this slide, the opportunities for public involvement are informally participating in meetings, specifically the ACRS review is a transcribed meeting where the ACRS solicits Public comment.

There are also the formal adjudicatory hearings and a little note at the bottom is the key here and that is if a hearing request is granted, the environmental review that Jim just described is conducted in accordance with Part 51. We had our scoping meeting, we've got a supplement to environmental impact statement, we're at this little box right here, right now, conducting a Public meeting to discuss the comments on the supplement as it relates to the environmental impacts that are described in Part 51 and Jim outlined those.

The other opportunity for Public involvement is when the pieces come together, the inspection activities, we hold Public meetings to discuss the inspection results. We hold meetings throughout the safety evaluation process where interested members of the public can comment.

Finally, all of these pieces come together when they're presented to the Nuclear Regulatory Commission for a decision and that is a Public meeting. All the documents that are provided to the commission for their consideration, except for the staff's recommendation which is withheld until the commission makes its finding. The safety evaluation, the supplement to the GEIS, the inspection reports - all of those things are in the Public domain at the time the commission meets.

[Discussion]

[Presentation by Ms. Hickey]

[Discussion]

Ms. Haylor: I have a question regarding the examination of alternative energy sources. Was it considered to analyze a combination of alternative energy sources such as the one, on the slide that you showed briefly, a combination of all those together or was the analysis just all with one? A46, A.1.16

Ms. Hickey: I cannot answer that right now. I believe they were all looked at independently. That's correct, we did not look at them mixed. So they were all looked at individually.

Ms. Haylor: My initial reaction would be that this would certainly prejudice the analysis because just basic common sense, as far as evolving technology, it seems to be going in a combination of various alternative energy sources would seem to be a more viable analysis than just saying we could generate all the energy that's produced by Oconee Nuclear Station from solar power.

So I think that the analysis is somewhat deficient there.

Mr. Wilson: I think in the first part of Eva's description of what's in the alternative section, she pointed out that we were looking at placing an alternative - something that would replace a large baseload unit and we didn't look at two or three different small sources added together, we looked at something that would replace Oconee's nuclear generating capacity, directly.

Ms. Haylor: Thanks, I think your answer was clear on that.

Ms. Hickey: Your comment is noted.

Ms. Haylor: Also, just as an aside or also I'd like to mention were energy reduction measures, conservation measures factored into that analysis at all? A47, A.1.16

Ms. Hickey: No, that wasn't one of the considerations here, it was just a direct replacement of Oconee Nuclear Plant.

Mr. Cameron: Could you hold on just a minute, Mike so I can get you on here.

Mr. Scott: I'm Mike Scott, partially responsible for that section of the report. Actually there are demand side measures that Duke, in its IRPs and its power planning have looked at in the past and are continuing to examine. That's on Page 8-27, if you want to look at that analysis.

Conservation, at least in part, was looked at as a possibility for replacement power.

Mr. Cameron: Okay, thank you. Those are the type of comments that the staff will be looking at as they develop the final environmental impact statement. In other words, looking at combinations of technologies and looking at conservation.

As Eva said, those are noted. Nicole, do you have any other comments on this part?

Ms. Haylor: I had another question on an unrelated subject but one that you mentioned in your presentation about the cumulative - potential cumulative health impacts over the span of the operation of the nuclear power plant.

A48, A.1.9 My question is, do you know if the Centers for Disease Control has ever done a nation-wide, systematic study of the potential health impacts from - obvious health repercussion, increased cancer rates or whatever, leukemia in, say a fifty mile radius or a twenty mile radius of the nuclear power stations operating in the United States?

Ms. Hickey: I know there are many studies that have been conducted. I don't know if there's one specifically along that line, there may be, I'm just not aware of it.

I know that there are continuing studies on the impacts from radiological -

Mr. Cameron: Anybody from the NRC that wants to offer any information on that, Chris?

Mr. Grimes: The only thing I can add to that is when we had our Public meeting at Calvert Cliffs, Solomons, Maryland, the Maryland Public Health Officer reported that they had started a cancer register in Maryland which came as a bit of a surprise because we didn't know that anybody had developed a cancer register in the United States, let alone one right in my back yard.

At that time the question came up whether or not anyone was aware of a national register or any national studies and I didn't hear an answer to that so my suspicion is no, but we will contact the Centers for Disease Control and other health organizations and see if we can find out if there are any plans to develop any nationwide information concerning radiological impacts and cancer studies.

Mr. Cameron: Okay, thank you Chris.

Any more comments or questions. Margaret?

Ms. Thompson: Thanks, I'm Margaret Thompson. I used to practice law as a Federal government lawyer for the EPA up in New York, Region 2, hazardous waste issues mostly under a couple of different Federal - now I teach law classes on various subjects, sometimes at USC law school in Columbia and currently here at Clemson, Environmental Science, Law and Policy.

I wanted to raise two points, simply for the record. One of them I'll bring up first, water use and quality which I asked you about earlier and the subject passed by and I wanted to make sure the

public attending only tonight realized that the information that should be there on your water discharge permit and its status is not in the report that the present NPDES permit, for both water discharge and land disposal permits are currently under review by –.

I've been planning to ask Mike Gandy, who is doing that review for – what he could state in public, to date, this evening and he went back to Columbia before the evening meeting started so he's not here. So my question becomes, when will the public get this water pollution permit status information if it's not in this report now and it isn't ready yet and we don't have another formal public meeting officially scheduled? A49, A.1.8

Ms. Hickey: We hope that it will be complete and in the final report but I'm not sure that - I'm assuming that will happen but since we don't have that yet I don't want to say.

But hopefully, the permit will be in place -

Ms. Thompson: So you're waiting on – and you're dependent on their schedule. A50, A.1.8

Ms. Hickey: I don't know that we're dependent, that's dependent of the schedule but the hopes are that it will be in place by the time we do the final report.

Ms. Thompson: And what if it's not? A50, A.1.8

Ms. Hickey: I don't know. They're expecting the decision in August so we're assuming that it will be complete and the permit will be complete.

Ms. Thompson: So clean water questions are open? A49, A.1.8

Mr. Cameron: I would imagine that - the permit has a life of its own outside of the draft environmental impact statement process and the permit has to be issued and I think that's sort of the bottom line on that.

Mr. Grimes: I'm going to take a shot at it. We can't dictate to the state how they will implement their clean water provisions. It has a bearing and a relationship to this action and if the permit hasn't been resolved by the time that we present the final environmental impact statement to the Commission then we'll note that to the Commission, we'll note the status of it and the Commission will have to make its decision on that basis.

But I note that the threshold that the Nuclear Regulatory Commission will look at that issue - is predicated on whether or not the absence of the status is so compelling as to foreclose a decision on the license renewal.

It's a different standard than I imagine the state uses for issuance of the permit.

Ms. Thompson: Okay, thanks.

Mr. Cameron: I'm going to come back to you if you have another question but let's go to Mike for clarification on that.

Mr. Tuckman: This is Mike Tuckman from Duke Power. We have NPDEs permits, they are required to be renewed every four years and this is just the renewal process for that permit. It's not like we're operating without a permit.

Mr. Cameron: Okay, that's a helpful clarification.

Margaret, do you have another question on this segment?

Ms. Thompson: Yes, a short one. I think on refurbishment, Chapter 3 states that Duke has reported that it doesn't plan on refurbishment activities so you didn't need to review those issues. Yet, there's a statement with information suggesting that component replacement, as a technical term, is anticipated as an on-going activity throughout the extent of the life of the plant.

A51, A.1.5 I'm a lawyer, could you distinguish for me between component replacement and refurbishment so as to indicate whether the Public would have information in decisions respecting component replacement if it - if the Public should get information about refurbishment and isn't going to, would we get information about component replacement?

Mr. Grimes: We have a language barrier and it relates to - I used the term refurbishment earlier as well in talking about maintenance activities.

For the purpose of the environmental impact review, refurbishment is described to - it's intended to describe something that constitutes a site construction activity or change in a facility that is so great that it might have an effect on the local environment. For example, putting up a new building or putting a shield around the whole plant and that's refurbishment with a capital "R", for the purposes of an environmental review.

When I use the term refurbishment in aging management, it's refurbishment with a small "r" and I've been looking for a different term, maybe it would be maintenance and rebuilding but it refers to repairs and replacements of individual components, pipe segments, repairing of concrete walls, that's a refurbishment activity but not one that's going to have a substantial impact on the environment. It's part of normal plant maintenance.

So, when we speak about refurbishment at the component level, that's something that occurs day in and day out and it's a part of the processes that we're reviewing for aging management.

[Discussion]

[Presentation by Mr. Palla]

[Discussion]

[Presentation by Mr. Wilson]

[Discussion]

Ms. Haylor: I have one question. If the Public comments that come in, if they are not acknowledged or deemed worthy by the Nuclear Regulatory Commission, what avenue of recourse is available to the Public? A52, A.1.4

Mr. Wilson: Let me see if I understand your question. Your comment will be a part of the environmental impact statement. It will be put in its entirety into Appendix A of the document and in that appendix, we'll indicate how we've addressed your comment. If we determine that it's appropriate, we'll change the document accordingly, so I guess you kind of have to wait until we issue the document in it's final form to see if we appropriately addressed it.

I guess if you're unhappy with our treatment, you should let us know and I guess you could write a letter to the Commission and ask them to reconsider how your comment is being considered. It will be part of the document itself as well as our disposition of your comment.

Mr. Grimes: I'll add to that. The typical forms of appeal, if you're not satisfied with how the staff has executed its responsibilities are to formally complain to the Commission itself, you can tell your Congressman and then your Congressman calls me up and says, why didn't you do the job right or whatever.

There are a variety of different ways that members of the Public can appeal on how we execute our responsibility.

Ms. Haylor: In your opinion, would the appeal even have a chance of being heard by the Commission if you didn't already have standing? A53, A.1.4

Mr. Grimes: The Commission takes its responsibilities to the Public very seriously and standing doesn't really have anything to do with it since there's not a Hearing pending on particular issues in litigation. Certainly, in any circumstance you can try to take a particular complaint to the Courts but in the absence of some kind of exchange and appeal to the Commission or appeal to some legislative body, the NRC has not properly executed its responsibility, the Courts are probably not going to entertain the issue.

Mr. Cameron: I think we'll probably see if there are any more questions on that and we may be able to provide some more clarification to you after the meeting on that, Nicole.

Let's go to Greg Robison for a comment and Greg you can - feel free to come up here.

Mr. Robison: Good evening, I'm Greg Robison. I work for Duke Power. I'm the manager of the Oconee license renewal project and I just wanted to take just a moment to say thank you to several groups of individuals.

A54, A.1.3 First I'd like to thank the NRC. I think their diligence and thoroughness in implementing the license renewal process is evident if you'll take a look at the supplemental environmental impact statement, you'll see the detail that they've really put into the work. They are to be commended for that work.

I'd also like to thank the Duke team, specifically I'd like to thank all the individuals at Duke who put all the hours and energy into producing our part of the license renewal application. There was a lot of interest and a lot of hard work, a lot of dedication. We were able to bring many, many work years of effort to that application and I'm glad that we had the strong team that we do have.

I'd also like to say thank you to the Oconee Staff extended, the strong environmental commitment that that staff has had in managing the environmental issues that's been there from day one, over twenty-six years now of operation. We bring that back to the table and I really appreciate that and I want to say thank you to them.

And importantly, tonight, I want to say thank you to the neighbors in the communities who are represented here with the Public. Thank you for your interest tonight but more importantly, thank you for your interest over the twenty-six years. We work hard, we want to be a neighbor and you can only be a neighbor if you're neighbors will accept you. We appreciate it, we plan to be here - license renewal is an effort that we want to undertake and as we look around us and it will continue to be important for us to be a part of the community.

We don't see our commitment changing. Renewal will give us an opportunity to continue to work hard, to stay focused and to run a safe and efficient power plant and for that we say thank you.

Mr. Cameron: Thank you very much, Greg. Mr. Castrill? Hi, did I get that right? Let me give you a mike so we can get you on the record for whatever you want to say.

Mr. Castrill: I don't have a comment I came just to listen as a citizen [inaudible].

Mr. Cameron: Well, thank you. Let's go to the representative of the Nuclear Energy Institute, Doug Walters.

Mr. Walters: Good evening. My name is Doug Walters. I'm with the Nuclear Energy Institute. The Nuclear Energy Institute is a Washington, D. C. based policy organization. We represent more than two hundred and seventy-five U. S. and International companies involved in nuclear energy. All the utilities in the United States that have nuclear power plants are members of NEI.

Most, if not all of our activities involve nuclear energy which you heard earlier this evening represents about twenty percent of America's electricity.

Of course we're here today to discuss the draft environmental impact statement for Oconee for license renewal and, as you hear, after the extensive review that was done no significant environmental impacts were identified as a result of extending the license on the Oconee Plant.

This review included the potential impacts from obviously continued operation, the plant's interaction with the land, water and air socio-economic factors, aquatic species, threatened and endangered species and many other issues were considered.

The NRC also examined the environmental impacts of alternative energy sources and I think - a view in response to the question that was asked about that, I think the standard there is that nuclear has to be shown to be within a range of alternatives. So, it's not necessarily - I think you could consider a mix or combination but the test is whether the nuclear plant is within the range, in terms of environmental impacts of other alternative energy sources. A55, A.1.16

Of course license renewal is important for the future of America. We need it to meet our future energy needs. You may be aware that the nation, right now, has difficulty meeting the clean air standards or requirements and that's with the nuclear plants already operating. A56, A.1.1

We should commend, by the way, the NRC for the very open and thorough public process that they exercised in developing this generic environmental impact statement. It certainly helps to ensure that the important issues are not overlooked or left unexplored and, at the same time, it makes the process more efficient and effective. A57, A.1.4

The NRC actually started this process some time ago and, as you saw, they concluded that there were a number of issues that could be addressed for all nuclear power plants and they did that in the generic environmental impact statement.

The remaining issues, again, as you heard this evening have to be addressed in the context of individual renewal application and that's what the purpose of this meeting is.

The NRC certainly plays a vital role in license renewal but it isn't the NRC that will decide whether the plant - nuclear energy, I should say, or the particular plant is the right generating source for a given area. The NRC's role is to determine, solely based on safety whether the plant may continue to operate under a renewed license.

I'd just like to briefly talk a little bit about what license renewal really means. Without renewal these plants will have to shut down. Oconee would have to shut down at the end of its forty year operating license. If the Region - if this area decides that they need emissions free generation that that plant provided then it would be too late if the plant shuts down. The time for making that decision will have passed.

A58, A.1.1 With renewal, Oconee preserves the option to continue operating should that decision be made. That's a good option to have.

A59, A.1.1 There are some other benefits of renewal and I'll just mention three.

One is - I touched on this earlier. It allows the U. S. to maintain a good energy mix. It allows us to maintain an economic generating capacity. Nuclear power does not generate green house gases or other pollutants such as sulphur dioxide, nitrogen oxide and particulates.

Second, renewal preserves jobs and there's a substantial tax revenue, as you heard, from the communities around these plants.

Third, renewal is much less cheaper than building a new capacity. Many people don't realize this but nuclear power is the largest source of emissions free generation. It's twenty percent of the overall generation of the country but it's about sixty-four and a half percent of the emissions free generation capacity in the United States. That compares to about thirty-five percent which we get from hydro which is the second highest source. Photovoltaic cells, windpower, they represent about .01 percent of emissions free capacity and geo-thermal is about .6.

Under the clean air act, States are increasingly - are under increasingly stringent controls on emissions, and again, as an emission free source nuclear power already helps limit the amount of greenhouse gases emitted through electricity generation.

So, in closing, I'd just say that nuclear power provides important benefits to the U. S. and the communities in which the plants are located. It provides vast amounts of electricity, on demand, to support continued economic growth and our high standard of living and it does all that without polluting the air.

Thank you very much.

Mr. Cameron: Okay, thank you very much Doug.

Let me sum up a little bit here.

The NRC staff was here to present the results of the draft environmental impact statement and to get your comments not only here tonight but written comments if you chose to submit them to the commission, based on the draft environmental impact statement and what you heard tonight.

The NRC staff is obligated to consider those comments and wants to consider those comments and not only to consider them but to explain how those comments were dispositioned in preparing the final environmental impact statement.

As Chris correctly pointed out, the concept of standing is no consideration, in terms of filing comments on the draft environmental impact statement or if you disagree with the staff's conclusions in the final environmental impact statement in writing a letter to the Commission saying that you disagree with something in the final environmental impact statement.

The Commission would then have those comments for its consideration when it makes the final decision on license renewal, when it has the results of the environmental study and also of the safety study.

As with any final environmental impact statement of any agency, if someone does not think that that's an adequate statement then the Agency's adequacy of that statement can always be challenged in Federal Court and, of course then standing does become important again because you're in an adjudicatory arena.

Any final comments before we adjourn tonight?

[No response.]

I'd just like to thank all of you for attending tonight and for your thoughtful comments.

Thank you very much.

Meeting is adjourned.

[Whereupon, the meeting was concluded.]

LETTER B

Chief, Rules and Directives Branch
Mailstop T-6D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Attn.: James H. Wilson

Re: Oconee Nuclear Station, Units 1, 2, and 3
Draft Plant-Specific Supplement to the Generic Environmental Impact

Dear Mr. Wilson:

I'm responding to the request for comment on the plant-specific dra to the Generic Environmental Impact Statement for License Renewal of Nu regarding the renewal of operating licenses for the operation of the Oconee Station (ONS).

B, A.1.11

Relicenses, with no new construction or land disturbance, should hav on any properties included in or eligible for inclusion in the National Regist Places. We have had the opportunity to meet with the ONS's consultant anc identified National Register properties and identified cultural resources in th The ONS should be aware that there might be unidentified archaeological si plant area. Any future construction or land management activities could aff archaeological sites. ONS may want to address the issue of future identifica management of cultural resources in the plant area as part of its continued o

These comments are provided to assist you with your responsibilities Section 106 of the National Historic Preservation Act of 1966, as amended, regulations codified at 36 CFR Part 800. If you have questions, please don't call me at 803/896-6169.

Sincerely,

Nancy Brock, Coordinator
Review and Compliance Programs
State Historic Preservation Office

S. C. Department of Archives & History • 8301 Parklane Road • Columbia • South Carolina • 29223-4905 • (803) 896

B-1

LETTER C

South Carolina Department of
Natural Resources

Paul A. Sandifer, Ph.D.
Director
Office of Chief Counsel
Buford S. Mabry, Jr.
Paul S. League
Ester F. Haymond
James A. Quinn*
Charleston Office

August 12, 1999

Chie
Rules & Directives Branch
Division of Administrative Services
Mail Stop T-6D59
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Docket Nos. 50-269, 50-270, and 50-287
Duke Energy Corporation, Oconee Nuclear Station, Units 1, 2, & 3

Dear Sirs:

Please be advised that the South Carolina Department of Natural Resources, an agency of the State of South Carolina, intends to submit comments to the U.S. Nuclear Regulatory Commission in response to the draft supplement to the Generic Environmental Impact Statement in response to the notice published at 64 FR 26843-02, in connection with the above captioned project. The Federal Register Notice stated that comments, to be certain of consideration, must be received by August 16, 1999. At this time, the Department of Natural Resources begs leave to submit comments for your consideration after that date. The Department has taken reasonable steps to compile information necessary to formulate its comments; however, staff of this Department has had to research files as far back as the 1960s. This burden has delayed the final formulation of comments. C, A.1.17

As soon as this Department's comments are completed, they will be immediately forwarded to you at the above address. Inasmuch as preparation of your final plant-specific supplement to the GEIS will likely take some time, I trust that any delay in our Department's submission of its comments will cause you no unreasonable

Post Office Box 167 • Columbia, S.C. 29202 • 803-734-4006 • Fax 803-734-6310
*Post Office Box 12559 • Charleston, S.C. 29422 • 803-762-5061 • Fax 803-762-5412
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PRINTED ON RECYCLED PAPER

C-1

inconvenience. I assure you that our staff is working diligently to provide comments relative to your ongoing review.

Sincerely,

Paul S. League
Assistant Chief Counsel

PSL:mwr
cc: Mr. James H. Wilson
Dr. Paul A. Sandifer, Director
John Frampton, Assistant Director
Skip Still, Wildlife Region 1

LETTER D

64FR 28843
May 27 1999

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

RECEIVED
1999 AUG 18 PM 3 34
RULES & DIR BRANCH
US NRC

(3)

August 16, 1999

4EAD-OEA

Chief
Rules Review and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: EPA Review and Comments on
Draft Supplemental Generic Environmental Impact Statement (DSEIS)
License Renewal of Nuclear Plants
Oconee Nuclear Station (ONS) Units 1, 2, and 3 (NUREG 1437)
Oconee County, South Carolina

Dear Sir/Madam:

Pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has reviewed the subject Draft Supplemental Generic Environmental Impact Statement (DSEIS). The document provides information to educate the public regarding general and project-specific environmental impacts and analysis procedures. We appreciate your consistency with the public review and disclosure aspects of the NEPA process. The above-referenced supplemental document is site-specific to the Oconee Nuclear Station; this document is tiered from Generic EIS for License Renewal of Nuclear Plants.

The DSEIS was prepared in response to an application submitted to the NRC by Duke Energy Corporation, the current licensee, to renew the operating licenses for Oconee Nuclear Station Units 1, 2, and 3 for an additional 20 years. Operating Licenses for Units 1 and 2 will expire in 2013, and for Unit 3 in 2014.

The proposed action is the renewal of the operating license for the referenced facility. This will provide an option that allows for power generation capability beyond the term of the current nuclear power plant operating license, to meet future system generating needs.

Based on our review, we rate the DSEIS "EC-2", that is, we have environmental concerns about the project, and more information is needed to fully assess the impacts. In particular, the issues of public participation and offsite radiological impacts warrant further discussion in the Final EIS. Our detailed comments are attached.

Thank you for the opportunity to comment on this project. If you have any questions or require technical assistance you may contact Ramona McConney of my staff at (404)562-9615.

Sincerely,

Heinz J. Mueller, Chief
Office of Environmental Assessment

Attachment

Comments on
Draft Supplemental Generic Environmental Impact Statement (DSEIS)
License Renewal of Nuclear Plants
Oconee Nuclear Station (ONS) Units 1, 2, and 3

▸ **Terminology** - The title "Generic" for this document is misleading, since the document is site-specific to the Oconee Nuclear Station relicensing application.	D1, A.1.19
▸ **Public participation** - We note the Availability Notice for related documents available to the public. However, there is no mention of information meetings or public meetings to be held within the affected communities. Have such meetings been scheduled?	D2, A.1.4
▸ **Alternatives** - EPA appreciates that all reasonable energy resource alternatives were evaluated, in addition to the relicensing and no-action alternatives.	D3, A.1.16
▸ **Offsite Radiological Impacts** - Section 6.1, page 6-3: discussion of the radiological impacts of the uranium fuel cycle on human populations needs clarification regarding collective effects over time. The statement is made that science cannot rule out the possibility that there will be no cancer fatalities from "tiny" doses. The paragraph previously states that tiny doses have some statistical adverse health effects. NRC should clarify and state what collective impact it believes these doses may have on human populations. Also, please define "tiny".	D4, A.1.9

LETTER E

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL POLICY AND COMPLIANCE
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

64 FR 28841
May 27, 1999
(4)

RECEIVED
1999 JUL 26 AM 8:28
RULES & DIR. BRANCH
US NRC

July 19, 1999

ER-99/471

Chief,
Rules, Review and Directives Branch
Division of Administrative Services
Mailstop T6D59
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sir:

E, A.1.17 The Department of the Interior has reviewed the Draft Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 2, Oconee Nuclear Station. We have no comments to offer.

Thank you for the opportunity to review and provide comments on this draft EIS.

Sincerely,

James H. Lee
Regional Environmental Officer

E-1

LETTER F

DHEC
PROMOTE PROTECT PROSPER
2600 Bull Street
Columbia, SC 29201-1708

64 FR 28841
May 27, 1999
(5)

RECEIVED
1999 AUG 16 AM 11:12
RULES & DIR. BRANCH
US NRC

August 11, 1999

Chief
Rules and Directives Branch
Mailstop T-6D 59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: SCDHEC- Division of Radioactive Waste Management Comments on the Oconee Nuclear Station, Units 1, 2 and 3 Draft Plant Specific Supplement to the Generic Environmental Impact Statement (GEIS) (TAC NOS. M99162, M99163, and M99164)

We would like to thank the NRC for the opportunity to comment on the Draft Supplement to the GEIS for Oconee Nuclear Station (ONS).

The only comment we have at this time concerns the reconciliation of the NPDES permit toxicity issue. The permit for ONS has been referred to the Bureau of Water Permit Administration Section for Public Notice to be published August 14, 1999. The permit is expected to become effective October 1, 1999 provided there are no challenges or appeals from the public during the 30-day Public Notice period. F, A.1.8

Should you have any questions or need additional information please contact Michael Gandy at (803)896-4246 or email at gandym@columb34.dhec.state.sc.us

Sincerely,

Virgil Autry, Director
Division of Radioactive Waste Management
Bureau of Land and Waste Management

cc: Mr. W. R. McCollum, Jr.
Vice President
Oconee Nuclear Station, Duke Energy Corp.

F-1

Hartsill Truesdale, Bureau Chief
SCDHEC Bureau of Land and Waste Management

David Wilson, Assistant Bureau Chief
SCDHEC Bureau of Land and Waste Management

Henry Porter, Section Manager
SCDHEC Bureau of Land and Waste Management

Alton Boozer, Bureau Chief
SCDHEC Bureau of Water

Luis Reyes, Regional Administrator
Nuclear Regulatory Commission - Region 2

LETTER G

Claude L. Gilbert, Jr.
1104 Candlewood Drive
Hopkins, South Carolina 29061

AUGUST 13, 1999

RECEIVED 64FR2884,
1999 AUG 16 PM 3 11 May 27, 99
RULES & DIR BRANCH
US NRC

(6)

CHIEF
Rules and Directives Branch
mailstop T-6D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: *REQUEST FOR COMMENT ON THE OCONEE NUCLEAR STATION, UNITS 1,2,and 3. DRAFT PLANT-SPECIFIC SUPPLEMENT TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT (TAC NOS. M99162 AND M99164)*

Dear Mr. Wilson

As a native South Carolinian, business owner and taxpayer I wish to express my view that Duke Power's request to relicense Oconee Nuclear Station should be denied. With no solution for nuclear waste except to throw it in the ground, Now is the time to stop the operation of this money pit. A nuclear phaseout is necessary, not relicensing these white elephants. Subsidizing a failed industry will not help America. G1, A.1.2

In light of the enclosed report sighting violations by Duke Power, this proves without a doubt that they are not qualified to run a nuclear reactor much less be allowed to extend the life of this dangerous process. The citizens of the US should come before the needs of a few stockholders. Tell the truth- do the right thing- shut down Oconee on time before it is too late. G2, A.1.13

Thank you

Claude L. Gilbert, Jr.

PS On another related note: MOX fuel is not the answer,(I fear Duke will later use Oconee for this even though they have stated they wont) reprocessing contaminates the environment and produces more waste. Please don't forget the health and well being of *everyone* on this planet. Please look at the situation in France (La Hague)and also in England (BNFL) to see what reprocessing does. G3, A.1.17

Public Citizen

Aug. 10, 1999

Regulations Violated at Nuclear Reactors Across Country

Public Citizen Study Finds Government's Failure to Enforce Regulations Undermines Safety

WASHINGTON, D.C. -- Safety has been compromised at nuclear reactors throughout the United States, with more than 90 percent of the country's reactors run in violation of government safety regulations over the last three years, a Pubic Citizen study has found. Rather than holding nuclear utilities accountable for violating these regulations, the Nuclear Regulatory Commission (NRC) has established an amnesty program that will last until March 30, 2001. This amnesty means that the NRC only holds utilities accountable for the most egregious rule violations.

The study, *Amnesty Irrational*, found that between October 1996 and May 1999, 102 of the country's 111 reactors were operated outside the safety parameters established in their licenses. When a nuclear reactor is operated outside these safety parameters it is called operating "outside design basis." During the three years analyzed, utilities operated their nuclear reactors "outside design basis" more than 500 times, the study found.

Utilities have failed to follow rules pertaining to such key safety systems as the emergency core cooling system and the electrical cables that control the nuclear reactor, the records revealed. Additionally, in some instances, a single event could have prevented the functioning of safety systems needed to do such things as shut down the reactor, cool the radioactive fuel in the reactor's core and prevent the release of radiation into the environment.

"Safety has been compromised at nuclear reactors across the United States," said James Riccio, staff attorney for Public Citizen's Critical Mass Energy Project. "In some cases, safety margins were significantly reduced, if not eliminated."

When a nuclear utility operates its reactor "outside design basis," it is impossible for the NRC or the utility to determine whether the reactor poses an undue risk to public health and safety. The more often a nuclear reactor is operated "outside design basis," the less certain that the reactor and its safety systems will operate as designed.

The NRC has long known that design basis problems were undermining the safety of nuclear reactors it was supposed to regulate. However, due to the potential

financial impact on the nuclear industry, the NRC has obfuscated the issue and delayed taking action, the report says.

"The NRC has ignored these important safety issues for decades," said Wenonah Hauter, director of Public Citizen's Critical Mass Energy Project. "If these nuclear reactors don't meet safety requirements, they should be shut down until they do."

Design basis issues already have contributed to the closure of three nuclear reactors: Haddam Neck, and Millstone Unit 1 in Connecticut, and Maine Yankee in Maine. However, the design basis issues that resulted in these shutdowns were not identified by the utilities. These problems came to light only because of events or whistleblower allegations that prompted NRC inspections. Furthermore, Public Citizen has found that the same design basis problems that resulted in these shutdowns exist at other reactors throughout the U.S.

"The NRC's amnesty program is an irrational move by an ineffective regulator and will not address the significant design basis issues that still exist at nuclear reactors across the United States," Riccio said.

Those reactors that have filed the most design basis event reports with the NRC are listed below.

REACTORS REPORTING "OUTSIDE DESIGN BASIS" 1996-1999

VERMONT YANKEE	1	VT Yankee Nuclear Power Corp.	VT	42
PILGRIM	1	Boston Edison Co.	MA	27
THREE MILE ISLAND	1	GPU Nuclear Corp.	PA	26
COOK	2	Indiana/Michigan Power Co.	MI	22
COOK	1	Indiana/Michigan Power Co.	MI	18
POINT BEACH	1	Wisconsin Electric Power Co.	WI	18
POINT BEACH	2	Wisconsin Electric Power Co.	WI	18
MILLSTONE	1	Northeast Nuclear Energy Co.	CT	16
OYSTER CREEK	1	GPU Nuclear Corp.	NJ	16
MILLSTONE	3	Northeast Nuclear Energy Co.	CT	16
PRAIRIE ISLAND	1	Northern States Power Co.	MN	14
CATAWBA	2	Duke Power Co.	SC	14
DIABLO CANYON	2	Pacific Gas & Electric Co.	CA	14
NINE MILE POINT	2	Niagara Mohawk Power Corp.	NY	14
HADDAM NECK	1	Northeast Nuclear Energy Co.	CT	13
PRAIRIE ISLAND	2	Northern States Power Co.	MN	13
OCONEE	3	Duke Power Co.	SC	12
DIABLO CANYON	1	Pacific Gas & Electric Co.	CA	11
OCONEE	2	Duke Power Co.	SC	11
CATAWBA	1	Duke Power Co.	SC	10
DAVIS-BESSE	1	Toledo Edison Co.	OH	10
NINE MILE POINT	1	Niagara Mohawk Power Corp.	NY	10
OCONEE	1	Duke Power Co.	SC	10
PALISADES	1	Consumers Power Co.	MI	10
INDIAN POINT	3	New York Power Authority	NY	10
INDIAN POINT	2	Consolidated Edison Co.	NY	9

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Return to Public Citizen Home Page

OCONEE's Licensee Events that are a result of being "Outside Design Basis"

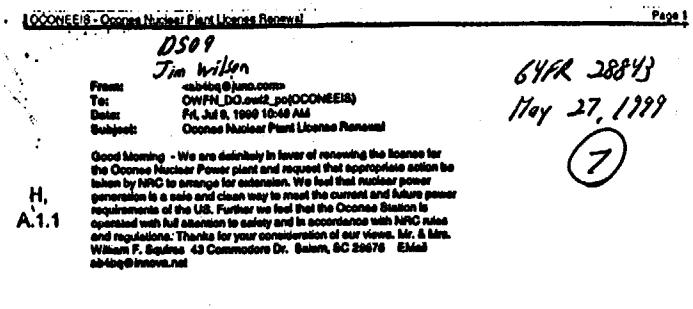
Located in SC and Region 2

32540	1, 2, 3	6/25/97	6/25/97	6/26/97		No	No	No	No	No
32227	1, 2, 3	4/26/97	4/26/97	4/26/97		No	No	No	No	No
35853	1, 2, 3	03/30/ 99	03/30/ 99	04/15/ 99		Yes	No	No	No	No
34856	1, 2, 3	9/19/98	9/19/98	9/19/98		No	No	No	No	No
33378	3	12/10/97	12/10/97	12/10/97		No	No	No	No	No
33378	3	12/10/97	12/10/97	12/12/97		No	Yes	No	No	No
33628	2, 3	1/30/98	1/30/98	1/30/98		No	No	No	No	No
33709	1, 2, 3	2/12/98	2/12/98	2/13/98		No	No	No	No	No
33762	1, 2, 3	2/20/98	2/20/98	2/20/98		No	No	No	No	Yes
33378	3	12/10/97	12/10/97	1/12/98		Yes	No	No	No	Yes
35411	1, 2, 3	02/26/ 99	02/26/ 99	02/26/ 99		No	No	No	No	No
35708	1, 2, 3	05/12/ 99	05/12/ 99	05/12/ 99		No	No	No	No	No
32640	1,2,3	9/25/97	9/25/97	10/15/97		Yes	No	No	No	No
35633	1, 2, 3	03/30/ 99	03/30/ 99	03/30/ 99		No	No	No	No	No
34990	1, 2, 3	10/1/98	10/1/98	10/2/98		No	No	No	No	No
34288	1, 2, 3	8/18/98	8/18/98	8/18/98		Yes	No	No	No	No
33663	1, 2	3/11/98	3/11/98	3/11/98		No	No	No	No	No

Enter Event Number From Above for Specific Details

Get Event Details

LETTER H



OCONEE1S - Oconee Nuclear Plant License Renewal Page 1

D509
Jim Wilson

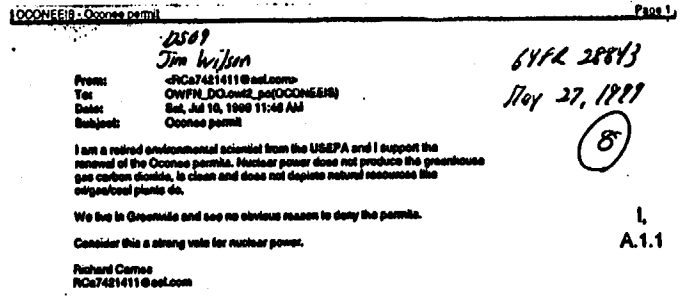
64FR 28843
May 27, 1999
(7)

From: <sb4bq@juno.com>
To: OWFN_DO.owf2_po(OCONEE1S)
Date: Fri, Jul 9, 1999 10:48 AM
Subject: Oconee Nuclear Plant License Renewal

Good Morning - We are definitely in favor of renewing the license for the Oconee Nuclear Power plant and request that appropriate action be taken by NRC to arrange for extension. We feel that nuclear power generation is a safe and clean way to meet the current and future power requirements of the US. Further we feel that the Oconee Station is operated with full attention to safety and in accordance with NRC rules and regulations. Thanks for your consideration of our views. Mr. & Mrs. William F. Squires 43 Commodore Dr. Salem, SC 29676 EMail sb4bq@innove.net

H,
A.1.1

LETTER I



OCONEE1S - Oconee permit Page 1

D509
Jim Wilson

64FR 28843
May 27, 1999
(8)

From: <RCa7421411@aol.com>
To: OWFN_DO.owf2_po(OCONEE1S)
Date: Sat, Jul 10, 1999 11:48 AM
Subject: Oconee permit

I am a retired environmental scientist from the USEPA and I support the renewal of the Oconee permits. Nuclear power does not produce the greenhouse gas carbon dioxide, is clean and does not deplete natural resources like oil/gas/coal plants do.

We live in Greenville and see no obvious reason to deny the permits.

Consider this a strong vote for nuclear power.

Richard Camso
RCa7421411@aol.com

I,
A.1.1

LETTER J

OCONEE3 - Comment on including Transmission Line Impacts in the Draft Supplement to the Generic Environmental Impact Stmt

8549
Jim Wilson

64FR28843
May 27, 1999

From: "Cudworth, Jon" <CudworthJ@duke.com>
To: "OCONEE3S" <OCONEE3S@nrc.gov>
Date: Mon, Jul 12, 1999 9:33 AM
Subject: Comment on including Transmission Line Impacts in the Draft Supplement to the Generic Environmental Impact Statement for Oconee Station

(9)

I have attached a Word 97 file that contains my comment. If you need the comment in another format, please let me know by return e-mail or by phone at (803) 948-7963 and I'll convert it.

<<T-Lines Comment.doc>>

Comment of Jon Cudworth Regarding Including Transmission Line Impacts in the Draft Generic Environmental Impact Statement Supplement for Oconee License Renewal

J, A.1.7

My name is Jon Cudworth and I reside at 325 Longleaf Ct, Aiken, South Carolina 29803. I believe that the U. S. Nuclear Regulatory Commission (NRC) should delete from the draft OEIS supplement for Oconee[1] all analysis of transmission line impacts. In the following paragraphs I offer the basis for my belief that, in including the transmission line analyses, NRC has exceeded its statutory authority.

As NRC indicates in the draft supplement, the National Environmental Policy Act (NEPA) requires environmental impact analysis for major Federal actions. NRC regulations require analysis of direct and indirect effects,[2] terms that the President's Council on Environmental Quality define as being caused by the action.[3] Put another way, if an effect would not be caused by the proposed Federal action, the effect is outside the scope of NEPA coverage for the proposed action. This requirement for a causal relationship between the Federal action and the effect is reflected in the NRC license renewal environmental regulation, which requires "...an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines..."[4] The threshold question regarding the relevance of transmission line impacts should be whether the proposed action, renewing the license, causes impact in the form of potential shock hazard.

I have read the Duke position on the irrelevance of the transmission lines to license renewal.[5] Duke has put forth facts that indicate that Oconee station transmission lines would remain in use even if the Oconee station were shut down. If the lines would remain in use, it would appear that the potential for shock hazard would exist regardless of license renewal. In such a case, there would be no causal connection between the proposed action, license renewal, and the impact, transmission line shock hazard potential. If uncontested, the Duke statements would indicate that Oconee transmission impacts are not germane to the NEPA analysis of Oconee station license renewal.

[1] *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Supplement 2; Oconee Nuclear Station; Draft Report for Comment*, NUREG-1437 Supplement 2, May 1999.
[2] 10 CFR 51 Subpart A Appendix A Items 7(a) and (b).
[3] 40 CFR 1508.8.
[4] 10 CFR 51.53(c)(3)(ii)(H).
[5] Letter, Tuckman to Document Control Desk, 3/4/99, Enclosure 2, Environmental RAI 11.

1 July 12, 1999

The NRC response to Duke regarding relevance of Oconee transmission line impacts[6] does not contest the Duke contention that the transmission lines would remain energized regardless of license renewal. Instead, the response indicates that the basis for determining the scope of the transmission lines is defined as those lines originally constructed for the specific purpose of connecting the plant to the transmission system. Frankly, I think that the NRC response misses the point.

At the time that Oconee was constructed, Oconee transmission line construction was a connected action and transmission line impacts were indirect impacts of plant construction. If the plant had not been built, the lines would not have been built. There was a causal relationship between the Federal action, licensing operation, and the impact of transmission line shock hazard potential. Analysis of potential shock hazards from Oconee transmission lines, therefore, would have been appropriate at that time. However, at the license renewal stage, absent a showing of such a causal relationship, there is no Federal action that causes transmission line impacts. NRC has failed to show that license renewal would be the cause of potential shock hazard from Oconee transmission lines.

It is possible that the wording of the NRC regulation is a source of confusion:

> If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendation of the National Electric Safety Code for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided. 10 CFR 51.53(c)(3)(ii)(H)

The regulatory requirement is a single sentence that is one paragraph long but it is in the basic logic form of an independent and a dependent clause (if A, then B). The basis for analysis that NRC presents is found in the independent clause. Duke does not appear to contest this clause, so it might be that the Oconee lines were constructed for the specific purpose of connecting the plant to the transmission system. However, regardless of whether the lines meet the referenced Code, one has to go on to see what the regulation requires – an assessment of the impact of the proposed action on the potential shock hazard. If the proposed action, license renewal, would have no impact on the potential shock hazard, then no further analysis should be necessary. Duke seems to have demonstrated persuasively that license

[6] Letter, Carpenter to McCollum, 3/10/99.

renewal would have no impact on the potential shock hazard.

The governing NRC regulation, 10 CFR 51, indicates that it implements NEPA.[7] If, in implementing this regulation, NRC requires an applicant to analyze something that NEPA and the implementing regulation do not require, isn't NRC exceeding its statutory authority? And if NRC includes the analysis in its NEPA document, isn't that exceeding the NRC authority? NEPA and 10 CFR 51 very clearly do not apply to impacts that are not caused by license renewal and Oconee transmission line impacts apparently are not caused by license renewal. I think that NRC is in error and should revise the Oconee GEIS supplement by 1) deleting transmission lines impact discussion and 2) adding an explanation that, because the lines would remain energized regardless of license renewal, any impacts from transmission line operation would not be caused by the proposed Federal action and are not within the scope of the GEIS supplement.

[7] 10 CFR 51.2.

LETTER K

0509
Jim Wilson

64FR 28843
May 27, 1999

(10)

Duke Power.
A Duke Energy Company

M. S. Tuckman
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August 17, 1999

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: License Renewal
Comments on Plant-Specific Draft Supplement to NUREG-1437
Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

By letter dated July 6, 1998, Duke Energy Corporation submitted an Application for Renewed Operating Licenses for Oconee Nuclear Station, Units 1, 2, and 3 (Application). Volume IV (Environmental Report) of the Application contains the environmental information required by 10 CFR Part 51. By two letters, each of which was dated December 29, 1998, the NRC staff requested additional information to complete its review of the environmental information. Duke provided written responses to these requests by letter dated March 4, 1999.

The results of the staff review of the environmental information provided in the Application are contained in the plant-specific draft supplement to NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, regarding the renewal of the operating licenses for Oconee Nuclear Station, Units 1, 2, and 3 (draft SEIS). By letter dated May 20, 1999, the NRC staff requested comments on the draft SEIS.

Ka, A.1.3

Duke agrees with the conclusions stated in the draft SEIS that:

- "Current measures to mitigate environmental impacts of plant operation were found to be adequate, and that no additional mitigation measures were deemed sufficiently beneficial to be warranted."
- "... the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of ONS."

Regarding the issue of transmission lines (discussed in SEIS Section 2.1.7), Duke acknowledges the position of the NRC as set forth in Section 2.1.7 of the SEIS (p. 2-13). However, Duke's position continues to be that the scope of the transmission lines that should be considered within the scope of the proposed action, as defined in the environmental report, are those lines that run from the Oconee Turbine Building to the 230kV and the 525kV switchyards. The bases for Duke's position are set forth in Section 4.9 of the Environmental Report and as part of Duke's March 4, 1999 response to NRC Request for Additional Information 11.

Kb, A.1.7

Attachment 1 provides our additional comments on the draft SEIS. In addition, other comments of an editorial nature have been previously discussed with the NRC staff. Since the NRC staff was aware of these items, Duke did not include these items in this letter.

If there are any questions regarding these comments, please contact Bill Miller at 704-373-7900.

Very truly yours,

M. S. Tuckman

M. S. Tuckman

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Attachment 1

Comments on
Generic Environmental Impact Statement
for
License Renewal of Nuclear Plants
Draft NUREG-1437
Supplement 2
Oconee Nuclear Station

Chapter Executive Summary, Frontmatter
Section N/A

Number	Page	Line	Comment
1	xvii	14	CCW should be "Condenser Circulating Water"

Chapter 1.0 Introduction
Section Table 1-1

Number	Page	Line	Comment
2	1-8	Table 1-1	The following permit should be added (Reference ER Table 7.2-1): Agency: SCDHEC Authority: RCRA, Section 3005 Requirement: Permit Permit Number: SCD043979822 Permit Issued: 3/9/1998 Activity Covered: Part A Hazardous Waste Permit, Interim Storage Facility for Mixed Wastes
3	1-8	11	Current NPDES permit is being in the process of being renewed. Line 11 should be revised to state: "The permit is currently being renewed [a]."
4	1-8	8	"ONS has two permits for drinking water wells in protected area" is not a correct statement. ONS has one drinking water well for the restroom facilities at the Site Softball Field. The permit number for this well is 202098AI. (Note that the Duke ER had supplied the information on the wells. During the review of this draft SEIS, Duke found that the site has only one well permitted as a drinking water well).
5	1-8	11	Permit Number for SCDHEC FWPCA is incorrect. The correct permit number is SC0000515.
6	1-8	22	Revise footnote (a) to state: "A NPDES permit renewal application was submitted by Duke on March 27, 1998. The draft permit will be issued in mid-August for a 30 day public comment period. See Section 2.2.3."

Attachment 1
Comments on Draft NUREG-1437
Supplement 2
Oconee Nuclear Station

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

Section N/A

Number	Page	Line	Comment
7	2-1	9	Should be "Babcock & Wilcox."

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

Section 2.1 Plant and Site Description and Renewal Term Plant operation

Number	Page	Line	Comment
8	2-5	1	Revise sentence to state: "ONS is located on the shores of Lake Keowee. The main bodies of the lake lie to the north and to the southwest of the site."
9	2-5	32	Several of the amenities at the Visitor's Center (lakeside picnic center and landscaped grounds) are mentioned, but the nice nature trail is not mentioned. This trail is used extensively by civic organizations and schools and is a great place for wildflower tours.

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

Section 2.1.1 External Appearance and Setting

Number	Page	Line	Comment
10	2-6	Figure 2-4	Figure 2-4 appears to list the ONS 525 kV switchyard as the "825 kv Switchyard." Also the standard abbreviation for kilovolt is kV, not kv, as is used in this figure.

Attachment 1
Comments on Draft NUREG-1437
Supplement 2
Oconee Nuclear Station

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

Section 2.1.2 Reactor Systems

Number	Page	Line	Comment
11	2-7	12	Line 12 should be revised to state: "But because of their distance from the site, these zones ..."
12	2-7	29	Should be "Babcock & Wilcox."
13	2-7	34	ONS can use fuel up to 5% enrichment. Line should be revised to state: "ONS fuel is low enriched (up to 5 percent by weight) ..."

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

Section 2.1.3 Cooling and Auxiliary Water Systems

Number	Page	Line	Comment
14	2-8	23-25.	Oconee License Renewal SER Section 2.2.3.6.3.2.1 (Page 2-102) Intake Structure within Scope of License Renewal and Subject to an Aging Management Review states that: "the licensing basis does not rely on the underwater weir nor recirculation of the intake canal water for decay heat removal after a loss of Lake Keowee event. Based on the above documentation, the staff agrees with the applicant's determination that the underwater weir is not within the scope of license renewal." Therefore, the description of the function of this weir on Lines 23-25 is not applicable. It is appropriate to describe the weir and its location, but the description of the function should be deleted. Delete the sentence beginning: "The purpose of this dam is to retain...."
15	2-8	27	The sentence refers to Figure 2-4, showing the location of such intake features like the skimmer wall, intake structure, submerged dam, and the outfall. The location of the submerged dam is not shown on the figure.

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

Number	Page	Line	Comment
16	2-9	19	Evaporation is not a waste processing method; therefore, evaporator concentrates are not produced.
17	2-10	18 – 20	The Radwaste Facility processes high-activity wastes, low-activity wastes and miscellaneous wastes from the Auxiliary Building, not the opposite as currently stated in lines 18 through 20.
18	2-10	26	Dilution is not considered part of processing. The waste is released prior to any dilution. However, hydro dilution flow is used in determining the release rate. Delete statement: "(diluted to meet the permissible concentration limits for discharge)...."
19	2-10	35	The value "28,343 m^3 (944,773 ft^3) per year" is the potential waste generation rate. The liquid waste holdup capacity is approximately 80,000 gallons.
20	2-11	10	Gases are also produced in tanks and piping other than those holding liquid wastes (e.g. Letdown Storage Tank, Core Flood Tank). Line should be revised to state: "... by the evolution of gases in liquids contained in tanks and piping."
21	2-11	30	The word "limit" should be inserted after "rate."

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.1.5 Nonradioactive Waste Systems

Number	Page	Line	Comment
22	2-12	14-15	Change to "reactor coolant system make-up water, steam generator make-up water..."
23	2-12	15 – 18	These lines should be changed to state: "... and deborating demineralizers. Non-sanitary, nonradioactive wastes are neutralized and sent to the holding ponds, eventually being discharged to the Keowee River, downstream from the Keowee Hydroelectric Station. Sanitary wastes are routed to an aerated sewage lagoon. The effluents are treated by chlorination. Prior to discharge, the treated effluents from the sanitary waste treatment system are dechlorinated."

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.1.7 Power Transmission System

Number	Page	Line	Comment
24	2-13	7-28	As stated in the Duke response to RAI 11, the lines that were constructed for the specific purpose of connecting the plant to the transmission system are those lines that run from the Oconee Turbine Building to the 230 kV and 525 kV switchyards.

Attachment 1
Comments on Draft NUREG-1437
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Oconee Nuclear Station

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.2 Water Use

Number	Page	Line	Comment
25	2-15	32-33	Revise line to state: " ... provide once-through condenser circulating water (CCW)."
26	2-15	35	The amount of water supplied from the Seneca water treatment plant and used for potable water is 120 m^3/d [0.03 million gpd]. Revise line to state: "... treatment plant (120 m^3/d [0.3 million gpd]) is used for potable water."
27	2-16	Figure 2-7	The average flow through Keowee Hydroelectric Station is listed as 1632 cfs. The correct value is 1032 cfs.
28	2-16	8-12	Revise to state: "There are a total of seven groundwater wells at the Oconee site. One of these wells is used to supply the site baseball field with drinking water and with water for a restroom facility. This well is also used for seasonal irrigation at the site baseball field and has a pumping capacity of 0.0019m^3/s (30 gpm). The well at the baseball field is the only groundwater well on site permitted to supply drinking water. There are two groundwater wells used to supply seasonal irrigation for landscaping at a training building and an office complex. The other four wells are used infrequently as low volume, non-potable water sources. The estimated combined pumping rate for all groundwater wells at the Oconee site is less than 0.068 m^3/s (100 gpm)."

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Comments on Draft NUREG-1437
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Oconee Nuclear Station

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.3 Water Quality Data

Number	Page	Line	Comment
29	2-17	24	Insert "state" in front of agency.
30	2-17	26	The 1998 toxicity issue has been resolved. The sentence referring to this issue should be deleted. Line 26 should be revised to state: "The permit is currently being renewed. A NPDES permit renewal application was submitted by Duke on March 27, 1998. The draft permit will be issued in mid-August for a 30 day public comment period."

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.4 Air Quality

Number	Page	Line	Comment
31	2-18	18	Add footnote stating: "In May, 1999 the Federal Court of Appeals (D.C. Circuit) remanded EPA's revisions to the ground-level ozone and particulate matter standards. The court held that there was no basis for either revision, and that the revised ozone standard was unconstitutional. Therefore, future implementation of revisions to these standards is uncertain."
32	2-18	23-24	Add Ellicott Rock Wilderness Area and Middle Prong Wilderness Areas.

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.6 Aquatic Resources

Number	Page	Line	Comment
33	2-19	16	Delete the word "aquatic."

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Attachment 1
Comments on Draft NUREG-1437
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Oconee Nuclear Station

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.7 Radiological Impacts

Number	Page	Line	Comment
34	2-23	10	Insert "Hartwell Reservoir" following "Lake Keowee" in the list of aquatic environments.

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.9.2 Historical and Archaeological Sites at ONS

Number	Page	Line	Comment
35	2-41	7 - 10	The reference to the location of these sites should be deleted to protect these areas from unauthorized excavation. It should be sufficient to mention that two sites exist, southwest of the plant and that these sites are categorized as having nondescript lithic scatter.

Chapter 3.0 Environmental Impacts of Refurbishment
Section Table 3-2

Number	Page	Line	Comment
36	3-3	14	This line lists "Public services: public utilities." This appears to be a single issue. 10 CFR Part 51, Subpart A, Table B-1 lists these as two separate issues. This should be corrected by listing these two issues separately.
37	3-3	20	This table lists Environmental Justice as a Category 2 issue related to refurbishment. GEIS Table 9.1 does not list Environmental Justice as a Category 2 issue. The footnote used in GEIS Table 9.1 should be referenced to this issue in Table 3.2.

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Attachment 1
Comments on Draft NUREG-1437
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Oconee Nuclear Station

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.1 Cooling System

Number	Page	Line	Comment
38	4-2	12	The appropriate GEIS reference sections for the issue "Altered thermal stratification of lakes" are sections 4.2.1.2.3 and 4.4.2.2. Line 12 incorrectly lists GEIS Section 4.2.1.2.2 as a reference section. This should be corrected.

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

Number	Page	Line	Comment
39	4-8	2	It is stated that the NPDES permit governs the release of effluents by Oconee Nuclear Station into the receiving waters of "Lake Keowee." The permit also governs discharges that go into Keowee Hydro's tailrace. Therefore it is recommended that the wording be changed to also include "and to the Keowee Hydro Station's tailrace."
40	4-8	4	The 1998 toxicity issue has been resolved. The sentence referring to this issue should be deleted. Line 4 should be revised to state: "The permit is currently being renewed. The draft permit will be issued in mid-August for a 30 day public comment period."

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Attachment 1
Comments on Draft NUREG-1437
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Oconee Nuclear Station

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.1.2 Impingement of Fish and Shellfish

Number	Page	Line	Comment
41	4-9	7	It is stated that the NPDES permit governs the release of effluents by Oconee Nuclear Station into the receiving waters of "Lake Keowee." The permit also governs discharges that go into Keowee Hydro's tailrace. Therefore it is recommended that the wording be changed to also include "and to the Keowee Hydro Station's tailrace."
42	4-10	18	Draft states "Although the 316(b) demonstration was not formally approved...." Duke is not aware of any correspondence indicating that the 316(b) demonstration was not formally approved. This portion of the sentence should be deleted or the sentence should be revised to state "No correspondence could be located indicating EPA's formal approval of the study. However, the EPA issued a modified NPDES permit on August 30, 1976 that deleted ..."

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.1.3 Heat Shock

Number	Page	Line	Comment
43	4-11	37	It is stated that Duke submitted a reapplication in "April" 1998. This should be replaced to state "March, 1998."

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Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.1.4 Microbiological Organisms

Number	Page	Line	Comment
44	4-12	9	10 CFR 51.53(c)(3)(ii)(G) states $9x10^{10}$ m^3 /year, not $9x10^{12}$ m^3 /year as stated in the document. Revise Line 9 to state: "that is lower than the $9 \times 10^{10} m^3$ per year..."
45	4-12	8 – 12	The following revision is suggested: "The combined flow rate for the Keowee and Little Rivers is lower than the $9x10^{10}$ m^3/year ($3.15x\ 10^{12}$ ft^3/year) specified in the 10 CFR 51.53 (c)(3)(ii)(G). This low flowrate raises a concern from the standpoint of the potential for enhancement of thermophylic microorganisms such as *Naegleria fowleri*. These type of organisms could be a potential health concern for members of the public swimming in the cooling source (Duke 1998a)."

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.2.2 Electromagnetic Fields – Chronic Effects

Number	Page	Line	Comment
46	4-15	41	The conclusion for GEIS Section 4.5.4.2.3 states: "If NRC finds that a consensus has been reached by appropriate federal health agencies that there are adverse health effects, all license renewal applicants will have to address the health effects in the license renewal process." SEIS Section 4.2.2 states that on this issue "evidence is inconclusive." To ensure closure on this issue, Line 41 should be revised to add: "Therefore, no further review is required for this issue in this SEIS."

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.4.5 Historical and Archeological Resources

Number	Page	Line	Comment
47	4-22	26	Lines 22 through 26 discuss the need to take additional care during normal operation and maintenance activities on site to protect cultural resources. To ensure this protection occurs, Duke has revised the ONS site work practices on land disturbing activities. Revise Line 26 to add: "To ensure that care is taken to protect cultural resources that may be encountered during construction or other land disturbing activities, the ONS site environmental work practices have been revised. If archeological sites are identified during land disturbing activities, land disturbing activities will stop and the State Historic preservation Office will be contacted to determine the appropriate steps to be taken prior to resuming the activities."

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.6 Threatened or Endangered Species

Number	Page	Line	Comment
48	4-28	23-31	References to "preliminary" analysis and "preliminary" determination should be changed to final once the USFWS concurs with the NRC staff biological assessment conclusions, if that occurs prior to the issuance of the Final SEIS.
49	4-28	28	Line should be revised to state: "conducting surveys of sensitive habitats prior to initiation of construction activities for new transmission lines."

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.8 Summary of Impacts of Operations During the Renewal Term

Number	Page	Line	Comment
50	4-29	22	The following statement should be added at the end of Line 22: "Therefore, no evaluation of this issue is required."

Chapter 4.0 Environmental Impacts of Operation During the Renewal Term
Section 4.9 References

Number	Page	Line	Comment
51	4-29	35	The citation reference "(Should come with RAI)", needs to be clarified.
52	4-30	20	The correct reference is "Letter from M.S. Tuckman..."

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.3.2 Staff Evaluation

Number	Page	Line	Comment
53	5-13	24	"component cooling water" should be changed to "condenser circulating water"

Chapter 6.0 Impacts from the Uranium Fuel Cycle and Solid Waste Management
Section 6.1 The Uranium Fuel Cycle

Number	Page	Line	Comment
54	6-6	18	Reference is made to the Baltimore Gas and Electric (BGE) ER. This Draft SEIS is written for Duke Energy Corporation's Oconee plant. The correct reference is "the Oconee ER."
55	6-6	29	Reference for identification of new and significant information is made to the BGE ER. This Draft SEIS is written for Duke Energy Corporation's Oconee plant. The correct reference is "the Oconee ER."

Attachment 1
Comments on Draft NUREG-1437
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Chapter 8.0 Alternatives to License Renewal
Section 8.1 No-Action Alternative

Number	Page	Line	Comment
56	8-2	40-43	Water quality on Lake Keowee is affected by many factors other than the factors that Duke has an influence over by the operation of the Duke plants or by the operation of its subsidiaries. Duke is proud to provide corporate and technical assistance to various entities in the region concerned with water quality issues. However, SCDHEC is the state agency responsible for water quality on South Carolina lakes, rivers, and streams. Revise Line 40 to state: "... exceptionally high if Oconee closes. Therefore, the corporate and technical leadership and assistance that Duke voluntarily provides in the area of water quality monitoring may be less readily available." Delete the sentence beginning:" If water quality begins to decline, ..."

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Attachment 1
Comments on Draft NUREG-1437
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Oconee Nuclear Station

Chapter 8.0 Alternatives to License Renewal
Section 8.2 Alternative Energy Sources

Number	Page	Line	Comment
57	8-4	22	Revise to state "sulfur dioxide emissions ..."
58	8-4	30	Line should be clarified by revising to state: "Approximately 90 percent of the 700,000 tons of ash would be flyash and the remaining 10 percent would be bottom ash."
59	8-4	36	Revise to state: "Facilities would be constructed to control and treat leachate from ash and scrubber waste disposal areas and runoff from coal storage areas."
60	8-5	15	Revise to state: "Total waste volume would be 900,000 MT (1,000,000 tons)/yr. of ash and scrubber sludge."
61	8-7	31	Revise line to state: "However, leachate from ash and scrubber waste disposal areas and runoff from coal storage areas would have to be controlled to avoid groundwater and surface water contamination."
62	8-9	36	Revise to state "approximately 900,000 MT (1,000,000 tons)/yr. of this waste..."
63	8-12	33	The Duke ER supplied information on use of forced draft cooling towers. Duke would not likely use natural draft cooling towers due to the aesthetic difference between natural draft and forced draft cooling towers. Recommend removing the first sentence.

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Chapter 8.0 Alternatives to License Renewal
Section 8.2 Alternative Energy Sources (Continued)

Number	Page	Line	Comment
64	8-12	37-38	This line reads as if Catawba has a natural draft cooling tower. Catawba has forced draft cooling towers. Duke would not likely use natural draft cooling towers.
65	8-13	1	Remove first sentence. Duke does not consider natural cooling towers as an option.
66	8-13	29	Add "Addition of 30M (100 ft) tall cooling towers or...."
67	8-15	13	Duke would not likely use natural draft cooling towers due to the aesthetic difference between natural draft and forced draft cooling towers. Remove reference to natural draft cooling towers.
68	8-17	23	Units for waste should be units of volume, not area. Duke estimates the volume for this waste would be "2500 ft^3/yr of spent catalyst...."
69	8-22	23-26	Duke would not likely use natural draft cooling towers due to the aesthetic difference between natural draft and forced draft cooling towers. Remove this sentence and reference. Catawba uses forced draft cooling towers.
70	8-23	23	Add statement :"Addition of 30M (100-ft) high mechanical draft cooling towers."

Chapter 8.0 Alternatives to License Renewal
Section 8.3 References

Number	Page	Line	Comment
71	8-29	1	The date of the reference is May 13, 1999. The letter is from M. S. Tuckman.

Chapter 9.0 Summary and Conclusions
Section N/A

Number	Page	Line	Comment
72	9-3	25	Add statement: "Therefore, no further analysis of the chronic effects of electromagnetic fields is required."

Chapter 9.0 Summary and Conclusions
Section 9.1 Environmental Impacts of the Proposed Action- License Renewal

Number	Page	Line	Comment
73	9-4	13	The fifth word on the line reads 'bonds.' This should be revised to "bounds."

Chapter 9.0 Summary and Conclusions
Section 9.3 Staff Conclusions and Recommendations

Number	Page	Line	Comment
74	9-6	16	Wording "preliminary" should be deleted upon release of final document.

Chapter Appendix C Chronology of Licensing Correspondence
Section N/A

Number	Page	Line	Comment
75	C-2	5	The date of the reference is May 13, 1999. The letter is from M. S. Tuckman.

Chapter Appendix D Organizations Contacted
Section N/A

Number	Page	Line	Comment
76	D-2	11	Should be Asheville, not Charlotte.
77	D-2	13	Should be Charleston, not Columbia.

Chapter Appendix E Duke Compliance Status and Consultations
Section Table E-1

Number	Page	Line	Comment
78	E-2	Table E-1	The following permit should be added (Reference ER Table 7.2-1): Agency: SCDHEC Authority: RCRA, Section 3005 Requirement: Permit Permit Number: SCD043979822 Activity Covered: Part A Hazardous Waste Permit, Interim Storage Facility for Mixed Wastes
79	E-2	16	Add footnote to Line 16. Line 16 should state: "being revised[a]" Footnote (a) should be added to end of Table E-1 to state: "A NPDES permit renewal application was submitted by Duke on March 27, 1998. The draft permit will be issued in mid-August for a 30 day public comment period. See Section 2.2.3."
80	E-2	30	"ONS has two permits for drinking water wells in protected area" is not a correct statement. ONS has one drinking water well for the restroom facilities at the Site Softball Field. The permit number for this well is 202098AI. (Note that the Duke ER had supplied the information on the wells. During the review of this draft SEIS, Duke found that the site has only one well permitted as a drinking water well).

Chapter Appendix F- GEIS Environmental Issues Not Applicable to the Oconee Nuclear Station
Section N/A

Number	Page	Line	Comment
81	F-1, F-2	N/A	The GEIS issues related to impacts from refurbishment activities are not listed in this section. There are nine Category 1 issues and nine Category 2 issues that are related to refurbishment activities (Reference Table 3-1 and 3-2). These should be repeated in this table. An alternative to listing these issues in Appendix F would be to change the title to " Appendix F GEIS Environmental Issues Not Applicable to the Oconee Nuclear Station Because of Plant or Site Characteristics".
82	F-1	28	The appropriate GEIS reference sections for the issue listed on lines 28 – 30 is 4.8.1.3. Lines 28 – 29 incorrectly list GEIS Sections 4.3.2.1 and 4.4.2.1 as the GEIS sections for this issue.

A.3 References

10 CFR 50.59, "Changes, tests and experiments."

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.20, "Criteria for and identification of licensing and regulatory actions requiring environmental impact statements."

10 CFR 51.53, "Postconstruction environmental reports."

10 CFR 51.95, "Postconstruction environmental impact statements."

10 CFR 54.21, "Contents of application – technical information."

10 CFR 54.30, "Matters not subject to a renewal review."

10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-level Radioactive Waste."

61 FR 28467, "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses. Final Rule." June 5, 1996.

61 FR 66537, "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses. Final Rule." December 18, 1996.

64 FR 9884, "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses. Proposed Rule. February 26, 1999.

64 FR 9889, "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, Availability of Supplemental Environmental Impact Statement." February 26, 1999.

64 FR 28843, "Duke Energy Corporation, Oconee Nuclear Station, Units 1, 2 and 3; Notice of Availability of the Draft Supplement to the Generic Environmental Impact Statement and Public Meeting for the License Renewal of Oconee Nuclear Station, Units 1, 2 and 3." May 27, 1999.

64 FR 48496, U.S. Nuclear Regulatory Commission. "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rules." September 3, 1999.

64 FR 50507, "Environmental Impact Statements; Notice of Availability. EIS No. 990310, Final Supplement, NRC, Generic EIS – License Renewal of Nuclear Power Plants Operating Licenses, NUREG-1437, Addendum 1." September 17, 1999.

Cardis, E. and J. Esteve. 1992. *International Collaborative Study of Cancer Risk Among Nuclear Industry Workers, II Protocol.* International Agency for Research on Cancer Internal Report 92/001.

Duke Energy Corporation. 1999. Letter from M.S. Tuckman, Duke Energy Corporation to U.S. Nuclear Regulatory Commission. Subject: License Renewal - Response to Requests for Additional Information, Oconee Nuclear Station. Dated March 4, 1999.

Jablon, S. 1990. *Cancer in populations living near nuclear facilities.* National Institute of Health (NIH) Publication Number 90-874. Washington, D.C.

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

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

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 statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations and the Pacific Northwest National Laboratory.

Name	Affiliation	Function or Expertise
	NUCLEAR REGULATORY COMMISSION	
James H. Wilson	Nuclear Reactor Regulation	Project Manager, Ecology
Thomas Kenyon	Nuclear Reactor Regulation	Project Management
Barry Zalcman	Nuclear Reactor Regulation	Section Chief and Technical Monitor
Cynthia Sochor	Nuclear Reactor Regulation	Environmental Engineer
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Claudia Craig	Nuclear Reactor Regulation	Environmental Engineer
Kimberly Leigh	Nuclear Reactor Regulation	Environmental Scientist
James G. Luehman	Nuclear Reactor Regulation	Project Management
Robert Jolly	Nuclear Reactor Regulation	Environmental Engineer
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Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
John Monninger	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Sid Feld	Nuclear Regulatory Research	Severe Accident Mitigation Alternatives
Nicholas Saltos	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
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Susan L. Blanton		Aquatic Ecology
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Michael R. Sackschewsky		Terrestrial Ecology
Paul R. Nickens		Cultural Resources
Paul L. Hendrickson		Land Use
Lance W. Vail		Water Use, Hydrology
Wayne C. Cosby		Technical Editor

(a) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to the Duke Application for License Renewal of Oconee Nuclear Station, Units 1, 2, and 3

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to the Duke Application for License Renewal of Oconee Nuclear Station, Units 1, 2, and 3

This appendix contains a chronological listing of correspondence between the NRC and Duke Energy Corporation (Duke) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of Duke's application for renewal for the Oconee Nuclear Station (ONS) Units 1, 2, and 3 operating licenses. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, D.C., and the Oconee County Library, 501 West Broad Street, Walhalla, SC 29691.

July 6, 1998	Letter from Duke Energy Corporation to NRC forwarding the application for renewal of operating licenses for the Oconee Nuclear Station, Units 1, 2, and 3, requesting extension of operating licenses for an additional 20 years
July 31, 1998	Letter from C. Grimes, NRC, to Duke Energy Corporation transmitting proposed NRC review schedule for Duke Energy Corporation application for renewal of operating licenses for Oconee Nuclear Station, Units 1, 2, and 3
August 5, 1998	Letter from J. Roe, NRC, to Duke Energy Corporation, transmitting *Federal Register* Notice of Acceptance for Docketing of the Application and Notice of Opportunity for a Hearing Regarding Renewal of Licenses Nos. DPR-38, DPR-47, and DPR-55
August 26, 1998	Letter from Duke Energy Corporation to NRC forwarding letter from U.S. Fish and Wildlife Service that concurs with the utility's determination contained in its environmental report that proposed action will have no effect on listed or proposed threatened or endangered species
September 14, 1998	Letter from T. Essig, NRC, to Duke Energy Corporation transmitting *Federal Register* Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process in support of the review of the application for renewal of the Oconee Nuclear Station, Units 1, 2, and 3 operating licenses for an additional 20 years
September 21, 1998	Letter from M. Bunch, Wildlife Diversity of the South Carolina Department of Natural Resources (SC DNR), to NRC commenting on license renewal of the Oconee Nuclear Station

October 8, 1998	Letter from Duke Energy Corporation to NRC forwarding the South Carolina Department of Natural Resources letter which concurred with the licensee's report regarding impacts of license renewal to threatened and endangered species
October 9, 1998	Meeting notice for October 19, 1998, scoping meeting in support of the environmental review for Oconee Nuclear Station license renewal
October 14, 1998	Letter from R. Keck, National Wild Turkey Federation, to NRC commenting on license renewal of the Oconee Nuclear Station, Units 1, 2, and 3
October 30, 1998	Letter from R. Nash, Appalachian Council of Governments, to NRC in support of Oconee license renewal
November 5, 1998	Memorandum from J. Wilson, NRC, to T. Essig, NRC, summarizing the Oconee Nuclear Station scoping meeting held in support of the review of Oconee's license renewal application
November 6, 1998	Letter from A. Viney, South Carolina Wildlife Federation, to the NRC regarding the environmental scoping process for Oconee Nuclear Station license renewal
November 9, 1998	Memorandum from J. Wilson, NRC, to T. Essig, NRC, summarizing the Oconee Nuclear Station site visit in support of the environmental review for the license renewal application.
November 10, 1998	Letter from D. Bauknight, Natural Resources Conservation Service, to NRC regarding the environmental scoping process for Oconee license renewal
November 10, 1998	Letter from C. Gilbert to NRC expressing his view that the Oconee license renewal application should be denied
November 20, 1998	Letter from J. Wilson, NRC, acknowledging receipt of written comments during the scoping process regarding Oconee license renewal
November 30, 1998	Letter from T. Essig, NRC, to United Keetowah Band of Cherokee inviting comment on Oconee license renewal
December 7, 1998	Letter from T. Essig, NRC, to M. Bunch, Wildlife Diversity of the SCDNR, regarding the scope of review for threatened and endangered species
December 29, 1998	Letter from J. Wilson, NRC, to Duke Energy Corporation forwarding requests for additional information (RAI) for the review of the Oconee Nuclear Station license renewal application regarding severe accident mitigation alternatives
December 29, 1998	Letter from J. Wilson, NRC, to Duke Energy Corporation forwarding RAIs for the review of the Oconee Nuclear Station Environmental Report associated with license renewal
January 15, 1999	Letter from Duke Energy Corporation to NRC stating that environmental RAI responses would be provided on or before March 4, 1999 and severe accident mitigation alternative RAIs would be provided by March 12, 1999

January 20, 1999	Letter from J. Wilson, NRC, forwarding environmental scoping summary report to scoping participants and other interested parties
March 1, 1999	Letter from J. Wilson, NRC, to South Carolina Department of Health and Environmental Control (SCDHEC) requesting information on the current status of the National Pollutant Discharge Elimination System and land disposal permits, and any water quality issues
March 1, 1999	Letter from J. Wilson, NRC, to Federal Energy Regulatory Commission (FERC) requesting information on the current status of the FERC license for Keowee dam and hydro-electric station and any other information that NRC should be aware of regarding future operation
March 4, 1999	Letter from M.S. Tuckman, Duke Energy Corporation, to the NRC transmitting the response to the requests for additional information
April 21, 1999	Letter from R. Gandy, of SCDHEC, to NRC stating that Oconee has been assigned an NPDES permit number and that resolution of toxicity testing issues and the public comment period must be completed before issuance of a permit.
April 29, 1999	Letter from J. Wilson, NRC, to Duke Energy Corporation forwarding followup to request for additional information dated December 29, 1998, related to the environmental portion of the review of the license renewal application for Oconee Nuclear Station.
May 10, 1999	Letter from C. Carpenter, NRC, to Duke Energy Corporation transmitting NRC staff's determination of the scope of transmission lines for the review of Duke Energy's license renewal application.
May 13, 1999	Letter from M.S. Tuckman, Duke Energy Corporation, to NRC transmitting the response to the followup to the request for additional information related to the environmental portion of the review of the license renewal application for Oconee Nuclear station.
May 17, 1999	Memorandum from J. Wilson, NRC, to B. Zalcman, NRC, regarding NRC engagement of discussion with the U.S. Fish and Wildlife Service in support of the environmental review for license renewal
May 20, 1999	Letter from J. Wilson, NRC, to Duke Energy Corporation forwarding the Oconee plant-specific draft supplement to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)
May 18, 1999	Letter from D. Matthews, NRC, to Duke Energy Corporation forwarding the Federal Register Notice of Availability of the draft supplements to the GEIS
May 27, 1999	Letter from N. Brock, SC State Historic Preservation Office, to NRC commenting on the impact of Oconee license renewal to historic properties

June 22, 1999	Memorandum from J. Wilson, NRC, to C. Carpenter, NRC, announcing a July 7, 1999, public meeting in Clemson, SC to obtain comments on the draft supplement to the GEIS
June 30, 1999	Letter from C. Carpenter, NRC, to R. Banks, Fish and Wildlife Service, forwarding biological assessment to evaluate whether proposed renewal of Oconee Nuclear Station operating licenses would have adverse effects on listed species
July 19, 1999	Letter from J. Lee, Department of Interior (DOI), to NRC providing no comment on the draft supplement to the GEIS
July 9, 1999	E-mail from W. Squires to NRC providing comment in support of Oconee Nuclear Station license renewal
July 10, 1999	E-mail from R. Carnes to NRC providing comment in support of Oconee Nuclear Station license renewal
August 12, 1999	Letter from P. League, SCDNR, to NRC regarding its intention to submit comments on the draft supplement to the GEIS
August 17, 1999	Letter from Duke Energy Corporation to NRC forwarding Duke's comments on the draft supplement to the GEIS
August 27, 1999	Memorandum from J. Wilson, NRC, to C. Carpenter, NRC, providing the meeting summary for the public meeting on the draft supplement to the GEIS held in Clemson, South Carolina on July 8, 1999
September 2, 1999	Letter from R. Banks, DOI, to C. Carpenter, NRC, providing comments on the biological assessment submitted regarding license renewal at Oconee Nuclear Station
November 4, 1999	Letter from B. Cole, FWS to C. Carpenter, NRC, concurring on the staff's June 30, 1999, biological assessment for Oconee Nuclear Station license renewal

C.1 Reference

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, State, regional, and local agencies were contacted:

Anderson County, Department of Economic and Community Development, Anderson County, Clemson, South Carolina

Appalachian Council of Governments, Economic Development/Planning Services, Greenville, South Carolina

Bureau of Water, SC Department of Health and Environmental Control, Columbia, South Carolina

Coldwell Banker (Appraiser), Anderson, South Carolina

Federal Energy Regulatory Commission, Office of Hydropower Licensing, Washington, DC

HITT & Associates (Appraiser), Pickens, South Carolina

Institute of Earth Science, University of South Carolina, Columbia, South Carolina

Keowee–Toxaway State Park, Sunset, South Carolina

Knight Realty & Appraisals, Pickens, South Carolina

Landrith and Associates (Appraisers), Seneca, South Carolina

Luther Fields (Appraiser), Clemson, South Carolina

Moss and Associates (Appraiser), Walhalla, South Carolina

Museum of the Cherokee Indians, Cherokee, North Carolina

North Carolina Department of Parks and Recreation, Natural Heritage Program, Raleigh, North Carolina

Oconee County, Department of Economic Development, Oconee County, Walhalla, South Carolina

Old Pickens Presbyterian Church, Perpetual Care Committee, Salem, South Carolina

Pickens County, Economic Development and Planning Department, Pickens County, Pickens, South Carolina

Pickens County Museum, Pickens, South Carolina

Planner for Oconee County Social Services, Oconee County, Walhalla, South Carolina

Secretary for the Oconee County Planning Commission, Walhalla, South Carolina

South Carolina Department of Natural Resources, Wildlife Diversity office

South Carolina Institute of Archaeology and Anthropology (State Archaeologist), University of South Carolina, Columbia, South Carolina

South Carolina State Historic Preservation Office, Columbia, South Carolina

State Toxicologist, South Carolina Department of Health and Environmental Control, Columbia South Carolina

U.S. Fish and Wildlife Service, Asheville, North Carolina

U.S. Fish and Wildlife Service, Charleston, South Carolina

Appendix E

Duke Compliance Status and Consultations

Appendix E

Duke Compliance Status and Consultations

As part of Duke Energy Corporation's (Duke's) application for renewal of their operating licenses for Oconee Nuclear Station (ONS) Units 1, 2, and 3, they prepared a list of licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities pertinent to ONS operations. The list, with minor changes to reflect the current status of these documents, is shown in Table E-1.

Correspondence from Federal and State agencies acknowledging Duke's permits and status compliance with requirements is also attached, including

- South Carolina Department of Health and Environmental Control (SCDHEC) cover letter, dated September 29, 1999, and front page from the National Pollutant Discharge Elimination System (NPDES) permit identifying effective dates.

- SCDHEC letter, dated October 25, 1996, stating that there seems to be no significant threat to offsite persons from pathogenic microorganisms whose abundance might be promoted by artificial warming of recreational waters.

- U.S. Fish and Wildlife Service (FWS) letter, dated June 26, 1999, concurring with determination of no effect on listed or proposed endangered or threatened species.

- FWS letter, dated November 4, 1999, discussing threatened and endangered species within the power transmission line corridors.

- State Historic Preservation Office letter, dated September 30, 1997, stating that they know of no properties included in or eligible for inclusion in the National Register of Historic Places that will be affected by this project.

Table E-1. Oconee Environmental Permits and Compliance Status

Oconee Environmental Permits	Federal Act	Federal, State or Local Permitting Agency	Date Permit Issued or Expired/ Compliance Status
Operating Licenses DPR-38, DPR-47, and DPR-55	Atomic Energy Act, 10 CFR Part 50	NRC	Expires February 6, 2013; October 6, 2013; and July 19, 2014
Independent Spent Fuel Storage Installation, Materials License No. SNM-2503	Atomic Energy Act, 10 CFR Part 72	NRC	Expires January 31, 2010
FERC Project No. 2503	Federal Power Act, Section 4(e)	Federal Energy Regulatory Commission	Expires 2016
NPDES Permit # SC0000515	Federal Water Pollution Control Act (FWPCA) Section 402	SCDHEC	Issued September 29, 1999 Expires September 30, 2003
Part A Hazardous Waste Permit #SCD043979822 Interim Storage Facility for Mixed Wastes	Resource Conservation and Recovery Act (RCRA) Section 3005	SCDHEC	Issued March 9, 1988 - In compliance
Operating Permit #1820-0041 Air Quality	Clean Air Act - Section 112	SCDHEC	Issued April, 22 1997 - In compliance
Landfill Permit #373303-1601	RCRA Subtitle D	SCDHEC	Issued January, 11 1995 - In compliance
Drinking Water Well Permit #202098AI	Safe Drinking Water Act 42, U.S.C. 1412	SCDHEC	In compliance
General Stormwater Permit SCR000000	FWPCA Section 402	SCDHEC	Issued October 10, 1992 - In compliance
Infectious Waste Permit #SC37-0051G	N/A	SCDHEC	Issued May 6, 1992 - In compliance

Table E-1. (contd)

Oconee Environmental Permits	Federal Act	Federal, State or Local Permitting Agency	Date Permit Issued or Expired/ Compliance Status
Environmental Laboratory Certification #37756001	N/A	SCDHEC	Issued May 6, 1992 - In compliance
Underground Storage Tank #06673	RCRA Subtitle I	SCDHEC	Issued January 1, 1982 - In compliance
Underground Storage Tank Permit #11174	RCRA Subtitle I	SCDHEC	Issued November 3, 1988 - In compliance
Underground Storage Tank Permit #11843	RCRA Subtitle I	SCDHEC	Issued November 3, 1989 - In compliance
Endangered Species	Endangered Species Act, Section 7 - Consultation	FWS	Consultation
Historic Preservation	National Historic Preservation Act, Section 106	South Carolina Historic Preservation Office	Consultation
Part A Hazardous Waste Permit, Interim Storage Facility for Mixed Wastes #SCD043979822	RCRA, Section 3005	SCDHEC	Issued March 9, 1998

D H E C
PROMOTE PROTECT PROSPER
2600 Bull Street
Columbia, SC 29201-1708

CERTIFIED MAIL/RETURN RECEIPT REQUESTED

September 29, 1999

Ms. Angela M. Grooms, Manager
Water Protection
Duke Energy Corporation
13339 Hagers Ferry Rd., MG03A5
Huntersville, NC 28078

RE: DUKE ENERGY/OCONEE NUCLEAR
NPDES Permit # SC0000515
Oconee County

Dear Ms. Grooms:

Enclosed is the National Pollutant Discharge Elimination System (NPDES) Permit for the above referenced facility.

The Department of Health and Environmental Control (DHEC) will enforce all the provisions of this permit in an equitable and timely manner. In order that you understand your responsibilities included in the provisions of this permit, particular attention should be given to the following sections

1. PART I.A.: This section contains listings of effluent characteristics, discharge limitations, and monitoring requirements. In accordance with Federal Law, effluent limitations are based on Best Practicable Treatment (BPT) currently available or water quality standards, whichever are more stringent.

2. PART I.C.3.: This section contains your responsibilities for reporting monitoring results. Preprinted Discharge Monitoring Report (DMR) forms are provided by DHEC for reporting monitoring results. A new preprinted DMR form will be sent to you at a later date, but prior to the date specified for submittal in Part I.C.3. You must use this form to make copies for all of your monthly submittals in duplicate to this Agency. This will be the only preprinted DMR form you will receive until your permit is reissued or modified. If the DMR form is lost or mutilated, you may request a replacement in writing.

3. PART II.B.4: This section describes the specific requirements for an NPDES permit to be transferred to another party.

4. PART II.C.: This section contains your responsibilities for the proper operation and maintenance of your facility.

5. PART III: This section contains all the special requirements relative to your permit. Such items in this section include the certified operator required to operate your wastewater treatment plant, the day of the week on which monitoring shall occur, sludge disposal requirements, and toxicity evaluation and monitoring.

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

This permit, as issued, will become effective on the effective date specified on the permit, provided no appeal for an adjudicatory hearing is made. The issuance of the permit represents a final staff decision that may be appealed to the Board of DHEC. Such appeal must be made within fifteen (15) days of the receipt of the permit.

In the event an appeal is filed, the entire reissued permit is automatically stayed. After the start of the administrative review any party may request the Administrative Law Judge (ALJ) to lift the automatic stay. The ALJ will then determine which portions of the permit, if any, will go into effect before the administrative review has been completed. The applicable portions of the previous permit will continue in effect until the administrative review has been completed.

If you wish to appeal the staff's decision, you must submit an initial pleading in accordance with Regulation 61-72, Volume 25, S.C. Code of Laws, 1976, as amended. As required by this regulation, the initial pleading must be served on the Board of SCDHEC, Attn: Clerk of the Board, 2600 Bull Street, Columbia, S.C. 29201, (803)898-3300. The submission of the initial appeal will be within the time period if delivered by First Class mail or other parcel delivery service on or before the fifteenth day.

The following elements must, at a minimum, be included within the request:

1. Identity of the petitioner and nature of interest in the matter for which review is requested;
2. Caption or other information sufficient to identify the permit decision being appealed;
3. The date of receipt of the decision;
4. Facts, stated with particularity, alleged by the petitioner as grounds entitling it to relief;
5. A summary of any prior proceedings in the case, and the extent of petitioner's participation;
6. The relief requested;
7. Any other information necessary for a clear understanding of the case; and
8. An agreement by the petitioner to be subject to cross-examination and to make any employee or consultant of such petitioner or other person represented by the petitioner available for cross-examination at the expense of the petitioner or such other person upon the request of the Hearing Officer, on his own motion, or on the motion of any party.

If you have any questions about the technical aspects of this permit, please contact me at (803) 898-4167. Information pertaining to adjudicatory matters may be obtained by contacting the Legal Office, SCDHEC, 2600 Bull Street, Columbia, S.C. 29201, or by calling them at (803) 898-3350.

Sincerely,

Marion F. Sadler, Jr.

Marion F. Sadler, Jr. Director
Industrial, Agricultural, and
Storm Water Permitting Division

Enclosure
cc: EPA
Betty Lou Foster, NPDES Permit Administration
Enforcement Section
District Office

South Carolina Department of Health
and Environmental Control

National Pollutant Discharge Elimination System Permit

for Discharge to Surface Waters

This Permit Certifies That

Duke Power/Oconee Station

has been granted permission to discharge from a facility located at

SC Highway 183 & 130 in Seneca
Oconee County

to receiving waters named

Lake Keowee and Keowee River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976), Regulation 61-9 and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

Marion F. Sadler, Jr., Director
Industrial, Agricultural, and Storm Water Permitting Division
Bureau of Water

Issued: ***September 29, 1999***

Expires: ***September 30, 2003***

Effective: ***October 1, 1999***

Permit No.: ***SC0000515***

South Carolina
DHEC
Department of Health and Environmental Control

October 25, 1996

Mr. Thomas W. Yocum
Environmental Engineering
Duke Power/MG03C1
1339 Hagers Ferry Rd.
Huntersville, NC 28078-7829

Dear Mr. Yocum:

Thank you for the telephone discussions and for technical documents you sent relative to public health considerations of thermophilic microorganisms. I have reviewed this material and related technical information in my own library.

While some microorganisms associated with thermal water discharges, especially related to air conditioning cooling towers, have been demonstrated to have deleterious human health effects, these events have occurred rarely and none have been identified with heated water sources associated with nuclear power plants, to my knowledge.

Pathogenic species of Legionella bacteria and Naegleria amoeba have been identified in heated cooling waters associated with nuclear plants. In most cases, the heated waters showed a very small increase (approximately 10-fold) over unheated source waters, but were higher in source waters in a few cases.

The most likely exposure to Legionella aerosol would be to workers within the plant. This would not impact the general public beyond the plant boundaries. A similar exposure possibility exists for Naegleria amoeba, with a slightly greater exposure potential for swimmers.

The potential public health hazard from pathogenic microorganisms whose abundance might be promoted by artificial warming of recreational waters is largely theoretical and not substantiated by available data. There is some justification for providing appropriate respiratory protection and dermal protection for workers regularly exposed to known contaminated water, but there seems no significant threat to off-site persons near such heated recreational waters. Routine monitoring for pathogenic microorganisms could be established if suspicious illnesses arose or if there were significant community concerns.

Please contact me at 803/737-4170 if you desire additional discussion of this matter.

Sincerely,

John F. Brown, DVM, PhD

John F. Brown, DVM, PhD
State Toxicologist

cc: WM Miller

Duke Power
Energy Center
P.O. Box 1006
Charlotte, NC 28201-1006
Mail Code EC12Y

Duke Power
A Duke Energy Company

June 23, 1998

Mr. Roger L. Banks
US Fish and Wildlife Service
PO Box 12559
Charleston, SC 29422-2559

Subject: Oconee Nuclear Station - NRC License Renewal
FWS Log No. 4-6-98-227

Dear Mr. Banks:

Duke Power Company is in the process of preparing a license renewal package for Oconee Nuclear Station. As part of the license renewal process, the Nuclear Regulatory Commission (NRC) requires that applicants identify adverse impacts to rare and endangered species resulting from continued operation of the facility or refurbishment activities.

Duke Power Company hired Dr. L.L. Gaddy to survey a one-mile radius around the facility to identify any rare or endangered species. Enclosed please find the results of this survey titled *"Endangered, Threatened and Otherwise Noteworthy Plant and Animal Species of the Oconee Nuclear Station."*

Dr. Gaddy located four state-listed plant species within the one-mile radius. The locations of these plants are shown on Map 1 of the attached report. These areas are remote from the actual operation of the plant and there are no plans for future refurbishment activities in these locations. Therefore, Duke Power does not believe that continued operation of the facility will adversely impact these species. We ask that you provide your comments regarding both the survey report and our determination of no adverse impact.

Please do not hesitate to contact me at 704/373-4392 if you have any questions.

Sincerely:

Jennifer R. Huff
Scientist

Enclosure

cc: Mr. Ed Duncan, SCDNR

cc: Dr. L.L. Gaddy

Based on the information received 6-26-98 we concur with your determination that the proposed action:

☒ will have no effect on listed or proposed endangered or threatened species.

☐ is not likely to adversely affect listed or proposed endangered or threatened species.

☐ is not likely to have significant adverse wetland impacts.

Acting Field Supervisor
U.S. Fish and Wildlife Service, Charleston Field Office
FWS Log No. 4-6-98-227 Date 7-30-98

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

November 4, 1999

Ms. Cynthia Carpenter
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Ms. Carpenter:

Subject: Biological Assessment for License Renewal at Oconee Nuclear Station, TAC Nos. M99162, M99163, and M99164

We received a copy of your letter of June 30, 1999, and the subject biological assessment, in which you concluded the subject management activities would not likely adversely affect listed species. In a September 2, 1999, response to your letter, Mr. Roger Banks, Field Supervisor of the U.S. Fish and Wildlife Service's Charleston Field Office, indicated our concurrence with some of your findings, noting that we needed additional information about the maintenance of transmission rights-of way with respect to the following listed plants: bunched arrowhead, dwarf-flowered heartleaf, smooth coneflower, mountain sweet pitcher plant, and Schweinitz's sunflower. This response is based on a review of the biological assessment, field visits to portions of the project area, and supplemental information provided by the licensee. We are providing the following comments in accordance with the provisions of Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

According to the information provided in the biological assessment, the Nuclear Regulatory Commission is evaluating the proposed renewal of the license for the Oconee Nuclear Station, Oconee County, South Carolina. You considered approximately 330 miles of transmission lines associated with the Oconee Plant. The biological assessment evaluated effects of the proposed relicensing to listed species. Our field visit focused on right-of-way maintenance procedures. We visited one site, outside of the Oconee project area, where the licensee is managing a distribution line right-of-way for Schweinitz's sunflower, smooth coneflower, and Georgia aster (a Federal species of concern). Supplemental information from the licensee included details of right-of-way maintenance, procedures for minimizing impacts to sensitive areas, and the results of surveys for listed species.

Based on the information provided by the licensee, the field visit, and a review of our records, we agree that the project will not likely adversely affect these federally listed species. In view of this, we believe the requirements under Section 7(c) of the Act are fulfilled. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

Please keep Mr. Mark Cantrell of our staff (Telephone 828/258-3939, Ext. 227) and Ms. Lori Duncan of the Charleston Field Office (Telephone 843/727-4707, Ext. 21) apprised of the progress on this project. In any future correspondence pertaining to this matter, please reference our Log Numbers 4-2-99-117 (Asheville Field Office) and 4-6-99-318 (Charleston Field Office).

Sincerely,

for Brian P. Cole
State Supervisor

cc:
Field Supervisor, FWS, Charleston Field Office, Charleston, SC (Attention: Ms. Lori Duncan)

97-OCON-NRC-NP
80F

Duke Power
Group Environment, Health & Safety
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

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South Carolina Department of Archives
and History
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Columbia, SC 292111

☐ COPY _____ _____
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Subject: Oconee Nuclear Station
Historic and Archaeological Properties

Dear Ms. Brock:

Duke Power is currently preparing an application for renewal of Oconee Nuclear Station's operating license. One of the Nuclear Regulatory Commission's (NRC) requirements is that Duke must identify impacts to cultural resources resulting from the renewal of the license. Duke does not believe that there will be any impacts to cultural resources due to the fact that refurbishment is not anticipated to require any land-disturbing activities.

I have enclosed information about the relicensing process from Oconee's Environmental Report and the NRC's generic environmental report.

After you review the enclosed information, please send me a letter stating that impacts to cultural resources will be minimal and that there is no need for mitigation. Please do not hesitate to contact me at (704) 875-5966 if you have any questions or would like to discuss further.

Thank you for your assistance in this matter.

Sincerely:

Jennifer A. Rudisill
Resource Management

Enclosures (2)

"We know of no properties included in or eligible for inclusion in the National Register of Historic Places which will be affected by this project." 10/21/97
Nancy Brock
Review & Compliance Programs
Coordinator
State Historic Preservation
Office

E.1 References

10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-level Radioactive Waste."

Atomic Energy Act of 1954, as amended, 42 USC 2011, et seq.

Clean Air Act (CAA), as amended, 42 USC 7401, et seq.

Endangered Species Act, as amended, 16 USC 1531 et seq.

Federal Power Act of 1935, 16 U.S.C. 791a-825u.

Federal Water Pollution Control Act (FWPCA), as amended, 33 USC 1251 et seq. (Also known as the Clean Water Act).

National Historic Preservation Act, as amended, 16 USC 470 et seq.

Resource Conservation and Recovery Act (RCRA) of 1976, as amended, 42 USC 6901, et seq.

Safe Drinking Water Act of 1996, as amended, 42 U.S.C. 1412, et seq.

Appendix F

GEIS Environmental Issues Not Applicable to the Oconee Nuclear Station

Appendix F

GEIS Environmental Issues Not Applicable to the Oconee Nuclear Station

The following table lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)* (NRC 1996) and 10 CFR Part 51, Subpart A, Appendix B ,Table B-1, that are not applicable to the Oconee Nuclear Station (ONS) because of plant or site characteristics.

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 4.4.2.2	ONS cooling system does not discharge to an estuary. Lake Keowee is freshwater.
Water-use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	2	4.3.2.1 4.4.2.1	This issue is related to heat-dissipation systems that are not installed at ONS.
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING-TOWER-BASED HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at ONS.
Impingement of fish and shellfish	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at ONS.
Heat shock	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at ONS
GROUNDWATER USE AND QUALITY			
Groundwater-use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	2	4.8.1.1 4.8.2.1	ONS uses < 100 gpm of groundwater.

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
Groundwater-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.8.1.3 4.4.2.1	This issue is related to heat-dissipation systems that are not installed at ONS or are operated on bodies of water that are much smaller than Lake Keowee.
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	ONS does not have or use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	ONS does not have or use Ranney wells.
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	ONS is located on Lake Keowee, a freshwater lake.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	This issue is related to a heat-dissipation system that is not installed at ONS.
Groundwater quality degradation (cooling ponds at inland sites)	2	4.8.3	This issue is related to a heat-dissipation system that is not installed at ONS.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to a heat-dissipation system that is not installed at ONS.
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to a heat-dissipation system that is not installed at ONS.
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to a heat-dissipation system that is not installed at ONS.
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to a heat-dissipation systems that is not installed at ONS.

F.1 References

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effect of renewing the operating license of a nuclear power plant."

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

NRC FORM 335
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(See instructions on the reverse)

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Supplement 2 Regarding the Oconee Nuclear Station

Final Report

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Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
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9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

Same as 8. above

10. SUPPLEMENTARY NOTES

Docket Numbers 50-269, 50-270, 50-287

11. ABSTRACT *(200 words or less)*

This final supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the Nuclear Regulatory Commission (NRC) by Duke Energy Corporation (Duke) to renew the operating licenses for the Oconee Nuclear Station (ONS) Units 1, 2, and 3 for an additional 20 years under 10 CFR Part 54. The supplemental environmental impact statement includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse impacts. It also includes the staff's recommendations regarding the proposed action.

Based on the analysis and findings in the Generic Environmental Statement, the environmental report submitted by Duke, consultation with other Federal and State agencies, its own independent review, and its consideration of public comments, the NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for ONS Units 1, 2, and 3 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

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Supplement to the Generic Environmental Statement

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