NUREG-1437
Supplement 9

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 9

Regarding Catawba Nuclear Station, Units 1 and 2

Final Report

Manuscript Completed: November 2002
Manuscript Published December 2002

Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Abstract

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

This 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 OLs for Catawba Nuclear Station, Units 1 and 2 (Catawba) for up to an additional 20 years under 10 CFR Part 54 (Duke 2001a). 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 mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

Neither Duke nor the staff has identified information that is both new and significant for any issues for which the GEIS reached generic conclusions and that apply to Catawba Units 1 and 2. The staff determined that information provided during the scoping process did not call into question the conclusions in the GEIS. Therefore, the staff concludes that the impacts of renewing the Catawba OLs will not be greater than impacts identified for these issues in the GEIS. For each of these issues, the GEIS conclusion is that the impact is of SMALL[(a)] 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).

Each of the remaining issues applicable to Catawba is addressed in this SEIS. For each applicable issue, the staff concludes that the significance of the potential environmental effects of renewal of the OLs is SMALL. The staff also concludes that additional mitigation measures are not likely to be sufficiently beneficial as to be warranted. The staff determined that information provided during the scoping process did not identify any new issue that has a significant environmental impact.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewal for Catawba are not so great that preserving the

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

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.

Contents

Figures

Tables

Tables

Executive Summary

By letter dated June 13, 2001, Duke Energy Corporation (Duke) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Catawba Nuclear Station, Units 1 and 2 (Catawba) for up to an additional 20-year period. If the OLs are renewed, State regulatory agencies and Duke 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 OLs are not renewed, the plant must be shut down at or before the expiration dates of the current OLs, which are December 6, 2024, for Unit 1, and February 24, 2026, for Unit 2.

Section 102 of the National Environmental Policy Act (NEPA; 42 USC 4321) directs that an environmental impact statement (EIS) be prepared for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51, which identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plant*s (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[a]

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. The staff visited the Catawba site in October 2001 and held public scoping meetings on October 23, 2001, in Rock Hill, South Carolina. The staff reviewed the Duke Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1 (*Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*), and considered the public comments received during the scoping process in preparation of this Supplemental Environmental Impact Statement (SEIS) for Catawba. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part I, of this SEIS.

A draft SEIS was published for comment in May 2002. The staff held two public meetings in Rock Hill, South Carolina, on June 27, 2002, to describe the results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating their comments on the draft SEIS. All of the comments received on the

---

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

draft SEIS were considered by the staff in developing the final SEIS. These comments are addressed in Appendix A, Part II, of this SEIS.

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 mitigation measures available for reducing or avoiding adverse effects. It also includes the staff's 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 decision-makers would be unreasonable.

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

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

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the

scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operation–generic determination of no significant environmental impact"] and in accordance with § 51.23(b).

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

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

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

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

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

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

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

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

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

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must 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 OLs for Catawba) and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's (DOE's) Energy Information Administration (EIA), gas- and coal-fired generation appear to be the most likely power-generation alternatives if the power from Catawba is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the Catawba site or some other unspecified location.

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 information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither the scoping process nor the staff has identified any new issue applicable to Catawba that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all of the Category 1 issues that are applicable to Catawba.

Duke's license renewal application presents an analysis of the Category 2 issues plus environmental justice and chronic effects from electromagnetic fields. The staff has reviewed the Duke analysis for each issue and has conducted an independent review of each issue. Six Category 2 issues are not applicable, because they are related to plant design features or site characteristics not found at Catawba. Four Category 2 issues are not discussed in this SEIS, because they are specifically related to refurbishment. Duke has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of Catawba for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement, and therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the NRC's 1983 *Final Environmental Statement Related to the Operation of Catawba Nuclear Station, Units 1 and 2*.

Eleven Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. Four of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are discussed in this SEIS only 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 appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for Catawba Units 1 and 2 and the plant improvements already made, the staff concludes that two 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.

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

The recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for Catawba 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

7Q10	the estimated 7-day minimum flow occurring on the average once in 10 years
µCi	microcurie(s)
µCi/mL	microcuries per milliliter
µGy	microgray(s)
µm	micrometer(s)
µSv	microsieverts
AADT	annual average daily traffic (count)
ac	acre(s)
ACC	averted cleanup and decontamination costs
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
AOC	averted offsite property damage costs
AOE	averted occupational exposure
AOSC	averted onsite costs
APE	averted public exposure
APRC	averted power replacement cost
ATWS	anticipated transient without SCRAM
BEA	Bureau of Economic Analysis
Bq	becquerel(s)
Bq/ml	becquerels per milliliter
BMT	basemat melt-through
Btu	British thermal unit(s)
°C	degrees Celsius
Catawba	Catawba Nuclear Station, Units 1 and 2
CCW	component cooling water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CET	containment event tree
CFR	Code of Federal Regulations
CFS	cubic feet per second or ft^3/s
CHRS	containment heat removal system
Ci	curie(s)
cm	centimeter(s)
COE	cost of enhancement
COPC	chemicals of potential concern
CVCS	chemical and volume control system
CWA	Clean Water Act

DG	diesel generator
DBA	design-basis accident
DCH	direct containment heating
DOE	U.S. Department of Energy
DPR	demonstration project reactor
DSM	demand-side management
Duke	Duke Energy Corporation
ECCS	emergency care cooling system
EIA	Energy Information Administration (of DOE)
EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EOP	Emergency Operating Procedure
EPA	U.S. Environmental Protection Agency
EPZ	Emergency Planning Zone
EQ	equipment qualification
ER	Environmental Report
ESA	Endangered Species Act
ESRP	Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Operating License Renewal, NUREG-1555, Supplement 1
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FES	Final Environmental Statement
FR	Federal Register
FSAR	Final Safety Analysis Report
ft	foot/feet
ft^3	cubic feet
ft^3/yr	cubic feet per year
ft^3/s	cubic feet per second
F-V	Fussell-Vesely (importance measures used in risk analysis)
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
FWS	U.S. Fish and Wildlife Service
gal	gallon
GDC	general design criteria
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437

GI-LLI	gastrointestinal tract-lower large intestine
gpm	gallons per minute
GSI	generic safety issue
ha	hectare(s)
HHSI	high head safety injection
HLW	high-level waste
hr	hour(s)
Hz	Hertz
in.	inch(es)
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination for External Events
ISFSI	Independent Spent Fuel Storage Installation
ISLOCA	Interfacing Systems Loss of Coolant Accident
kg	kilogram(s)
km^2	square kilometers
km	kilometer(s)
kV	kilovolt(s)
kV/m	kilovolt per meter
kWh	kilowatt hour(s)
L	liter(s)
lb	pound
LNG	liquefied natural gas
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
L/s	liters per second
LWR	light-water reactor
M	million
m	meter(s)
m/s	meter(s) per second
m^2	square meters
m^3	cubic meters
m^3/d	cubic meters per day
m^3/s	cubic meter(s) per second
mA	milliampere(s)
MAAP	Modular Accident Analysis Program
MACCS2	MELCOR Accident Consequence Code System 2

mi	mile(s)
mGy	milligray(s)
MGD	million gallons per day
mL	milliliter(s)
mph	miles per hour
mrad	millirad(s)
mrem	millirem(s)
mSv	millisievert(s)
MT	metric ton(s) (or tonne[s])
MTU	metric ton(s)-uranium
MW	megawatt(s)
MWd/MTU	megawatt-days per metric ton of uranium
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)
NA	not applicable
NAFTA	North American Free Trade Agreement
NAS	National Academy of Sciences
NCDENR	North Carolina Department of Environmental and Natural Resources
NCI	National Cancer Institute
NEPA	National Environmental Policy Act of 1969
NESC	National Electric Safety Code
ng/J	nanogram per joule
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NWPPC	Northwest Power Planning Council
ODCM	Offsite Dose Calculation Manual
OL(s)	operating license(s)
PAR	passive autocatalytic recombiners
PDS(s)	plant damage state(s)
$PM_{2.5}$	particulate matter, 2.5 micrometers or less in diameter
PM_{10}	particulate matter, 10 micrometers or less in diameter
ppt	parts per thousand

PRA	Probabilistic Risk Assessment
PSA	Probabilistic Safety Assessment
PSD	prevention of significant deterioration
PSW	plant service water
PWR	pressurized water reactor
PW	present worth
RAB	reactor auxiliary building
RAI	request for additional information
RCP	reactor coolant pump
RCS	Reactor Coolant System
REMP	radiological environmental monitoring program
RWST	Refueling Water Storage Tank
ry	reactor year
s	second(s)
SAG	Severe Accident Guideline
SAMA(s)	Severe Accident Mitigation Alternative(s)
SAMDA	Severe Accident Mitigation Design Alternative
SAMG	Severe Accident Management Guideline
SAR	Safety Analysis Report
SBO	station blackout
SC	South Carolina
SCH	South Carolina Highway
SEIS	Supplemental Environmental Impact Statement
SER	Safety Evaluation Report
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Office
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCIAA	South Carolina Institute of Archaeology and Anthropology
SIC	Standard Industrial Classification
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
SSS	standby shutdown system
Sv	sieverts
TBq	terabecquerel
UDB	urban development boundary
UFSAR	Updated Final Safety Analysis Report

U.S.	United States
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
UST	upper storage tank
yr	year

1.0 Introduction

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

The Duke Energy Corporation (Duke)[(b)] operates Catawba Nuclear Station, Units 1 and 2 (Catawba) in north-central South Carolina under OLs NPF-35 and NPF-52, which were issued by the NRC. These OLs will expire in December 2024 for Unit 1 and in February 2026 for Unit 2. On June 13, 2001, Duke submitted an application to the NRC to renew the Catawba OLs for up to an additional 20 years under 10 CFR Part 54 (Duke 2001a). Duke is a *licensee* for the purposes of its current OLs and an *applicant* for the renewal of the OLs. Pursuant to 10 CFR 54.23 and 51.53(c), Duke submitted an Environmental Report (ER; Duke 2001b) in which Duke analyzed the environmental impacts associated with the proposed license renewal action, considered alternatives to the proposed action, and evaluated mitigation measures for reducing adverse environmental effects.

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

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

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

1.1 Report Contents

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

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

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

- the preparers of the supplement
- the chronology of correspondence between NRC and Duke with regard to this SEIS
- the organizations contacted during the development of this SEIS
- Duke's compliance status in Table E-1 (this appendix also contains copies of consultation correspondence prepared and sent during the evaluation process)
- GEIS environmental issues that are not applicable to Catawba.

1.2 Background

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

1.2.1 Generic Environmental Impact Statement

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

In the GEIS, the staff documented 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 in the GEIS, the staff (1) described the activity that affects the environment, (2) identified the affected population or resource, (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 NRC's standard of significance was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27, which requires consideration of both "context" and "intensity"). Using the CEQ terminology, the NRC established three significance levels–SMALL, MODERATE, or LARGE. The definitions of the three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, as follows:

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

In the GEIS, the staff assigned a significance level to each environmental issue, assuming that ongoing mitigation measures would continue.

In the GEIS, the staff 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 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 and spent fuel disposal).

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

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

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

In the GEIS, the staff assessed 92 environmental issues and determined that 69 qualified as Category 1 issues, 21 qualified as Category 2 issues, and 2 issues were not categorized. The latter two issues, environmental justice and chronic effects of electromagnetic fields, are to be addressed in a plant-specific analysis. Of the 92 issues, 11 are related only to refurbishment, 6 are related only to decommissioning, 67 apply only to operation during the renewal term, and 8 apply to both refurbishment and operation during the renewal term. A summary of the findings for all 92 issues in the GEIS is codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

1.2.2 License Renewal Evaluation Process

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

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

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

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

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

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

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

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

- contain an analysis of any Category 1 issue unless there is significant new information on a specific issue—this is pursuant to 10 CFR 51.53(c)(3)(iii) and (iv).

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

In preparing to submit its application to renew the Catawba OLs, Duke developed a process to ensure that information not addressed in or available during the GEIS evaluation regarding the environmental impacts of license renewal for Catawba would be properly reviewed before submitting the ER, and to ensure that such new and potentially significant information related to renewal of the licenses for Units 1 and 2 would be identified, reviewed, and assessed during the period of NRC review. Duke reviewed the Category 1 issues that appear in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, to verify that the conclusions of the GEIS remained valid with respect to Catawba. This review was performed by personnel from Duke and its support organization who were familiar with NEPA issues and the scientific disciplines involved in the preparation of a license renewal ER.

The NRC staff also has a process for identifying new and significant information. That process is described in detail in *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (ESRP), NUREG-1555, Supplement 1 (NRC 2000). The search for new information includes (1) review of an applicant's ER and process for discovering and evaluating the significance of new information; (2) review of records of public comments; (3) review of environmental quality standards and regulations; (4) coordination with Federal, State, and local environmental protection and resource agencies; and (5) review of the technical literature. New information discovered by the 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 assessment of the relevant new and significant information; the scope of the assessment does not include other facets of the issue that are not affected by the new information.

Chapters 3 through 7 discuss the environmental issues considered in the GEIS that are applicable to Catawba. 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 Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, 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 that discuss the Category 2 issues are presented immediately following the table.

The NRC prepares an independent analysis of the environmental impacts of license renewal and compares these impacts to the environmental impacts of alternatives. Evaluation of the Duke license renewal application began with publication of a notice of acceptance for docketing and opportunity for a hearing in the *Federal Register* (FR) cited as 66 FR 42893 (NRC 2001a) on August 15, 2001. On September 20, 2001, the staff published a Notice of Intent to prepare an EIS and conduct scoping. This notice was cited in the *Federal Register* as 66 FR 48489 (NRC 2001b). Two public scoping meetings were held on October 23, 2001, in Rock Hill, South Carolina. Comments received during the scoping meetings were summarized in the *Environmental Impact Statement Scoping Process: Summary Report – Catawba Units 1 and 2, Rock Hill, South Carolina* (NRC 2002a). Comments received during scoping that are applicable to this environmental review are presented in Part I of Appendix A.

The staff followed the review guidance contained in NUREG-1555, Supplement 1 (NRC 2000). The staff and contractors retained to assist the staff visited the Catawba site on October 22 and 23, 2001, to gather additional information and to become familiar with the site and its environs. The staff also reviewed the comments received during scoping, and consulted with Federal, State, regional, and local agencies. A list of the organizations consulted is provided in Appendix D. Other documents related to Catawba also were reviewed and are referenced.

On May 21, 2002, the NRC published the Notice of Availability of the draft SEIS (67 FR 35839), beginning a 75-day comment period (NRC 2002b). During the comment period members of the public could comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings were held near Catawba on June 27, 2002. During these meetings, the staff described the preliminary results of the NRC environmental review and answered questions related to it to provide members of the public with information to assist them in formulating their comments. The comment period for the Catawba draft SEIS ended August 9, 2002. Comments made during the 75-day comment period, including those made at the two public meetings, are presented in Part II of Appendix A. The NRC responses to these comments also are provided.

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

1.3 The Proposed Federal Action

The proposed Federal action is renewal of the OLs for Catawba, Units 1 and 2. Catawba is located in north-central South Carolina, in northeastern York County on the shore of Lake Wylie, approximately 29 km (18 mi) southwest of Charlotte, North Carolina, and 10 km (6 mi) north of Rock Hill, South Carolina, the nearest town. The current OL for Unit 1 expires on December 6, 2024, and for Unit 2 the OL expires on February 24, 2026. By letter dated June 13, 2001, Duke submitted an application to the NRC (Duke 2001a) to renew these OLs for up to an additional 20 years of operation.

The plant has two Westinghouse-designed, pressurized, light-water reactors, each with a design rating for a net electrical power output of 1129 megawatts electric (MW[e]). Plant cooling is provided by six mechanical draft cooling towers that discharge into Lake Wylie. Units 1 and 2 produce electricity to supply the needs of more than 619,000 homes.

1.4 The Purpose and Need for the Proposed Action

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

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

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

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 or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate. From the perspective of the licensee and the State regulatory authority, the purpose of renewing an OL is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license.

1.5 Compliance and Consultations

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

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

Agency	Authority	Requirement	Number	Permit Expiration or Consultation Date	Activity Covered
NRC	Atomic Energy Act, 10 CFR Part 50	Operating license	NPF-35 (Unit 1) NPF-52 (Unit 2)	December 6, 2024 (Unit 1) February 24, 2026 (Unit 2)	Operation of Catawba Units 1 and 2
FWS and NMFS	Endangered Species Act, Section 7	Consultation	NA	Consultation initiated December 2001	Operation during renewal term
FWS	Migratory Bird Treaty Act	Permit	DPRD 757484	Annual	Depredation permit
SCDHEC	Clean Water Act, Section 402	NPDES wastewater permit	SC0004278	June 30, 2005	Discharge of wastewater and cooling water into Lake Wylie
SCDHEC	Clean Water Act, Section 402	NPDES stormwater permit	Permit Cert. No: SCR003773	January 31, 2003	Collection, treatment, and discharge of stormwater
SCDHEC	Clean Air Act	Air emissions and operating permits	2440-0070	December 31, 2005	Emissions from diesel emergency generators, miscellaneous diesel engines, and other miscellaneous units
SCIAA and SHPO	National Historic Preservation Act, Section 106	Consultation	NA	Consultation initiated October 24, 2001	Impact on sites listed or eligible for listing in the National Register of Historic Places

FWS - U.S. Fish and Wildlife Service
NA - Not applicable
NPDES - National Pollutant Discharge Elimination System
SCIAA - South Carolina Institute of Archaeology and Anthropology
SHPO - State Historic Preservation Office (located at the South Carolina Department of Archives and History)
SCDHEC - South Carolina Department of Health and Environmental Control

The staff has reviewed the list and consulted with the appropriate Federal, State, and local agencies to identify any compliance or permit issues or significant environmental issues of concern to the reviewing agencies. These agencies did not identify any new and significant environmental issues. The ER states that Duke is in compliance with applicable environmental standards and requirements for Catawba. The staff has also not identified any environmental issues that are both new and significant.

1.6 References

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

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

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

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

Clean Air Act (CAA). 42 USC 7401, et seq.

Duke Energy Corporation (Duke). 2001a. *Application for Renewed Operating Licenses, Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. *Applicant's Environmental Report – Operating License Renewal Stage Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

Endangered Species Act (ESA). 16 USC 1531, et seq.

Federal Water Pollution Control Act (FWPCA). 33 USC 1251, et seq. (Also known as the Clean Water Act [CWA]).

Migratory Bird Treaty Act. 16 USC 703-712.

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

National Historic Preservation Act (NHPA). 16 USC 470, et seq.

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

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

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

U.S. Nuclear Regulatory Commission (NRC). 2001a. "Duke Energy Corporation, McGuire, Units 1 and 2, and Catawba, Units 1 and 2; Notice of Acceptance for Docketing of the Application and Notice of Opportunity for a Hearing Regarding Renewal of Facility Operating License Nos. NPF-9, NPF-17, NPF-35, and NPF-52 for an Additional 20-Year Period." 66 FR 42893. August 15, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2001b. "Duke Energy Corporation, Catawba Nuclear Station, Units 1 and 2; Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." 66 FR 48489. September 20, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2002a. *Environmental Impact Statement Scoping Process: Summary Report – Catawba Nuclear Station Units 1 & 2*, Rock Hill, South Carolina. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2002b. "Duke Energy Corporation, Catawba Nuclear Station, Units 1 and 2; Notice of Availability of the Draft Supplement 9 to the Generic Environmental Impact Statement and Public Meeting for License Renewal of Catawba Units 1 and 2." 67 FR 35839. May 21, 2002.

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

The Catawba Nuclear Station, Units 1 and 2 (Catawba), owned by Duke Energy Corporation (Duke), is located in York County, South Carolina. It is situated on a peninsula that protrudes into Lake Wylie, a man-made lake created by the Wylie Dam. Both units are the subject of this action. Each reactor is a pressurized light-water reactor (LWR) with four steam generators producing steam that turns turbines to generate electricity. Each unit has six mechanical draft cooling towers for heat removal. The station and its environs are described in Section 2.1, and its interaction with the environment is presented in Section 2.2.

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

Catawba is located on 158 ha (391 ac) of Duke-owned land in rural north-central South Carolina (Duke 2001a). Figures 2-1 and 2-2 show the site location and features within 80 and 10 km (50 and 6 mi), respectively. Duke refuels each Catawba nuclear unit on an 18- to 24-month schedule. During these refueling periods, site employment increases by as many as 500 workers for temporary duty over a 30- to 40-day period. Catawba has approximately 1218 full-time workers employed by Duke and site contractors during normal plant operations. The plant is located approximately 29 km (18 mi) southwest of Charlotte, North Carolina. Rock Hill, South Carolina, the nearest city, is about 10 km (6 mi) south of the site.

Lying within the Piedmont physiographic province, the Catawba site is characterized by rolling hills and numerous small streams and rivers. The site and surrounding area vary in elevation from 174 to 193 m (570 to 632 ft), are dominated by Iredell soils, and harbor typical piedmont plant communities and land cover types, predominantly pine and pine-mixed hardwoods (Duke 2001a).

Four parks, three located in and owned by York County (Ebenezer Park, Pitcarin Cove Park, and Wind Jammer Beach Park) and one located in and owned by Mecklenburg County (McDowell Park), are within a 10-km (6-mi) radius of the Catawba site. Eight state parks (Andrew Jackson State Park, Chester State Park, Croft State Park, Crowders Mountain State Park, Kings Mountain State Park, Lake Norman State Park, Rosehill Plantation State Park, and South Mountains State Park), Cowpens National Battlefield, Kings Mountain National Military Park, and the Catawba Indian Reservation are located within 80 km (50 mi) of Catawba (Duke 2001a).

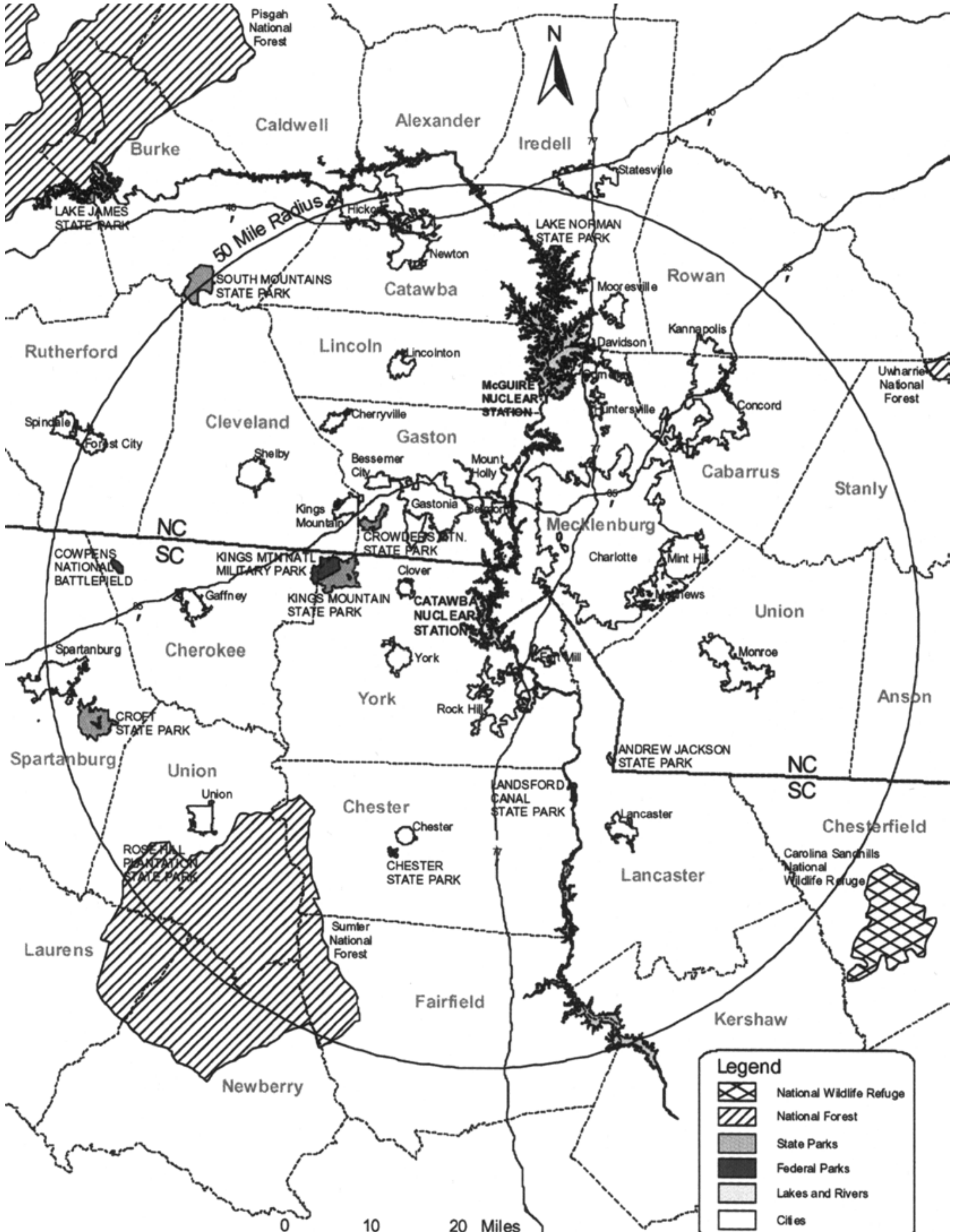

Figure 2-1. Location of Catawba 80-km (50-mi) Region (Duke 2001a)

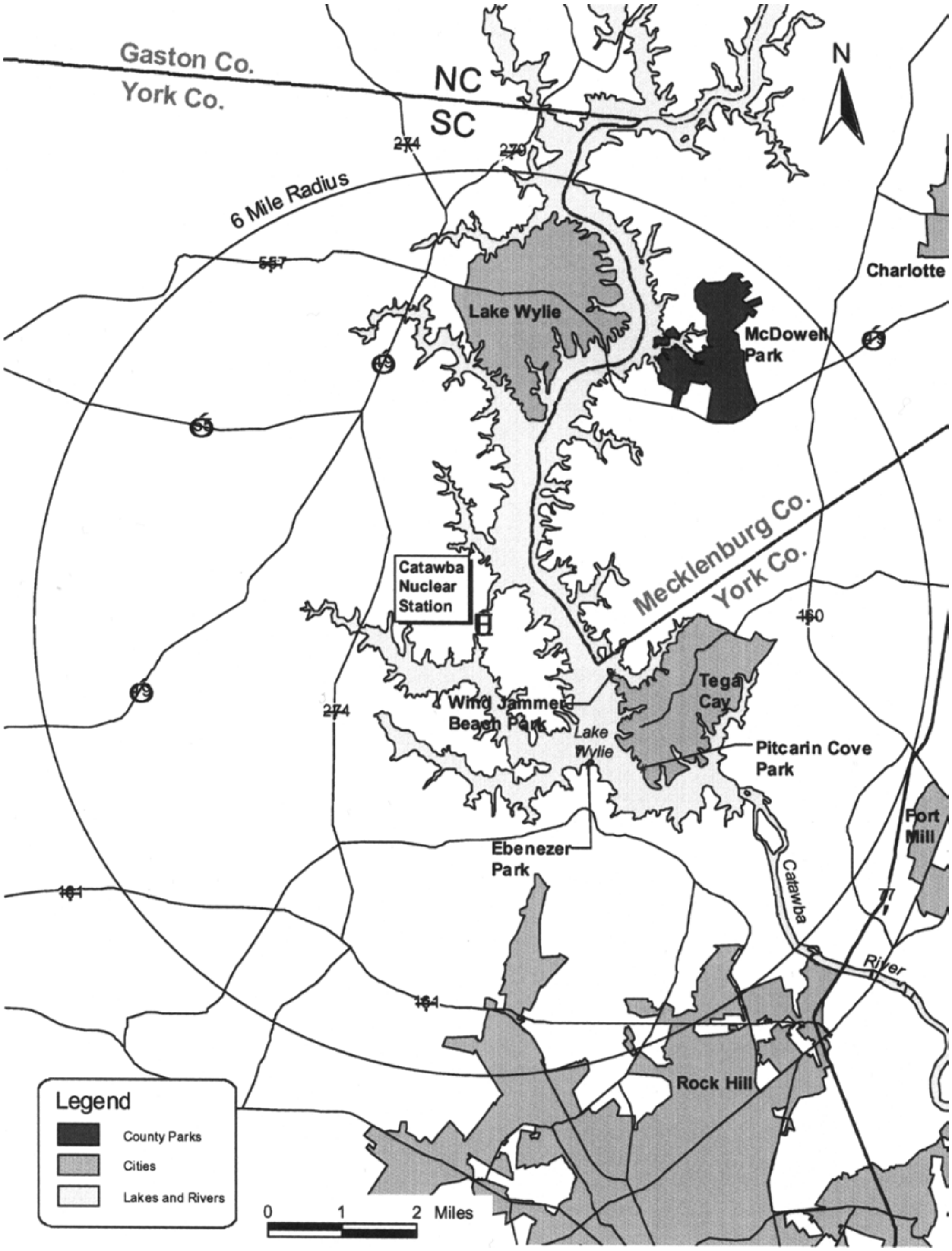

Figure 2-2. Location of Catawba 10-km (6-mi) Region (Duke 2001a)

2.1.1 External Appearance and Setting

Catawba consists of two reactor buildings, two turbine buildings, two diesel generator buildings, six mechanical draft cooling towers, one shared service building, one auxiliary building, one water chemistry building, and one switchyard. The cooling water intake and discharge structures and standby nuclear service water pond are shared features (Duke 2001a).

The Catawba site lies within the Piedmont physiographic province, a northeast trending zone from Georgia through Virginia that varies in width from about 129 to 193 km (80 to 120 mi) (Duke 2001a). The site is underlain by a variety of low-quartz granite known as adamellite. The Piedmont physiographic province is an area of infrequent earthquakes of only moderate intensity (AEC 1973). The Piedmont physiographic province is bounded on the northwest by the Blue Ridge province and on the southeast by the Atlantic Coastal Plain province (AEC 1973).

2.1.2 Reactor Systems

The Catawba site is shown in Figure 2-3. Units 1 and 2 are pressurized LWRs with four reactor coolant loops, each of which contains a steam generator that produces steam and turns turbines to generate electricity. Each unit is designed to operate at core power levels up to 3411 megawatts (thermal) (MW[t]), with a corresponding net electrical output of approximately 1129 megawatts (electric) (MW[e]). The nuclear steam supply system for each unit and the Unit 2 steam generators were supplied by Westinghouse Electric Corporation. The current Unit 1 steam generators, installed in 1996, were supplied by Babcock & Wilcox International.

The reactor containment is housed in a separate free-standing steel containment structure within a reinforced concrete shield building. The containment employs the ice condenser pressure-suppression concept, and is designed to withstand environmental effects and the internal pressure and temperature accompanying a postulated loss-of-coolant accident or steam-line break. Together with its engineered safety features, the containment structure for each unit is designed to adequately retain fission products that escape from the reactor coolant system.

The Catawba reactors are licensed for fuel that is slightly enriched uranium dioxide, up to 5.00 percent by weight uranium-235 (although to date the highest percent used at Catawba is 4.73 percent by weight uranium-235). Catawba has several different fuel designs that are used

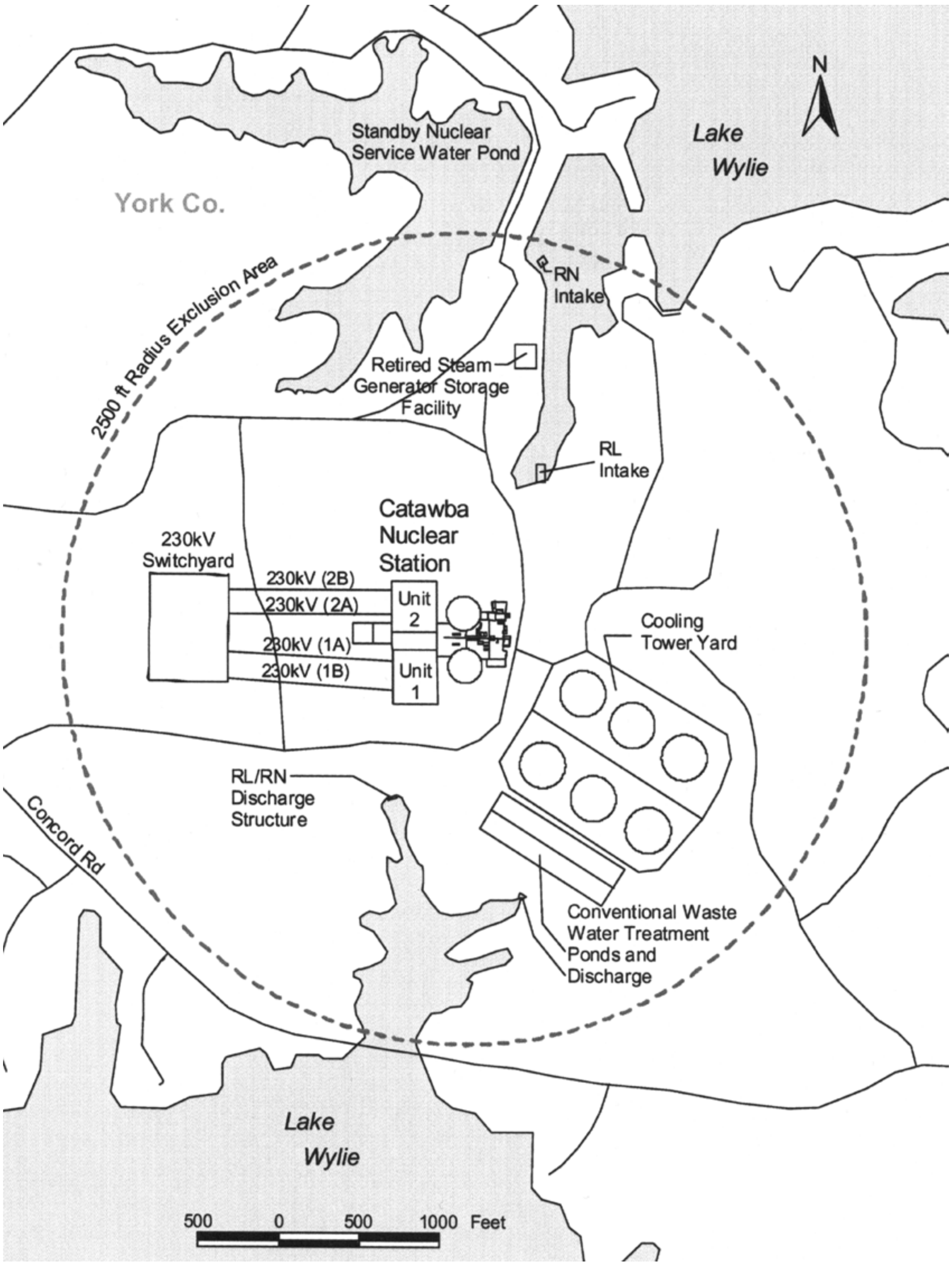

Figure 2-3. Catawba Exclusion Area (Duke 2001a)

for the production of electricity. The Mark-BW design has a maximum fuel assembly burnup of 55,000 megawatt days/metric tons of uranium (MWd/MTU) and a maximum approved fuel pin burnup of 60,000 MWd/MTU. The Westinghouse Robust Fuel Assembly design does not have a maximum fuel assembly burnup limit; however, this burnup value would be limited by the maximum approved fuel pin burnup limit of 60,000 MWd/MTU (Duke 2001a).

2.1.3 Cooling and Auxiliary Water Systems

Catawba uses water from Lake Wylie for cooling and process water. The average daily withdrawal from Lake Wylie for the cooling water and other service water systems is 386 million liters per day (L/d) (102 million gallons per day [MGD]). The average daily discharge back into Lake Wylie from Catawba is 230 million L/d (60.7 MGD). The consumptive water losses result from evaporation and drift from the six mechanical-draft cooling towers that provide cooling for the condenser circulating water system.

Water from Lake Wylie is taken in through two intake structures. The low pressure service water intake structure is located on the Beaver Dam Creek arm of Lake Wylie (Figure 2-3; RL Intake). Trash racks and traveling screens are used to remove trash and debris from this intake water. The intake structure is designed for a maximum water velocity of 0.15 m/s (0.5 ft/s) in front of the trash racks at the maximum design drawdown of Lake Wylie. The low pressure service water system supplies water for various functions on the secondary side of the plant. The nuclear service water intake structure also is located in the Beaver Dam Creek arm (Figure 2-3; RN Intake). This intake supplies cooling water to various heat loads in the primary side of the plant and supplies water to the standby nuclear service water pond.

Catawba does not use cooling ponds for normal operations; however, it does have a standby nuclear service water pond. The purpose of this pond is to provide an ultimate heat sink in the event of a rapid decline in water level in Lake Wylie. The pond is isolated from the plant service water during normal plant operations.

The discharge structure is located on the Big Allison Creek arm of Lake Wylie (Figure 2-3; RL/RN Discharge Structure). This structure is designed to allow warm discharge water to float on the surface with a minimum amount of mixing. Approximately 1.48 million L/d (0.39 MGD) from the conventional waste water treatment system and from the sewage treatment system is discharged to Lake Wylie.

Catawba obtains potable water from the city of Rock Hill. In addition, there are a total of three groundwater supply wells at the Catawba site. These wells supply water on a periodic basis to remote locations and for seasonal irrigation. The average annual groundwater withdrawal rate from these wells is 1.89 L/s (30 gallons per minute [gpm]).

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

Catawba 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 operations. These systems process radioactive liquid, gaseous, and solid effluents before they are released to the environment. The waste disposal systems for Catawba meet the design objectives of 10 CFR Part 50, Appendix I (Numerical Guide 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). These systems 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 mostly are contained in the sealed fuel rods, but small quantities escape and contaminate the reactor coolant. Neutron activation of the primary coolant system also is responsible for coolant contamination.

Nonfuel 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 modifications and operations and routine maintenance activities. Solid wastes may be shipped to a waste processor for volume reduction before disposal at a licensed burial site (Duke 2001a). Spent resins and filters are stored or packaged for shipment to a licensed offsite processing or disposal facility.

Fuel rods that have exhausted a certain percentage of their fuel and are removed from the reactor core for disposal are called spent fuel. Each unit is refueled approximately every 18 to 24 months, and refueling outages are staggered so both units are not in an outage at the same time. Spent fuel is stored onsite in one of the two spent fuel pools. Each unit has its own spent fuel pool and fuel storage facility. Although an independent spent fuel storage installation (ISFSI) is planned, Catawba does not currently have an ISFSI facility.

The waste gas and solid waste systems are common to both units. Portions of the liquid radioactive waste system are shared.

The *Offsite Dose Calculation Manual* (ODCM) for Catawba (Duke 2001b) describes the methods used for calculating radioactivity concentrations in the environment and the estimated potential offsite doses associated with liquid and gaseous effluents. The ODCM also specifies controls for release of liquid and gaseous effluents to ensure compliance with the following:

- The concentration of radioactive liquid effluents released from the site to the unrestricted area will not exceed 10 times the concentration specified in 10 CFR Part 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained gases. For dissolved or entrained noble gases, the concentration shall not exceed 7.4 Bq/mL (0.0002 μCi/mL).

- The dose or dose commitment per reactor to a member of the public from any radioactive materials in liquid effluents released to unrestricted areas shall be limited to the design objectives of 10 CFR Part 50 Appendix I: (1) less than or equal to 0.015 mSv (1.5 mrem) to the total body and less than or equal to 0.05 mSv (5 mrem) to any organ during any calendar quarter, and (2) less than or equal to 0.03 mSv (3 mrem) to the total body and less than or equal to 0.1 mSv (10 mrem) to any organ during any calendar year.

- The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to (1) less than or equal to 5 mSv/yr (500 mrem/yr) to the total body and less than or equal to 30 mSv/yr (3000 mrem/yr) to the skin due to noble gases, and (2) less than or equal to 15 mSv/yr (1500 mrem/yr) to any organ due to iodine-131, iodine-133, tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days per NUREG-1301 (NRC 1991).

- The air dose per reactor to areas at and beyond the site boundary due to noble gases released in gaseous effluents shall be limited to the design objectives of 10 CFR Part 50, Appendix I, of less than or equal to 0.1 mGy (10 mrad) for gamma radiation and less than or equal to 0.2 mGy (20 mrad) for beta radiation during any calendar year.

- The dose to any individual member of the public from nuclear facility operations will not exceed the maximum limits of 40 CFR Part 190 (less than 0.25 mSv [25 mrem]) and 10 CFR Part 20 (i.e., less than or equal to 5 mSv [500 mrem] in a year and less than or equal to 0.02 mSv [2 mrem] in any hour).

The systems used for processing liquid waste, gaseous waste, and solid waste are described in the following sections.

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

All radioactive and potentially radioactive liquids generated in the plant are collected, segregated, and processed. Most deaerated reactor- or primary-grade liquids containing fission product gases and other radioactive materials, including tritium, are collected in the reactor coolant drain tank in the reactor building or in the waste drain tank in the auxiliary building and then are recycled. The liquid radwaste system collects aqueous solutions from equipment flush and drain lines, floor drains, decontamination sink drains, ultrasonic cleaner drains, laundry drains, and ventilation equipment drains. These potentially contaminated liquid wastes are collected in storage tanks in the auxiliary building and waste monitor tank building for processing by filtration or demineralization or both. Wastes from the auxiliary building and from secondary system drains are processed in the waste monitor tank building. Waste input streams are segregated based on radioactivity content and disposed of depending on the concentration of radioactive material in the waste. Those waste streams containing little measurable activity above background levels are discharged to Lake Wylie.

Further processing by filtering, chemical treatment, or demineralization is required for other waste streams. Following treatment, effluents that meet regulated radioactivity levels for release are discharged into Lake Wylie. Wastes with higher radioactive material concentrations are packaged and shipped to an offsite vendor for further waste processing or for disposal in a licensed burial.

The ODCM (Duke 2001b) prescribes the alarm/trip setpoints for the liquid effluent radiation monitors; the setpoints are derived from 10 times the effluent concentration limits provided in 10 CFR Part 20, Appendix B, Table 2, Column 2. Liquid effluent radiation monitors are located on the waste monitor tank release line, the recycle monitor tank release line, the auxiliary monitor tank release lines, and conventional waste water treatment system release line.

During 2000, there were 192 batch releases of liquid effluents for the two units with a total volume of 5060 m^3 (1.33×10^6 gal) prior to dilution. The combined liquid waste volume prior to dilution for batch and continuous releases for 2000 was 305,000 m^3 (8.05×10^7 gal). The liquid waste holdup capacity for the plant is approximately 840 m^3 (221,500 gal) (Duke 2001a). In this liquid waste, there was a total fission and activation product activity of 0.003 TBq (0.083 Ci) and a total tritium activity of 26.6 TBq (718 Ci). These volumes and activities are typical of past years. The actual liquid waste generated is reported in the *Catawba Nuclear Station, Units 1 and 2, 2000 Annual Radioactive Effluent Release Report* (Duke 2001d). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

Duke does not anticipate any increase in liquid waste releases during the renewal period.

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

The waste gas system is designed to remove fission gases from radioactive contaminated fluids and to contain these gases. Fission gases are removed from other systems to the maximum extent possible and are contained in the waste gas system. The system is designed so storage and the subsequent decay of activity of these gases reduces to a large extent the need for regularly scheduled discharge of radioactive gases into the atmosphere during normal plant operation. There are times, however, when the release of radioactive gas may be necessary. As a result, there are provisions to sample and isolate each of the decay tanks.

The waste gas decay tanks, containment building purges, auxiliary building ventilation, and flow from the condenser air ejectors exhaust into the two unit vents. These four contributors to the unit vent exhaust are discussed below. The unit vents are the primary (major) gaseous release points from the plant and contain radiation monitors and flow rate measuring instrumentation (Duke 2001b).

- The waste gas system in the auxiliary building is shared between the two reactor units and consists of two waste gas compressors, two catalytic hydrogen recombiners, six gas decay storage tanks for use during normal power generation, and two gas decay storage tanks for use during shutdown and startup operations (Duke 2000a). Gases are allowed to decay in these tanks, then are released at permissible rates and activity to the vent as prescribed by the ODCM (Duke 2001b).

- Within the containment building, nonrecyclable reactor coolant leakage gases are released through the containment air release and addition system or through the containment purge system. The containment atmosphere is discharged through charcoal absorbers before its release.

- Gases collected inside the auxiliary building are released to the environment without further decay. Ventilation exhaust from potentially contaminated areas is passed through charcoal adsorbers before release.

- Gases from the condenser air ejectors are monitored continuously and discharged into the unit vent.

A separate gaseous effluent release point is the auxiliary monitor tank building. This effluent is normally considered nonradioactive. However, because of the potential for its release of radioactive effluents, ventilation of process areas pass through particulate and charcoal filters.

Radioactive gaseous wastes from Catawba are released primarily through the Unit 1 and Unit 2 vents. The exhaust streams that flow into the unit vents (i.e., waste gas decay storage tanks, containment ventilation, auxiliary building ventilation, and condenser air ejectors) are monitored for radioactivity. The unit vents are continuously monitored for noble gases, radioiodines, and particulate activity. The ODCM prescribes alarm/trip setpoints for these effluent monitors and control instrumentation to ensure that the alarm/trip will occur prior to exceeding the limits established in 10 CFR Part 20 for gaseous effluents (Duke 2001b). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

During 2000, there was a total fission and activation gas activity of 2.3 TBq (60.3 Ci), a total iodine activity of 7.77×10^{-7} TBq (2.1×10^{-5} Ci), a total particulate activity of 7.40×10^{-7} TBq (2.00×10^{-5} Ci), and a total tritium activity of 9.36 TBq (2.1×10^{2} Ci) released from the two units. These releases are typical of past years.

Duke does not anticipate any increase in gaseous releases during the renewal period.

2.1.4.3 Solid Waste Processing

Solid radioactive wastes from Catawba consist of spent resin and spent filters used in treating and separating radionuclides from gases and liquids; reactor components, equipment, and tools removed from service; contaminated oils and sludges; and contaminated protective clothing, paper, rags, and other trash generated from routine plant operations and from design modification and maintenance activities (Duke 2001a). The solid radwaste system is shared by the two units to contain and store radioactive waste materials and prepare them for shipment to a waste processor for volume reduction before disposal or for shipment directly to the licensed burial site.

Spent resin is flushed from plant demineralizers into spent resin storage tanks. The spent resin is processed by dewatering or solidification and packaged in a cask liner. Spent filter cartridges are removed from their housing and transferred to a shielded filter storage bunker where they are lowered into a disposal drum (Duke 2000a). Contaminated oils and sludges either are pumped to a processing area for solidification in cement or are shipped to an offsite vendor for processing prior to disposal.

Lower-activity wastes (i.e., miscellaneous solid materials) are processed at an offsite waste processing facility for volume reduction or segregation prior to disposal at a licensed facility such as those in Barnwell, South Carolina, or Envirocare in Utah. Higher-activity wastes (i.e., spent resins) are typically sent directly to a licensed disposal facility such as Barnwell, South Carolina (Duke 2001a). Onsite disposal within the owner-controlled area of slightly contaminated materials, of which secondary resins is an example, is approved by the NRC and the State of South Carolina in a process described in 10 CFR 20.2002 for materials confirmed to have acceptably low radionuclide concentrations.

Disposal and transportation of solid wastes 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 Catawba.

Approximately 90 solid waste shipments containing contaminated parts, tools, and equipment and 10 radwaste shipments containing dry active waste, dewatered resins, and irradiated hardware are made from Catawba each year as reported in the Catawba ER (Duke 2001a). The average yearly radioactive contaminated waste generated is about 250 m^3 (8825 ft^3). The volume shipped for burial averages about 50 m^3 (1750 ft^3) per year. These quantities may vary significantly from year to year.

In 2000, Catawba made five shipments of radwaste with a volume of 26.6 m^3 (938 ft^3) to a disposal facility. This includes the volume but not the shipment numbers sent for brokered dry active waste treatment and waste reduction. The combined waste contained a total activity of 50 TBq (1343 Ci) (Duke 2001d). Catawba has been aggressively reducing volume and minimizing waste for several years and intends to do so in the future.

2.1.5 Nonradioactive Waste Systems

Nonradioactive solid wastes from Catawba are disposed of in the onsite landfill or in other approved landfills. The onsite landfill typically handles the following types of wastes: asbestos, empty paint containers, and oil-contaminated materials. This landfill is permitted by the South Carolina Department of Health and Environmental Control (SCDHEC; Duke 2001a). General office trash and cafeteria wastes are collected and transported to an offsite permitted landfill. Construction wastes are hauled to a county construction and demolition debris landfill. Items such as paper, aluminum cans, and scrap metal are sent to a recycler.

Nonradioactive liquid wastes are sampled and treated according to the National Pollutant Discharge Elimination System (NPDES) permits issued to Catawba by the SCDHEC. These wastes originate from system drainage/leakage, water treatment activities, housekeeping and cleaning wastes, stormwater runoff, and floor and yard drains. These wastes are treated by sedimentation, skimming, precipitation, neutralization, and mixing before being discharged to Lake Wylie (Duke 2001a). Sanitary wastes are treated in an aerated facultative lagoon followed by an effluent polishing basin. The treated sanitary wastes are discharged into Lake Wylie through the station discharge structure (NRC 1983).

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation. Maintenance activities conducted at Catawba include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating, but 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. Duke refuels each of the Catawba units every 18 to 24 months (Duke 2001a). Each outage is typically scheduled to last approximately 30 to 40 days, and the outage schedules are staggered so that both units are not shut down at the same time. One-third of the core is replaced at each refueling. Approximately 500 additional workers are onsite during a typical outage (Duke 2001a).

Duke provided an appendix in *Duke Energy Company Catawba Nuclear Station Updated Final Safety Analysis Report* (Duke 2000a) regarding the aging management review to manage the effects of aging on systems, structures, and components in accordance with 10 CFR Part 54. Chapter 3 and Appendix B of the Catawba license renewal application specify the programs and activities that will manage the effects of aging during the license renewal period (Duke 2001a). Duke expects to conduct activities related to the management of aging effects during plant operation or during normal refueling and other outages, but no outages specifically for refurbishment activities are planned. Duke has no plans to add additional full-time staff (non-outage workers) at the plant during the period of the renewed licenses.

2.1.7 Power Transmission System

Catawba has five 230-kV transmission lines leaving the site from the switch yard (NRC 1983; Duke 2001a). The five lines (Table 2-1) are contained within rights-of-way ranging from 35 to 46 m (115 to 150 ft) in width and from 1 to 40 km (0.7 to 24.4 mi) in length covering a total of 75.7 km (42.4 mi) and approximately 295 ha (730 ac) (Duke 2001a; NRC 1983). The rights-of-way extend out from Catawba to the north, south, and west (Figure 2-4). The lines and rights-of-way were constructed or rebuilt between 1973 and 1983.

Duke owns less than 10 percent of the rights-of-way and has easements for the remaining 90 percent. Vegetation in the rights-of-way is managed through a combination of mechanical and herbicide treatments (Duke 2001a). Initial treatments include mowing and/or treatment with Arsenal (imazapyr) and Accord (glyphosate). Spot treatments then are applied once every 3 years using Arsenal, Accord, Garlon4A, and Krenite. Herbicide treatments in wetlands are limited to Arsenal and Accord, which are approved for use in wetlands. In addition, Duke cooperates with the South Carolina Department of Natural Resources (SCDNR) regarding

Table 2-1. Catawba Transmission Line Rights-of-Way

Line	Direction	kV	Length		Width		Area	
			km	(mi)	m	(ft)	ha	(ac)
Catawba-Allen	N	230	17.5	(10.9)	46	(150)	80	(198)
Catawba-Ripp	W	230	39.3	(24.4)	44	(145)	173	(426)
Catawba-Pacolet[(a)]	W	230	1.9	(1.2)	46	(150)	9	(22)
Newport (Allison Creek)	S	230	1.1	(0.7)	43	(140)	5	(12)
Newport (Newport)	S	230	8.4	(5.2)	35	(115)	29	(72)
Total			75.7	(42.4)			296	(731)

(a) An additional 64.4 km (40.1 mi) of line existing prior to construction of Catawba is shared but is not part of Catawba transmission system.

| protection of rare species and partners with The Wildlife Federation on vegetation management in some portions of the rights-of-way.

2.2 Plant Interaction with the Environment

Sections 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. Section 2.2.9 describes the historic and archaeological resources in the area, and Section 2.2.10 describes possible impacts on other Federal project activities.

2.2.1 Land Use

The Catawba site is located in the north-central portion of South Carolina 1.6 km (1 mi) west of the North Carolina-South Carolina state line and is situated within the Piedmont physiographic province. The power station is in northeastern York County, adjacent to Lake Wylie, and is approximately 16 km (10 mi) northeast of York, the county seat. The site is situated in the center of a peninsula about 1.6-km (1-mi) wide and 4.8-km (3-mi) long that protrudes into Lake Wylie, a body of water extending 45 km (28 mi) in length between dams and having a surface
| area of 4917 ha (12,149 ac) at normal operating level. Lake Wylie was formed by impounding

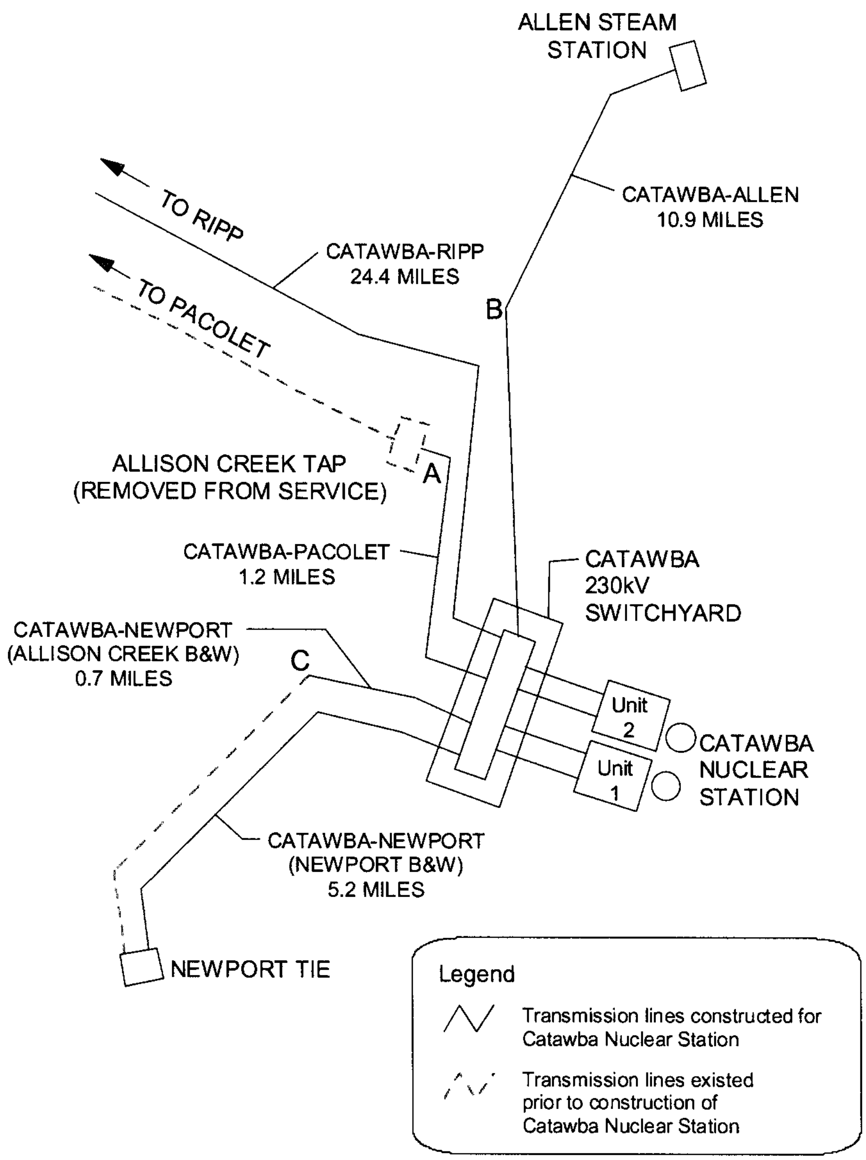

Figure 2-4. Catawba Transmission Lines and Rights-of-Way (Duke 2001a)

the water of the Catawba River. The lake was initially impounded in 1904. Present full pond was obtained in 1924 when an increase in the dam height raised the water level and increased the size of the lake. Duke either owns the land under the lake or the flood rights to that land. The lake level fluctuates in accordance with hydroelectric generation needs. Lake Wylie is a source of drinking water for several municipalities and supports extensive recreational use by fisherman, boaters, water skiers, and swimmers.

The total land area occupied by the site is 158 ha (391 ac) of which 106 ha (262 ac) is non-forested and contains generation, maintenance, and distribution facilities; a visitors center and lookout area; parking lots; open water; roads; and a railroad line. A recreation park and boat launch for Duke employees is located on a small peninsula protruding into Lake Wylie. Plans for an independent spent fuel storage installation are in the early stages of development and involve use of land presently used for other station purposes. There are approximately 51 ha (125 ac) of pine and pine-mixed hardwood forests. Forests cover the majority of the land area in the region surrounding the site. Most of the land within 8 km (5 mi) of the station is level to rolling with elevations ranging from 183 to 213 m (600 to 700 ft) above mean sea level with a few hills reaching 244 m (800 ft) in elevation.

The land occupied by Catawba is in unincorporated York County. York County and its municipalities currently have land-use plans and zoning requirements that govern development activities within the county.

2.2.2 Water Use

Catawba uses water from Lake Wylie for cooling and service water. Lake Wylie is the seventh of 11 impoundments in the 410-km (255-mi) Catawba-Wateree Project managed by Duke and licensed by the Federal Energy Regulatory Commission (FERC). Lake Wylie extends 45 km (28 mi) upstream from Wylie Dam to Mountain Island Dam. Flow through the Catawba-Wateree Project is managed by Duke to optimize hydroelectric generation, provide flood control, meet FERC minimum release requirements, and maintain a constant and reliable water supply for thermoelectric generating stations, surrounding communities, and industry. Lake Wylie has a storage volume of 3.48×10^8 m^3 (281,900 ac-ft) and a mean depth of 7 m (23 ft). The minimum daily release from Wylie Dam is 11.6 m^3/s (411 cfs).

As mentioned in Section 2.1.3, during operation, the average daily withdrawal from Lake Wylie is 380 million L/d (102 MGD), and the average daily discharge back into Lake Wylie from Catawba is 230 million L/d (60.7 MGD). During full-power operation, the water loss of 156 million L/d (41.3 MGD), or equivalently 1.81 m^3/s (64 cfs), results from evaporation and drift from the cooling towers. From 1997 through 1999, the average overall annual consumptive use of water from the Catawba River by Catawba was approximately 1.47 m^3/s (52 cfs). The mean flow in the Catawba River (below Wylie Dam) is 124 m^3/s (4390 cfs); therefore, evaporation and drift from Catawba from 1997 to 1999 represented a decrease of 1.46 percent in the long-term mean annual flow below Wylie Dam.

There are a total of three groundwater supply wells at the Catawba site. These wells supply water on a periodic basis to remote locations and for seasonal irrigation. The average annual groundwater withdrawal rate from these wells is 1.89 L/s (30 gpm). In addition to the groundwater wells, a dewatering system is used to reduce the hydrostatic pressures on the reactor and auxiliary buildings. The drainage system permanently maintains a groundwater level at or near the base of the foundation mat and basement walls, thus eliminating the hydrostatic forces. This groundwater drainage system consists of foundation underdrains and continuous exterior wall drains. The foundation underdrains and exterior wall drains discharge into three sumps. On a yearly basis, the average groundwater drainage discharge from these sumps is 2.15 L/s (34 gpm); therefore, total average annual groundwater use at Catawba is 4.04 L/s (64 gpm).

Potable water for Catawba is provided by the city of Rock Hill.

2.2.3 Water Quality

As Lake Wylie is situated in both North Carolina and South Carolina, both states are involved in the protection, from a watershed perspective, of the Lake Wylie's water quality. Lake Wylie exhibits thermal and oxygen dynamics similar to other southeastern reservoirs of comparable size, depth, flow conditions, and trophic status. Lake Wylie supports a good warm-water fishery.

Pursuant to the Federal Water Pollution Control Act (FWPCA) of 1977, also known as the Clean Water Act, the water quality of the plant effluents is regulated through the NPDES. The SCDHEC is the agency delegated to issue NPDES permits. The current permit (SC0004278) was issued April 30, 2001, and is due to expire June 30, 2005. Any new regulations promulgated by EPA or the SCHDEC would be included in future permits.

The temperature of the discharge to Lake Wylie is one aspect of the discharge regulated by the NPDES permit. For temperature, discharge limitations are specified as an allowable temperature rise (between intake and discharge) of 5.6°C (10°F) for the months of April through September and 7.8°C (14°F) from October through March.

2.2.4 Air Quality

The site is located in the north-central region of South Carolina at the very southern end of a region known as the Piedmont. In this region, the basic climatic classification is subtropical where a majority of the rainfall occurs in the summer creating some periods of unpleasantly humid conditions. The winter season is generally pleasant and attracts migratory birds. A feature unique to this climatic area is the occasional entry of very cold air masses during the winter season plunging temperatures well below freezing with resulting calamitous effects on the vegetation in the region. Temperatures in the region rarely exceed 35°C (95°F) or fall below -12°C (10°F). The best available extreme temperature data for the region (Charlotte, North Carolina) indicates the highest recorded temperature being 40°C (104°F), with the lowest reported temperature being -20.5°C (-5°F). The average precipitation in the region is 109 cm (43.1 inches) per year, which is evenly distributed throughout the year.

Normally, about 42 thunderstorms per year occur in the region (NOAA 1983). A vast majority of these storms occur during the months of May through September (34 of the 42). The most recent severe weather event was Hurricane Fran in August 1996. Based on statistics for the 30 years from 1954 through 1983, on the average, only 9 tornadoes are expected to occur in the state of South Carolina during the course of a year (Ramsdell and Andrews 1986). The probability of a tornado striking the site is calculated to be about 1×10^{-4} per year.

The wind energy resource in the vicinity of the site is limited, with the annual average wind power rated as 1 on a scale of 1 to 7 (Elliott et al. 1986). Wind turbines are economical for wind power classes 4 through 7 that have average wind speeds of 5.6 to 9.4 m/s (12.5 to 21.1 mph; DOE 2001a). Areas suitable for wind turbine application in South Carolina are limited to the ridges along the Blue Ridge Mountains in the extreme northwest corner of the state.

The Catawba site is located in Metropolitan Charlotte Interstate Air Quality Control region (40 CFR 81.75). This region is designated as in-attainment or unclassified for all criteria pollutants in 40 CFR 81.334 except for the EPA's reinstated 1-hr ozone standard. The County is at risk of being classified as non-attainment regarding ozone when a new 8-hr standard is implemented. The Cape Romain Area is the only area in South Carolina designated in 40 CFR 81.426 as a mandatory Class I Federal area in which visibility is an important value. There are more Class I areas located in North Carolina (40 CFR 81.422), but a vast majority are located in the region of the North Carolina-Tennessee border in the Smoky Mountains. None of these areas are within 80 km (50 mi) of the site.

After several years of litigation, new $PM_{2.5}$ and 8-hr ozone standards have been upheld. EPA is taking steps to implement the new standards (e.g., developing its approach and collecting the data necessary to designate which areas are non-attainment.)

Diesel generators, boilers, and other activities and facilities associated with Catawba operations emit various pollutants. Emissions from these sources are regulated under air quality permit number 2440-0070 issued by SCDHEC (Appendix E). This permit expires on December 31, 2005.

2.2.5 Aquatic Resources

Aquatic resources in the vicinity of Catawba are associated with Lake Wylie and the Catawba River. Lake Wylie, which serves as the cooling water source for Catawba, extends 45 km (28 mi) in length between Mountain Island Dam in North Carolina and Wylie Dam in South Carolina. Mountain Island Lake and Lake Wylie, which are part of the Catawba-Wateree Project, are owned and operated by Duke and are licensed by FERC as FERC Project 2232. The Catawba-Wateree Project consists of 11 lakes on the Catawba River, which are operated for hydroelectric power. Lake Wylie is the third largest lake in the Catawba River chain (Duke 2001a). Tributaries for Lake Wylie include the Catawba River, Allison Creek, Mill Creek, Crowders Creek, and the South Fork Catawba River (NCDENR 1999; SCDHEC 1999).

Upon leaving Lake Wylie, the Catawba River flows about 40 km (25 mi) south to Landsford Canal (Figure 2-1). This reach is a substantial portion of the 67 km (42 mi) of the Catawba River's total 360 km (225 mi) upstream of Lake Wateree Dam that remains free-flowing (Duke 2000b). The Catawba River then continues to Lake Wateree, the lowermost lake of the Catawba-Wateree Project, which is about 80 km (50 mi) south of Wylie Dam. Lake Wylie and the Catawba River are part of the Santee-Cooper drainage unit (Warren et al. 2000). Counties directly adjacent to Lake Wylie, adjacent to the immediate reaches of the Catawba River upstream and downstream of Lake Wylie, or with tributaries into the immediate adjacent reaches of the Catawba River include Gaston, Mecklenburg, and Union Counties in North Carolina and York, Chester, and Lancaster Counties in South Carolina. Besides serving as the cooling water source for Catawba, Lake Wylie is the source of municipal drinking water for several cities in the region and is used extensively by fisherman, boaters, water skiers, and swimmers (Duke 2001a).

Lake Wylie was formed from the impoundment of the Catawba River by Duke's Wylie Dam and initially achieved full pond volume in 1904; however, the dam was raised 15 m (50 ft) in 1924 (NRC 1983). It is reasonably shallow (mean depth of 7 m [23 ft], maximum depth of 28.4 m [93.2 ft]) and has a full pond surface area of 4916 ha (12,139 ac), a full pond volume of 348 million m^3 (281,900 ac-ft), a shoreline length of 526 km (327 mi), and a drainage area of 7822 km^2 (3020 mi^2). The annual mean flow at Wylie Dam is 106.9 m^3/s (3774 ft^3/s) with a minimum average daily flow (as specified by FERC) of 11.6 m^3/s (411 ft^3/s). Maximum drawdown is 3 m (10 ft) (Duke 2001a).

Lake Wylie is typical of many shallow impoundments in the Piedmont physiographic province region. Since impoundment, it has gone through the typical ecological succession experienced by all man-made reservoirs in which the biotic community initially is highly productive and then decreases in production until it reaches ultimate stability (Paterson and Fernando 1970; Voschell and Simmons 1978). Lake Wylie had achieved a degree of stability by the time initial aquatic studies were conducted (NRC 1983). More recent monitoring shows the aquatic community remains relatively stable (Duke 2001a, 2002a,b).

Duke's periodic biota monitoring program at Lake Wylie includes surveys of phytoplankton, zooplankton, and fisheries (Duke 2002a). The lake shows a pattern of aquatic organism distribution between up-lake and down-lake locations that is atypical from similar lakes. Up-lake locations are typically more diverse and productive due to the influx of nutrients from upstream, which are consumed further down-lake. However, the South Fork Catawba River, a major tributary, contributes substantial nutrient loads to lower Lake Wylie, and thus contributes to the unusual distribution of aquatic organisms (Duke 2001a).

Lake Wylie supports numerous phytoplankton, zooplankton, and macroinvertebrate communities. Ten phytoplankton classes comprising 114 genera and 293 species and varieties have been recorded (Duke 1993). Cryptophyic algae, blue-green algae, green algae, and diatoms dominate, forming a generally stable community whose densities and relative importance change seasonally (Duke 1993, 2001a). The dominant zooplankton genera in Lake Wylie are primarily planktonic or limnetic species characteristic of most North American reservoirs (NRC 1983). Thirty-three taxa have been identified, with major groups including Rotifera (rotifers), Copepoda (copepods), and Cladocera (cladocerans) (Duke 1993).

A total of 88 macroinvertebrate taxa have been reported from Lake Wylie in the vicinity of Catawba (NRC 1983). Midges (Chironomidae) are the most diverse group, typically dominating macroinvertebrate assemblages (Duke 1993). The most abundant chironomid genera are *Coelotanypus*, *Chironomus*, *Tanytarsus*, *Ablesmyia*, and *Cryptochironomus* (Duke 1993). There are a few native freshwater mussels (primarily Unionids) in Lake Wylie (Duke 1988, 2001a). The only mussel of any abundance is the introduced Asiatic clam (*Corbicula* sp.). No consistent spatial trend in the Asiatic clam standing crop has been observed in Lake Wylie in previous studies (Duke 1993). Current Asiatic clam monitoring focuses on clam densities at the intake screen conducted to assess impacts to plant operations.

A total of 49 fish species from 10 families have been reported in Lake Wylie since sampling began in 1973 (Duke 1988). Dominant species include threadfin shad (*Dorosoma petenense*), gizzard shad (*D. cepedianum*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), redbreast sunfish (*L. auritus*), pumpkinseed (*L. gibbosus*), redear sunfish (*L. microlophus*), black crappie (*Pomoxis nigromaculatus*), white catfish (*Ameiurus catus*), channel catfish (*Ictalurus punctatus*), and yellow perch (*Perca flavescens*). Data collected between 1978 and 1979 found largemouth bass accounted for the greatest biomass of all species collected at locations near the Catawba site, whereas threadfin shad were the most numerous (NRC 1983). In studies conducted through 1993, gizzard shad, threadfin shad, and bluegill were the dominant species observed in cove rotenone sampling, white catfish and gizzard shad were the species captured most frequently in gill netting, and bluegill and redbreast sunfish most frequently captured during electro-fishing (with threadfin shad and gizzard shad occasionally common). Threadfin shad was the dominant forage fish from 1993 to 1997 and comprised from 99.8 to 100 percent of the forage fish in purse seine hauls (Duke 2002a). Forage fish densities ranged from 1692 in 1997 to 115,432 fish/ha in 1993 (677 to 46,173 fish/ac, respectively). Total population estimates ranged from about 15 million in 1997 to 403 million in 1993. Between 1993 and 1997, the Lake Wylie littoral (shoreline) fish community, measured as mean total biomass, ranged from approximately 70 to160 kg fish/ 1000 m (250 to 570 lbs/mi) of shoreline electro-fished with a trend of decreasing biomass progressively downstream (Duke 2002b). Sunfish, catfish, and common carp (*Cyprinus carpio*) compose the majority of the biomass at all shoreline locations (Duke 2002b). Historic differences in species composition can be attributed to differences in areas sampled, sampling frequency, and sampling technique. Current fish monitoring consists of hydroacoustic and purse sein sampling and shoreline electro-fishing at 3-year intervals at locations that allow comparison to historic data (Duke 2002a, 2002b).

Lake Wylie supports a good warm-water fishery. The resident species generally favor the relatively stable water levels that are maintained in the reservoir (Duke 2001a). Game fish of the family Centrarchid (sunfish family – redbreast sunfish, pumpkinseed, bluegill, redear sunfish, largemouth bass, and black crappie) – need relatively stable water levels during their springtime spawning seasons. Duke, in cooperation with SCDNR, implements a reservoir water level stabilization program each spring to ensure stable water levels during the spawning season for largemouth bass and other members of the family Centrarchidae (Duke 2001a). White bass (*Morone chrysops*, a member of the family Percichthyidae) is the only fish species that makes an appreciable spawning run in Lake Wylie. This spawning run, which occurs during the February through April time period, is most evident in the area of Dutchman's Creek, which enters Lake Wylie on the extreme northwestern side of the reservoir. In the past few years, both blue catfish (*Ictalurus furcatus*) and flathead catfish (*Pylodictis olivaris*) have established populations in Lake Wylie (Duke 2001a). These fish are apparently migrants from upstream reservoirs and are presently represented by sparse populations. However, both populations are expanding and their predatory nature may eventually impact other species of fish (primarily other ictalurids) in Lake Wylie.

Table 2-2 lists Federal special status aquatic species found in Gaston, Mecklenburg, and Union Counties in North Carolina and York, Cherokee, Lancaster, and Chester Counties in

Table 2-2. Aquatic Species Listed as Endangered or Threatened by the FWS and Species that are Candidates for FWS Listing as Threatened or Endangered or are Considered Species of Concern by FWS Potentially Occurring in Gaston, Mecklenburg, and Union Counties in North Carolina, and York, Cherokee, Lancaster, and Chester Counties in South Carolina

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
Fish			
Etheostoma collis	Carolina darter	SOC	SC-SOC
Freshwater mollusks			
Lasmigona deciorata	Carolina heelsplitter	E	NC-E SC-E
Alasmidonta varicosa	Brook floater	SOC	NC-E SC-SOC

(a) SC = South Carolina, NC = North Carolina, E = endangered, SOC = species of concern

South Carolina (Gaddy 2001; SCDNR 2001; North Carolina Atlas of Freshwater Mussels and Endangered Fish 2001; FWS 2002). No Federally listed fish species occur in counties immediately adjacent to Lake Wylie, counties adjacent to the Catawba River immediately upstream or downstream of Lake Wylie, or tributary streams crossed by Catawba transmission lines (York and Cherokee Counties). The Carolina darter (*Etheostoma collis*), a Federally listed species of concern, has been found in small to medium-size streams 2 to 3 ft (0.6 to 0.9 m) deep from backwater pools or near stream banks in slow moving water (Collette 1962). It has not been collected from Lake Wylie in the vicinity of Catawba.

The Carolina heelsplitter (*Lasmigona decorata*), a Federally listed endangered freshwater mollusk that is also listed as endangered by both North and South Carolina, occurs downstream of Lake Wylie. All known populations of this species occur in the Pee Dee, Catawba, and Savannah River systems (FWS 1996; FWS 2001). All known populations in the Catawba River system occur in tributary streams to the Catawba River downstream of Lake Wylie. Areas containing these populations comprise two of the six units proposed as critical habitat (FWS 2001) including a 20-km (12-mi) stretch of Waxhaw Creek in Union County, North Carolina. Waxhaw Creek enters the Catawba River just above Landsford Canal (Figure 2-1), about 24 to 32 km (15 to 20 mi) downstream of Wylie Dam. Another population unit consists of a 10-km (6-mi) stretch of Gill Creek in Lancaster County, South Carolina. Flow from Gill Creek combines with Bear Creek just outside of the town of Lancaster (Figure 2-1), then joins Crane Creek before entering the Catawba River just below Landsford Canal about 48 km (30 mi) downstream from Wylie Dam. Three locations in the Catawba River downstream of Wylie Dam were surveyed for Carolina heelsplitter on October 26, 2001, by the FWS, NCDENR, and the

North Carolina Department of Transportation (Duke 2002c). The locations surveyed included the river immediately below Lake Wylie Dam and the river at the Interstate Highway 77 (I-77) bridge. The Catawba River at Landsford Canal State Park could not be surveyed due to high turbidity. No Carolina heelsplitter were found in this survey, and none have been observed in monitoring programs or surveys of Lake Wylie.

In addition, there are several aquatic species identified by North and South Carolina as state species of concern (rare species that have no legal protection) with potential to occur in the Catawba River system in counties in the vicinity of Lake Wylie. None of the species have been reported in monitoring or survey data from Lake Wylie.

2.2.6 Terrestrial Resources

The Catawba site is located in the Piedmont physiographic province (Bailey 1980). Common vegetation types on the Catawba site and the transmission line rights-of-way are pine *(Pinus* sp.), pine-mixed hardwood, mixed hardwoods, and bottomland hardwoods (Duke 2001a). Currently, ornamental plantings, parking areas, and facilities make up about 67 percent of the 183-ha (450-ac) Catawba Site. Thirty-two percent is forest habitat; and less than one percent is wetland habitat (Duke 2001a). Several of the ravines have mature mixed hardwood stands that include chalk maple (*Acer leucoderme*). In addition, many of the chalk maple stands in open dry bluff areas are dominated by black oak (*Quercus velutina*) rather than the more typical chestnut oak (*Quercus prinus*). The wetlands on the site are associated with beaver ponds, seeps, creeks, artificial impoundments, and Lake Wylie (Duke 2001a). Duke's environmental policies prohibit construction work in the wetlands and limit activities in woodlands.

Disturbed pastures and old fields are the dominant vegetation types in the transmission line rights-of-way with bluestems (*Andropogon* sp.), wire-grasses (*Aristida* sp.), asters (*Aster* sp.), sunflowers (*Helianthus* sp.), and goldenrods (*Solidago* sp.). Trees such as tag alder (*Alnus serrulata*) and black willow (*Salix nigra*) are common around seeps and ponds. These herbaceous communities in the transmission line rights-of-way are maintained by mowing and spot herbicide treatments.

Wetlands are found on portions of the transmission line rights-of-way and at the power station. These wetlands are small, and at the power station, they primarily are associated with Lake Wylie. Duke avoids these areas when possible during vegetation management activities, transmission line maintenance, and site maintenance, and consults with the U.S. Army Corps of Engineers as needed to comply with Section 404 of the Clean Water Act.

Eleven Federal and 14 State-listed threatened, endangered, and candidate species occur or potentially may occur at Catawba or along the transmission line rights-of-way (Duke 2001a; North Carolina 2001a; South Carolina 2001; FWS 2002). In addition, there are many species identified as species of concern (rare species that have no legal protection) that potentially may occur at the Catawba site or along the transmission line rights-of-way. Based on field surveys (Duke 2001a), no protected species, critical habitat, or species of concern are known to occur on the Catawba site or the transmission line rights-of-way, with the exception of the bald eagle (*Haliaeetus leucocephalus*). Eagles rarely are sighted near Catawba, and there are no known nesting sites on the site or its transmission line rights-of-way (Duke 2001a). Dwarf-flowered heartleaf (*Hexastylis naniflora*) has been identified in Cherokee County and habitat exists within the transmission line corridors. However, no *H. naniflora* have been observed on Catawba or the transmission line corridors. Georgia aster *(Aster georgianus)* has been found near the Allison Creek transmission line corridor, however, no *A. georgianus* have been found in any of the corridors or at the Catawba site. Table 2-3 lists the State- and Federal-protected species and their status.

2.2.7 Radiological Impacts

Duke has conducted a radiological environmental monitoring program (REMP) around the Catawba site since 1981 (Duke 2001c). The radiological impacts to workers, the public, and the environment have been routinely monitored, documented, and compared to the appropriate standards. The objectives of the REMP are:

- provide surveillance of detailed effluent monitoring to evaluate the significance, if any, of the contributions to the existing environmental radioactivity levels that result from station operation (Duke 2001c)

- detect and identify changes in environmental levels as a result of station operations (Duke 2001c)

- provide representative measurements of radiation and radioactive materials in the exposure pathways for the radionuclides that have the highest potential for radiation exposures of members of the public (Duke 2000a)

- implement Section IV.B.2 of Appendix I to 10 CFR Part 50, verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways (Duke 2000a).

Radiological releases are summarized in the annual reports *Catawba Nuclear Station, Units 1 and 2, Annual Radiological Environmental Operating Report* (Duke 2001c) and *Catawba*

Table 2-3. Terrestrial Species Listed as Endangered, Threatened, Candidate, or Federal Species of Concern by the FWS, South Carolina, or North Carolina that Occur or Potentially Occur at Catawba or Its Associated Transmission Line Rights-of-Way

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
Reptiles			
Clemmys muhlenbergii	bog turtle	T	NC-T
Birds			
Haliaeetus leucocephalus	bald eagle	T	SC/NC-E
Picoides borealis	red-cockaded woodpecker	E	SC/NC-E
Mammals			
Myotis austroriparius	Southeastern myotis	SOC	SC-T
Vascular Plants			
Amphianthus pusillus	pool sprite	T	SC-T
Aster georgianus	Georgia aster	C	NC-T
Delphinium exaltatum	tall larkspur	SOC	NC-E
Echinacea laevigata	smooth coneflower	E	SC/NC-E
Helianthus schweinitzii	Schweinitiz's sunflower	E	SC/NC-E
Hexastylis naniflora	dwarf-flowered heartleaf	T	SC/NC-T
Hymenocallis coronaria	shoals spider-lily	SOC	SC/SOC
Isoetes virginica	Virginia quillwort	SOC	NC-SOC
Isoetes melanospora	black-spored quillwort	E	SC-E
Lotus helleri	Heller's trefoil	SOC	NC-T
Oxypolis canbyi	Canby's dropwort	E	SC-E
Rhus michauxii	Michaux's sumac	E	NC-E
Rudbeckia heliopsidis	sun-facing coneflower	SOC	SC-SOC

(a) SC = South Carolina, NC = North Carolina, E = endangered, T = threatened, C = candidate, SOC = species of concern

Nuclear Station Annual 2000 Radioactive Effluent Release Report (Duke 2001d). The limits for all radiological releases are specified in the Catawba ODCM (Duke 2001b), and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the air, direct radiation, surface water, drinking water, groundwater, shoreline sediment, milk, fish, broadleaf vegetation, and food products in about a 24-km (15-mi) radius of the station.

Review of historic data on releases and the resultant dose calculations revealed that the doses to maximally exposed individuals in the vicinity of the Catawba site were a small fraction of the limits specified in the EPA's environmental radiation standards 40 CFR Part 190 as required by 10 CFR 20.1301(d). For 2000 (the most recent year that data were available), dose estimates were calculated based on actual liquid and gaseous effluent release data and on measured concentrations of radionuclides from the REMP (Duke 2001c). Dose estimates based on effluent data were performed using the plant effluent release data, onsite meteorological data, and appropriate pathways identified in the ODCM.

A breakdown of maximum dose to an individual located at the Catawba site boundary from effluent-based releases and environmental-based releases for the year 2000 was summarized by Duke (2001c) as follows:

- Total body dose from liquid effluent-based estimates was 4.37×10^{-4} mSv (0.0437 mrem) compared to 7.31×10^{-4} mSv (0.0731 mrem) from environmental-based estimates. These estimates were approximately 1 percent of the 0.06-mSv (6-mrem) dose limit[(a)]. The maximum total organ dose for the liquid effluent-based estimates was 0.00121 mSv (0.121 mrem) to the adult gastrointestinal tract-lower large intestine (GI-LLI) compared to 0.328 mSv (0.328 mrem) to the adult GI-LLI from the environmental-based estimates. These estimates were between 0.6 and 1.6 percent of the 0.20-mSv (20-mrem) dose limit (Duke 2001c).

- The air dose due to noble gases in gaseous effluents was 3.38×10^{-4} mGy (0.0338 mrad) gamma (0.17 percent of the 0.20-mGy [20-mrad] gamma dose limit)[(a)] and 7.37×10^{-4} mGy (0.0737 mrad) beta (0.18 percent of the 0.40-mGy [40-mrad] beta dose limit; Duke 2001c). Noble gases are not collected as part of the REMP; therefore, an environmental-based estimate was not calculated (Duke 2001c).

- The critical organ dose from gaseous effluents due to iodine-131, iodine-133, tritium, and particulates with half-lives greater than 8 days is 0.0121 mSv (1.21 mrem), which is 4 percent of the 0.30-mSv (30-mrem) dose limit (Duke 2001c).

(a) The dose limit is twice the dose limit in 10 CFR Part 50, Appendix I, because the limit is per reactor unit and Catawba has two operating reactor units.

The applicant does not anticipate any significant changes to the radioactive effluent releases or exposures from Catawba 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 Catawba ER (Duke 2001a) and information obtained from several county, city, and economic development staff during a site visit to York County from October 22 through 26, 2001. The following information describes the economy, population, and communities near the Catawba site.

2.2.8.1 Housing

The full-time work force at Catawba is approximately 1218 employees, which includes permanent and contractor staff. As shown in Table 2-4, approximately 55 percent of these employees live in York County, South Carolina; 15 and 14 percent live in Gaston and Mecklenburg Counties, North Carolina, respectively; and the rest live in other locations (Duke 2001a). Table 2-5 presents a further breakdown of employee residency by city and county. Since over half of the Catawba employees live in York County, the focus of the socioeconomic analysis for the most part is on that county.

Duke refuels each reactor at Catawba on an 18- to 24-month cycle. During refueling outages, an average of 1400 workers are onsite during the day shift, compared to a norm of 900 workers onsite during normal plant operations (Duke 2001a).

Table 2-6 provides the number of housing units and housing unit vacancies for York, Gaston, and Mecklenburg Counties for 1990 and 2000. York County has an urban development boundary within which development is to take place, but otherwise, it does not have growth-management controls.

Table 2-4. Catawba Permanent and Contractor Employee Residency by County

County	Number of Personnel	Percent of Total Personnel
York (SC)	673	55
Gaston (NC)	188	15
Mecklenburg (NC)	166	14
Other – NC	112	9
Other – SC	79	7
Total	1218	100

Source: Duke 2001a.; Duke 2002d

Table 2-5. Catawba Permanent and Contractor Employee Residency by County and City

County and City	Duke Power
YORK COUNTY, SOUTH CAROLINA	
Clover	76
Fort Mill	52
Lake Wylie	13
Rock Hill	362
York	131
Other Cites and Towns	39
Total York County	673
GASTON COUNTY, NORTH CAROLINA	
Belmont	34
Dallas	11
Mount Holly	15
Stanley	8
Gastonia	104
Other Cites and Towns	16
Total Gaston County	188
MECKLENBURG COUNTY, NORTH CAROLINA	
Charlotte	141
Huntersville	6
Matthews	11
Pineville	6
Other Cites and Towns	2
Total Mecklenburg County	166
CHEROKEE COUNTY, SOUTH CAROLINA	
Gaffney	27
Other Cites and Towns	4
Total Cherokee County	31
CHESTER COUNTY, SOUTH CAROLINA	
Chester	13
Other Cites and Towns	7
Total Chester County	20
LANCASTER COUNTY, SOUTH CAROLINA	
Lancaster	16
Other Cites and Towns	3
Total	19
UNION COUNTY, NORTH CAROLINA	
Other Cites and Towns	17

Table 2-5. (contd)

County and City	Duke Power
CABARRUS COUNTY, NORTH CAROLINA	
Concord	6
Harrisburg	5
Kannapolis	3
Total	14
CLEVELAND COUNTY, NORTH CAROLINA	
King's Mountain	15
Shelby	7
Other Cites and Towns	3
Total	25
LINCOLN COUNTY, NORTH CAROLINA	
Denver	7
Lincolnton	15
Other Cites and Towns	3
Total	25
Other Counties	
North Carolina	31
South Carolina	9
Total	1,218

Source: Duke 2001a.

Table 2-6. Total, Occupied, and Vacant (Available) Housing Units by County 1990 and 2000

	1990	2000	Approximate Percentage Change
YORK COUNTY, South Carolina			
Housing Units	50,438	66,061	31.0
Occupied Units	47,006	61,051	29.9
Vacant Units	3,432	5,010	46.0
GASTON COUNTY, North Carolina			
Housing Units	69,133	78,842	14.0
Occupied Units	65,347	73,936	13.1
Vacant Units	3,786	4,906	29.6
MECKLENBURG COUNTY, North Carolina			
Housing Units	216,416	292,780	35.3
Occupied Units	200,219	273,416	36.6
Vacant Units	16,197	19,364	19.6

Sources: USCB 2000; USCB 1990.

Table 2-7 contains data on population, estimated population, and annual growth rates for York County, South Carolina, and Mecklenburg and Gaston Counties, North Carolina.

Table 2-7. Population Growth in York County, South Carolina, and Mecklenburg and Gaston Counties, North Carolina, 1970 to 2020

	York County		Mecklenburg County		Gaston County	
	Population	Annual Growth Percent[(a)]	Population	Annual Growth Percent	Population	Annual Growth Percent
1970	85,216	--	354,656	--	148,415	--
1980	106,720	2.3	404,270	1.3	162,568	0.9
1990	131,497	4.4	511,433	2.4	175,093	0.7
2000	164,614	2.3	695,454	2.5	190,365	0.8
2010	184,800	1.2	888,137	2.5	203,623	0.7
2020	211,500	1.4	1,089,258	2.1	215,587	0.6

(a) Annual percent growth rate is calculated over the previous decade.
-- = Data not available.
Sources: USCB 2000; USCB 1990; North Carolina 2001b; South Carolina 2000.

2.2.8.2 Public Services

Public services include water supply, education, and transportation.

- **Water Supply**

  Table 2-8 summarizes the daily consumption and areas served for each of the two water systems within York County, the county most impacted by the re-licensing of Catawba. The county is served by two interconnected water systems–the eastern and western systems. The western system includes the town of York water treatment plant. The municipal water reservoir, which produces malodorous water when it turns over once each year, is the only source of drinkable water for the town of York. The town will soon remedy the problem through the construction of a new water treatment plant (York County 1999).

  Water treated by the town of York is purchased by York County for the unincorporated parts of the county. From the town of York, York County mains carry water through the central part of the county. The system branches off along Mount Gallant Road to Museum Road, where it connects to the city of Rock Hill water system and becomes the eastern part of the system. The central portion of the western system also branches off to the Catawba site and serves the Lake Wylie area.

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

Water System	Source	Maximum Daily Capacity m^3/day (MGD)	Average Daily Capacity m^3/day (MGD)	Areas Served
City of Rock Hill[(a)]	Lake Wylie	75,400 (20.0)	52,780 (14.0)	Rock Hill, Fort Mill, and unincorporated parts of York County
Town of York[(b)]	Lake Wylie	9048 (2.4)	4524 (1.2)	York, Lake Wylie, Catawba site, and unincorporated parts of York County

(a) Personal communication, Susan Featherstone, city of Rock Hill, South Carolina, November 28, 2001.
(b) Personal communication, Charles Helms, Director of Public Works, town of York, South Carolina, December 3, 2001.

The city of Rock Hill also has a water treatment plant and serves the eastern part of the county. York County purchases water from Rock Hill, and Rock Hill also sells water to the town of Fort Mill, which transports the water through its own lines to the York County water district where it is sold (York County 1999).

In addition, York County buys water from the Charlotte-Mecklenburg Utility District, North Carolina. This arrangement was initiated as a standing emergency agreement that began in the summer of 1998. Since then, water has been purchased as needed under the arrangement (York County 1999).

- **Education**

There are four school districts in York County. The Rock Hill School District is the largest with a total enrollment (elementary through high school) of 14,468 students. There are 27 elementary, 11 middle, and 7 high schools in the county. Catawba is located within the Clover School District, which receives 75 percent of the taxes paid by Catawba. The remaining 25 percent of this tax revenue is apportioned between York County and the remaining school districts. Table 2-9 presents summary information on each of the four school districts.

In addition, York County is the home of three colleges, all of which are located in Rock Hill. Winthrop University is the only comprehensive teaching university in South Carolina with 100 percent accreditation for all eligible programs. It offers programs in four broad areas: arts and sciences, business, visual and performing arts, and education. Total enrollment is approximately 6100 students (The Herald 2001).

Table 2-9. York County School District Profile

	York School District	Clover School District	Rock Hill School District	Fort Mill School District
Total enrollment	4,955	4,488	14,468	4,817
Number of schools				
Elementary	4	5	14	4
Middle	2	3[(a)]	4	2
High	2[(b)]	1	3[(c)]	1
Expenditures ($1000)	25,444	30,218	77,057	23,647

(a) Includes the Crowders Creek Elementary/Middle School complex.
(b) Includes the Floyd Johnson Vocational Center.
(c) Includes the Applied Technology Center.
Source: The Herald 2001.

York Technical College is a 2-year college with total enrollment of 3600 students. The college has 96 full-time faculty and offers 68 degree programs. It also offers certificates in business, computer, arts and sciences, health and human services, and industrial and engineering technology (The Herald 2001). Clinton Junior College is a 2-year college that offers course work in the liberal arts and business. It also offers a certificate in church ministry. Its total enrollment is less than 100 students (The Herald 2001).

- **Transportation**

There are 24 counties within the 80-km (50-mi) radius of the Catawba site: 11 in South Carolina and 13 in North Carolina. The 24-county area is served by 3 major interstate freeways. Interstate 85 (I-85) enters the region from the northeast and connects Charlotte, North Carolina, with points in Georgia to the southwest. Interstate 77 runs in a north-south direction, passes through Charlotte into South Carolina through York County, and continues on to Columbia, South Carolina. Interstate 40 (I-40) lies in an east-to-west direction, bypassing Charlotte on the north.

York County is traversed by several highways. In addition to I-77, the county is traversed by several other Federal highways including U.S. Highways 21 and 321, which are north-south thoroughfares, and South Carolina Highway (SCH) 274. Major east-west highways are SCHs 5 and 161.

In June 1997, the citizens of York County passed a 1 percent sales tax for the purpose of generating funds for roadway improvements. New roadways and roadway improvements are currently on-going throughout the County. The tax was expected to raise approximately $100 million over a 7-year period. Tax revenues collected and accounted for to date have exceeded projections; therefore, the maximum amount of the tax ($100 million) that could be collected over the 7-year period has been collected (York County 1999). Tax collection for the roadway improvements, therefore, has been terminated.

Access to the Catawba site is via Concord Road, a two-lane road leading to the plant entrance. The average annual daily traffic (AADT) count on the road numbers 3000 (Duke 2001a). Other roads lead to turnoffs for Concord Road from both North Carolina (State Route 49, the most heavily traveled route with AADT counts of 23,000 [Duke 2001a]) and South Carolina (SCHs 49, 274, 80, 55, and others). Level-of-service designations for these roads were not available (Duke 2001a).

2.2.8.3 Offsite Land Use

Land use designations have been applied in York County except for unincorporated areas. The county is divided into six major planning sectors for land use planning designations. Table 2-10 presents the major land use designations for York County.

Table 2-10. Land Use in York County

Land Use	Hectares	Acres	Percent of Total
Forest (all types)	118,570	292,990	66
Scrub/shrub[(a)]	18,600	45,970	10
Agriculture/grasslands	26,100	64,480	14
Water	4560	11,270	3
Urban/built up	10,780	26,640	6
Barren disturbed land	1910	4730	1
Total	180,520	446,080	100

(a) Scrub/shrub class of land may include pasture or fallow farmland.
Note: Land use based on satellite imagery from 1988 to 1990.
Source: South Carolina 1998.

Each of the planning sectors, and the predominant land use characteristics in each sector, are briefly discussed below.

The Fort Mill Planning Sector encompasses the northern part of York County along the I-77 corridor. The presence of I-77, combined with the proximity of Fort Mill to the metropolitan area of Charlotte, North Carolina, and its municipal airport, which provides major airline service to other parts of the country, has resulted in substantial growth in population over the last 20 years. The last decade has seen growth in light industrial/commercial type development, including an office space buildup near I-77. Lake Wylie provides recreational and scenic amenities and a water supply, which increases the value of homes and encourages the development of high quality, residential property.[a]

The Rock Hill East Planning Sector encompasses the area east of Rock Hill, both south and west of the Catawba River and north to the adjoining Chester County border. Land use in this sector is impacted by I-77, the developing Catawba Indian Nation Reservation, and the Catawba River. Major employers in this planning sector include the Celanese-Acetate Corporation; AMP, Inc.; State Farm Insurance; and Bowater, Inc. Major focal points of development include the intersection of SCH 161 and I-77. Land use has been historically rural but is transitioning to residential/subdivision use with building lots being 0.4 to 1.2 ha (1 to 3 ac) in size. Other communities located in the area include Leslie, Harmony, and Catawba, all of which are located along SCH 21 and the CSX railroad.[a]

The Rock Hill West Planning Sector is bounded on the north by Lake Wylie and on the east by the western portion of the city of Rock Hill. The more rural portion of this sector is the area along the Chester/York County boundary. The soils in this area tend to shrink/swell with wet and dry cycles, so for that reason, the county is discouraging intense residential development in the area (York County 1999). Factors affecting land use patterns in this sector include the Rock Hill-York County Airport, which is surrounded by a mix of land uses including residential, commercial, and rural.[a]

The Bethel/Lake Wylie Planning Sector is bordered by Lake Wylie and Mecklenburg County, North Carolina, to the east and Gaston County, North Carolina, on the north. Given good road access, this area historically has encouraged the location of residential commuters to the sector's northern part. Parts of the area are in rapid transition from rural use to residential development. Relatively more dense residential development is occurring around Lake Wylie.

(a) York County 1999. York County Comprehensive Plan – Land Use Element. Planning and Development Services. York, South Carolina. <http://www.yorkcountygov.com/departments/Planning Development/docs/land%20use.pdf> (Accessed November 21, 2001).

Historically, the sector has lacked open space and recreational land, but this situation has been remedied with acquisition of the Ferguson's/Nanny's Mountain area, which has been of prime, historical significance from colonial times when it served as a source of iron products during the Revolutionary War.[a]

The Clover/Kings Mountain Planning Sector has an observable difference between the more established and economically developed portions of eastern York County and the more rural sectors of the western part of the county. The area encompasses land that extends from the western town limits of the town of Clover to the boundary between Cherokee and York Counties. The predominant land use is agricultural conservation. The more developed, suburban/residential parts of the county lie to the east. Growth is projected to occur more to the east of Clover than to the west. Most of the workers from this section commute to Gaston and Mecklenburg Counties in North Carolina for employment. In recent years there have been ongoing attempts to foster growth within the town of Clover in hopes of reducing the amount of commuting.[a]

The York/McConnells/Broad River Planning Sector includes the town of York, which is the county seat. The town of York is the principal urban land use influence within the sector. It has pursued aggressively the installation of water and sewer lines to the east of town along SCHs 161 and 5. Wal-Mart has opened a facility to the east of town, which is expected to be an area of further economic development. It is anticipated that SCH 5 to the west will be widened to five lanes and, when completed, will evolve into an east-west connector between I-85 and I-77.[a]

The areas to the south (McConnells) and west (Smyrna) of the town of York are predominantly rural and designated for agricultural conservation, and have been characterized as York County's last frontier. However, improved roads, which enable easier and faster access to the western part of the county, may lead to economic development similar to that experienced in the eastern part of the county (Bair 2001). Much of the land around McConnells is still farmed, and tree farming is the main economic activity in the land west of McConnells and north to Smyrna. York County, in its update to the County-wide land use plan, will be placing increased emphasis on the preservation of rural lands. The Broad River, which has designated scenic status by the state of South Carolina, forms the sector's western boundary.[a]

(a) York County 1999. York County Comprehensive Plan — Land Use Element. Planning and Development Services. York, South Carolina. <http://www.yorkcountygov.com/departments/Planning Development/docs/land%20use.pdf> (Accessed November 21, 2001).

2.2.8.4 Visual Aesthetics and Noise

Catawba is located on the shores of Lake Wylie, a reservoir on the Catawba River that separates North and South Carolina and one of a series of impoundments on the Catawba River. Lake Wylie has a full-pond surface area of approximately 4917 ha (12,149 ac) and is the third largest lake in the Catawba chain of reservoirs. It serves as a recreational resource for Charlotte, North Carolina, and York County, South Carolina; a source of cooling water for Catawba; and a source of drinking water for several cities in the region (Duke 2001a).

The Catawba site covers 158 ha (391 ac). Several transmission lines cut across the landscape leading to the site. Land use around the site is rural/suburban and wooded with houses. Visibility of the site when approaching by land from access off Concord Road is limited until close to the plant boundary. Condensation from the cooling towers is visible from many miles on cooler mornings.

From onsite, a panoramic view can be seen from the visitor's center (Energy Quest), which overlooks the site.

The nuclear station and its cooling towers also can be seen from Lake Wylie. Noise from Catawba, at both the Energy Quest building and on the lake, is noticeable but not obtrusive.

2.2.8.5 Demography

Population was estimated from the Catawba site out to 80 km (50 mi) in 16-km (10-mi) rings. Population estimates for the 80-km (50-mi) area surrounding the site are based on information provided by the University of North Carolina (Duke 2002c), derived from the 2000 census data. NRC Guidance calls for the use of the most recent United States Census Bureau (USCB) decennial census data, which in the case of the Catawba site, was the 2000 census (USCB 2000; Duke 2001a).

- <u>Resident Population within 80 km (50 mi)</u>. Table 2-11 presents the population distribution within 80 km (50 mi) of the Catawba site for population estimates in 10-year increments starting with 2000 and ending with 2040.

  In 2000, an estimated 2,041,465 people lived within 80 km (50 mi) of Catawba. Between 2000 and 2010, total population within the 80-km (50-mi) radius is projected to increase by 24 percent. Between 2010 and 2020, the population is expected to increase by 21 percent. The growth rate then will experience a slight downward trend through 2030 and 2040, during which time the growth is projected to be 18 and 16 percent, respectively.

Table 2-11. Population Distribution from 2000 to 2040 Within 80 km (50 mi) of Catawba

	0 to 16 km (0 to 10 mi)	**16 to 32 km (10 to 20 mi)**	**32 to 48 km (20 to 30 mi)**	**48 to 64 km (30 to 40 mi)**	**64 to 80 km (40 to 50 mi)**	**Total**
Total 2000	140,760	586,474	524,292	406,417	383,522	2,041,465
Total 2010	182,527	694,129	694,243	504,540	449,202	2,524,641
Total 2020	228,349	814,999	875,273	612,428	528,018	3,059,067
Total 2030	276,446	944,688	1,061,916	726,321	614,635	3,624,006
Total 2040	326,238	1,080,791	1,252,307	844,328	706,416	4,210,080

Source: Duke 2002c

All or parts of 24 counties, one major city (Charlotte, North Carolina), and many small towns are located within 80 km (50 mi) of Catawba. Lake Wylie lies within a 16-km (10-mi) radius, as do the towns of Rock Hill (population 49,800), York (population 7000), and Fort Mill (population 7600). Over the past 25 years, York County has been ranked as one of the fastest growing counties in South Carolina, and between 1990 and 2000, the county experienced a population growth of 25.2 percent (USCB 2000, 1990).

The largest population center within a portion of the 32-km (20-mi) area is Charlotte, North Carolina, which is northwest of Catawba. The population of Charlotte in 2000 was 541,000 (USCB 2000).

Table 2-12 lists the projected age distribution for York (South Carolina), Gaston (North Carolina), and Mecklenburg (North Carolina) Counties in 2000 compared to the general age distribution of South and North Carolina. The population age distribution in York County tracks fairly closely with the general distribution for the State of South Carolina. The biggest difference is in the 65-and-over age bracket where York County's percentage of population is 10.4 percent compared to 12.1 percent for the general population in South Carolina. Gaston County's population age distribution closely parallels North Carolina's general population distribution. The exception is in the 18-to-24 age bracket where Gaston County lags North Carolina by 1.8 percent. Mecklenburg County has a higher percentage of its population in the 25-to-44 age group than North Carolina (36.4 versus 31.1 percent, respectively). Mecklenburg County slightly exceeds North Carolina in the under-18 age bracket (25.1 versus 24.4 percent, respectively) and is less than the North Carolina general population in the 65-and-over age bracket.

Table 2-12. Estimated Age Distribution of Population in 2000

	York County, S.C.		South Carolina		Gaston County, N.C.		Mecklenburg County, N.C.		North Carolina	
Age Group	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Under-18	43,284	26.3	1,009,641	25.2	46,874	24.6	174,249	25.1	1,964,047	24.4
18-to-24	15,557	9.5	407,851	10.2	15,700	8.2	67,336	9.7	806,821	10.0
25-to-44	51,123	31.1	1,185,955	29.6	59,013	31.0	252,803	36.4	2,500,535	31.1
45-to-64	37,578	22.8	923,232	23.0	44,710	23.5	141,342	20.3	1,808,862	22.5
65-and-Over	17,072	10.1	485,333	12.0	23,985	12.5	59,724	8.5	969,048	12.0
Total	164,614		4,012,012		190,365		695,454		8,049,313	

Source: USCB 2000.

- Transient Population. The transient population in the vicinity of the Catawba site can be characterized 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. Table 2-13 presents information on the major employment sectors and number of employees by sector for York County.

  Seasonal transients also result from part-time residents' pursuit of recreational activities. Lake Wylie is a major source of recreation in York (South Carolina) and Mecklenburg (North Carolina) Counties. The daily and seasonal population associated with recreation on the lake is listed in Table 2-14.

  Lake Wylie is located west to southwest of Charlotte in Gaston and Mecklenburg Counties in North Carolina and in the northeast part of York County in South Carolina. The lake has a full-pond surface area of approximately 4917 ha (12,149 ac) and 526 km (327 mi) of shoreline at full pond elevation (Duke 2001a).

  Duke owns eight developed public recreational access locations on Lake Wylie. Two of these access locations are leased. There are several county and city parks. Three undeveloped county parks are owned by Mecklenburg County. Twelve commercial non-residential marinas and one commercial/residential marina provide additional public access to the lake (Duke 2000b).

Table 2-13. Major Employment Sectors in York County, South Carolina in 1999

Employment Sector	Number of Employees
Services	22,380
Retail trade	14,641
Manufacturing	12,733
Government and government enterprises	10,393

Source: BEA 1999.

Table 2-14. Visitors to Lake Wylie: 1999 and Projected 2050

Recreational Activity	Estimated 1999	Projected 2050
Boating – all types	1,076,299	2,550,256
Bank/pier fishing	299,132	733,461
Lake swimming	252,173	678,044
Tailrace fishing	26,460	64,878
Backpacking	1967	8132
Hunting	12,783	20,136
Tent/vehicle camping	17,699	80,996
Windsurfing	1967	4506
Bicycling	9833	28,985
Picnicking	112,514	359,466
Sightseeing	90,375	310,981
Hiking	29,797	106,673
Wildlife viewing	57,032	211,249
Use of playgrounds	10,816	33,497
Total	1,998,846	5,191,260

Source: Duke 2000b.

In 1999, Duke undertook a study to estimate recreational use on Lake Wylie (Duke 2000a). Visitation figures were derived based on estimates of the traffic entering the Duke-owned public access areas. During the 1999 study period, the estimated number of visits was 839,531. A visit is considered a vehicle or vehicle/trailer entering the site for any part of a day. From survey data, a ratio of 1.3 to 1 occupants per vehicle was observed for those respondents claiming use of both public and private access areas. Employing the 1.3 to 1 ratio, Duke estimated that overall recreational visitation for Lake Wylie during the 1999 study period totaled 1,076,299 visits for boating (including fishing, canoeing, jet skiing, kayaking, sailing, and water skiing/tubing; see Table 2-14).

Using population projections for the counties within 80 to 96 km (50 to 60 mi) of Lake Wylie (the impact zone) from 1999 to 2050 in 10-year increments, Duke estimated future recreational use on the reservoir (Duke 2000a). Population projections to 2050 used a combination of 1970 to 1990 population data and 2000 and 2010 population projections from USCB data.[a]

The recreational use projections were estimated by computing the projected population increase for each impact zone and incorporating indexed values for future recreational use for the various activities. The indices are based on models that incorporate a number of variables, including age structure of the population, income, race, sex, population density, and other explanatory variables (Cordell 1999). For the year 2050, Duke has estimated that recreational use of the lake will total 5,191,260 visitors. Of this total, boating-related activities will account for 2,550,256 visitor days, or 49 percent. Table 2-14 presents information on the estimated use of Lake Wylie by recreational activity for 1999 and projections to 2050.

- <u>Migrant Labor</u>. Migrant workers typically are members of minority or low-income populations. Their travels, and the fact that they can temporarily spend a significant amount of time in an area without being an actual resident, means they may be unavailable for census counts. If this occurs, these workers would be “underrepresented” in minority and low-income population counts undertaken by the USCB.

  In 1997, York County had 726 individual farms. Nursery and greenhouse crops are increasing substantially, and migrant labor is used in these farming operations. There are about 500 migrant workers who reside in the county most of the year, and they work 8 to 10 months of the year.[b] The workers also may work in other lower paying occupations

(a) USCB 1990 decennial census data was used because the 2000 census was not available at the time the recreational study was undertaken.
(b) Henry Nunnery and Rusty Thompson, personal communication, Clemson University Agricultural Extension Service, York, S.C. October 24, 2001.

besides agriculture. Given the fact that they are not concentrated in a single location and their numbers are small, migrant workers probably do not materially change the population characteristics of any particular census tract in York County.

2.2.8.6 Economy

The prosperity of York County is closely linked to the economy of Charlotte, North Carolina. Charlotte (population 541,000) (USCB 2000) is one of the fastest growing regions in the Nation. It is a major financial center for the southeastern United States and is the home of corporate headquarters for Bank of America, Wachovia Bank, and Duke Energy Corporation.

In 2000, York County was the sixth fastest growing county in South Carolina (York County 2001). Population in York County is expected to grow a total of 11 percent from 2000 to 2015. This is more than twice the general growth rate predicted for South Carolina, which is expected to grow a total of approximately 5 percent during the same time period. New job creation in the county increased from a little less than 500 per year in 1990 to 1500 per year in 2000. Capital investment increased from an annual $50 million (1990 dollars) to $250 million (2000 dollars).

From an economic standpoint, York County was a county in transition during the decade of the 1990s. Like many areas of the southeastern United States, the County has lost some of its manufacturing base, primarily in textiles and mining. Table 2-15 lists the major industrial groups by a Standard Industrial Classification (SIC) code, their employment levels in 1990 and 1999, and the percentage change in employment. Significant increases in employment occurred in three major categories: (1) agricultural services, forestry, fishing and other; (2) retail and wholesale trade; and (3) services. Increases in employment more than offset losses in employment during the 9-year period.[a]

Still, York County is a net exporter of workers to surrounding counties linked to the economy of Charlotte. For example in 1990, 49 percent of the workers commuted to jobs outside York County with most of the commuters traveling to jobs in Mecklenburg and Gaston Counties in North Carolina. Table 2-16 presents information on York County labor commuting patterns between 1980 and 1990, which is the latest data available.

(a) During the 9-year period, there was a net increase in employment within the county of approximately 17,370.

Table 2-15. Economic Base for York County by Standard Industrial Classification (SIC) Code

Business Sector	Employment 1990	Employment 1999	Percent Change
Agriculture, forestry, and fishing	584	951	62.8
Mining	50	66	32.0
Construction	3994	4971	24.5
Manufacturing	14,858	12,733	-14.3
Transportation and public utilities	4070	3954	-2.9
Wholesale trade	2212	4397	98.8
Retail trade	10,367	14,641	41.2
Finance, insurance, and real estate	2711	3589	32.4
Services	13,783	22,380	62.4
Government and government enterprises	8207	10,393	26.6
Farm	1045	1174	12.3
Totals	61,881	79,249	

Source: BEA 1999.

Table 2-16. Commuting Patterns of York County Workers

	1980	1990	% Change
Residents working in York County	33,425	42,675	27.7
Residents commuting to:			
Mecklenburg County, N.C.	8057	16,849	109.1
Gaston County, N.C.	1359	2745	102.0
Chester County, S.C.	559	952	70.3
Lancaster County, S.C.	292	482	65.1
Workers commuting to York County from:			
Mecklenburg County, N.C.	1047	2389	128.2
Gaston County, N.C.	864	2166	150.7
Chester County, S.C.	1334	1780	33.4
Lancaster County, S.C.	969	917	-5.4

Source: York County 1999.

Economic development in York County is concentrated along the I-77 corridor running from Rock Hill north to the North Carolina border. This corridor is the location of the greatest commercial/industrial development and is home to new office parks and product distribution centers. Also, there is a concentration of new residential development paralleling I-77 and in a band roughly encompassed by the town of York and the city of Rock Hill. Along I-77, Fort Mill is experiencing a high level of mid-scale ($150,000 average per home) residential development.

To the west and northwest, development is influenced by Lake Wylie. Clean water, recreation opportunities, and an excellent fishery have led to construction of numerous upscale ($250,000-plus per home) residential developments around the lake.

The western part of the county, generally defined as that half of the county to the west of the towns of York and McConnell, is rural with agriculture and timber production being the predominant economic factors. Large farms and tracts of undeveloped land predominate, with a few residential developments and houses with acreage.

The economic contribution of agriculture to the economy of York County is significant. The market value of agricultural products produced and sold in York County increased from about $22 million in 1992 (1992 dollars) to $41 million in 1997 (1997 dollars) (USDA 1997). The main crop grown within York County is timber ($14.981 million in value in 1997) (South Carolina 2000) with approximately 118,560 ha (293,000 ac) (South Carolina 1998) in production during the 1990s.

Production of nursery and greenhouse crops is also increasing substantially. There are 20 greenhouse operations in the county.[a] Crop sales in 1992 were $5 million (1992 dollars) and increased by 173 percent to approximately $14 million (1997 dollars) in 1997 (USDA 1997). The increasing residential development in the county provides major market for the nurseries. Other crops of importance in the county are soybeans, hay, oats, and wheat (South Carolina 2000).

The unemployment rate for York County was at 3.6 percent at the beginning of 1990. It rose to a high of 8.1 percent as the economic ramifications of the North American Free Trade Agreement (NFTA) began to be felt in the southeastern part of the United States. Manufacturing in York County started to decline in 1992, and textile companies left to start plants in Mexico and other places. By December 2000, the unemployment rate in York County

(a) Personal communication Henry Nunnery and Rusty Thompson, Clemson University Agricultural Extension Service, October 24, 2001.

was at 2.7 percent[a] as the county continued its transition to a different type of employment base and economy.

In 1990, the average per capita personal income in York County was $17,480 (1990 dollars). This average compares to the South Carolina average of $16,050 and the U.S. average of $19,585. By 1999, the average per capita income in York County had increased to $24,575 (an increase of 41 percent in nominal terms), while the increases in South Carolina and the United States were to $23,540 (47 percent increase) and $28,545 (46 percent increase), respectively (BEA 1999).

The percent of York County's population identified in poverty status remained fairly constant at 10.3 percent of the population in 1989 (compared to 15.4 percent for South Carolina) versus an estimated 11 percent in 1997 (compared to 14.9 percent for South Carolina) (South Carolina 2000).

The growth that has occurred in York County may change the significance of Catawba's influence on the County's economy. If the economy continues to grow at the past-decade rate, which seems likely given the rising importance and significant impact of Charlotte on the regional economy, it is likely that the importance of Catawba as an employer and property tax payer in York County may decline. Catawba will continue to be an important contributor to the economic stability of the County and the surrounding region, particularly the Clover School District for which Catawba will continue to be a major economic benefactor. But the relative importance of its contribution will decline as the economic base of the region and county continues to grow and diversify.

Catawba currently pays a significant amount of annual property taxes to York County. There are five owners of the Catawba facility, and Duke's ownership share is approximately 9.6 percent. Table 2-17 presents information on the total real and personal property taxes paid by Catawba to York County, the total real and personal property taxes collected by the county, and the proportion of the total Catawba property taxes paid as it relates to the county total. This percentage declined between 1996 and 2000.

Approximately 75 percent of the property taxes paid by Catawba are allocated to support the schools in York County School District 2 (Clover District), the school district within which Catawba is located. The remaining 25 percent of the tax revenue from Catawba supports countywide operations and the three other school districts.

(a) Personal communication and supporting data from Matt Snellgrove, York County (South Carolina) Economic Development, November 28, 2001.

Table 2-17. Catawba Contribution to York County Property Tax Revenues

Year	Real and Personal Taxes Paid by Catawba ($)	Percent of Total County Property Taxes	Total County Real and Personal Property Taxes Collected ($)
1996	33,322,651	27.1	123,179,094
1997	35,377,146	26.4	133,762,343
1998	35,796,436	25.5	140,404,832
1999	35,957,979	23.4	153,351,879
2000	35,861,194	21.9	163,503,134

Source: Isaiah Boyd, York County Auditor, November 6, 2001.

2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known and potential historic and archaeological resources at Catawba and in the immediate surrounding area.

2.2.9.1 Cultural Background

The area around the Catawba plant is rich in prehistoric and historic Catawba Native American and historic Euro-American resources; although, in some cases the cultural periods have not been extensively documented. This is particularly true for the archaeological resources in the immediate area of the plant. General historical aspects of the Catawba Indians can be found in regional overviews (Brown 1966; Hudson 1970; Merrell 1989). More recently, the Catawba Indian Nation has initiated both archaeological (Kenion and May 1995) and historical projects through the Catawba Cultural Preservation Project to document the cultural resources both on the current reservation and the larger area of former occupation. Non-Indian history of the county, including information on historic properties, also has been documented (Shankman et al. 1983; Kissane and Kissane 1993; Thomas 1995).

- Prehistoric Period

  The prehistoric Native American occupation of the region that encompasses the Catawba site includes three periods: the Paleo-Indian period (about 10,000 to 8000 B.C.), the Archaic period (about 8000 to 1000 B.C.), and the Woodland period (about 1000 B.C. to A.D. 1600). Toward the end of the Woodland period from about A.D. 1500 to 1675, a transitional episode known as the Protohistoric period occurred during which initial contacts with Europeans and cultural changes associated with subsequent European settlement of the area took place.

The prehistoric periods were marked by initial reliance on big game hunting subsistence, followed by increased use of smaller game animals and plant foods in the Archaic era. Major environmental changes in the Archaic period led to an increasingly more sedentary lifestyle, focused primarily in riverine settings. Late in the Archaic era, more sedentary villages and an increasing reliance on cultivated crops became the norm, and the subsequent Woodland period was characterized by larger base camps in the river valleys with subsistence based on agriculture, hunting and gathering, and intergroup trade. The latter part of the Woodland period is primarily identified by the added presence of European trade goods.

- Native American Historic Period

At the time of European contact and subsequent intrusion into the area surrounding Catawba, the lands on both sides of the Catawba River in what would become North and South Carolina were occupied by the Catawba Indian Nation. Initial contact between the Catawba Indians and European explorers occurred in the 1560s, although European colonization of the region did not take place until nearly a century later. Following hostilities in the French and Indians Wars, a 39 km^2 (15 mi^2) reservation was established in 1763 for the Catawba Nation in South Carolina. This reservation was located in what would eventually become York and Lancaster Counties. The northern boundary line of the reservation was located just south of the current Catawba site. As a result of an 1840 treaty between the Catawba Nation and the State of South Carolina, the state purchased all of the land within the original reservation, much of which had already been leased by the Indians to white settlers. In 1850, a tract of some 254 ha (630 ac) of land on the west side of the Catawba River was purchased for the Catawba, including the reservation that continues to be occupied today. The reservation is located about 8 km (5 mi) southeast of the plant site. In 1962, the tribe was disbanded, and lands were divided among its members. The Catawba Tribe reorganized in 1973 and was awarded renewed Federal recognition in 1993.

- Euro-American Historic Period

In 1785, following the Revolutionary War, York County became one of the original counties in the newly created state of South Carolina. In a census taken 5 years later, the County had a population of just over 6600. Cotton was introduced to the area in the 1790s and quickly dominated the economy and land-use patterns of the County. Though interrupted by the Civil War, depletion of the County's soils as a result of intensive cultivation, and recurring ups and downs in the agricultural economy, cotton remained the primary crop into the first few decades of the 1900s when other crops, such as soybeans, became more prevalent.

An important event in the history of York County was the beginning of construction of the Catawba Dam and Power Plant in 1900. The completion of the dam and the newly formed Lake Wylie were instrumental in subsequent development of other dams and hydropower projects on the Catawba River and in sparking industrialization of the river corridor, including the beginnings of the Duke Power Company.

2.2.9.2 Historic and Archaeological Resources at Catawba

To assess known and potential cultural resource sites at Catawba, several existing literature and database sources were consulted, along with direct contacts at several organizations (see Appendix D). In addition to the sources included in Appendix D, electronic database searches were conducted at the National Park Service's National Register of Historic Places Information System and the Historic American Buildings Survey/Historic American Engineering Record listings.

Examination of the National Register listings did not disclose any listed or potentially eligible properties in proximity to the plant site. The closest potentially eligible property is the location of the Revolutionary-War-era Hill's Ironworks. This property is located near the point where SCH 274 crosses Allison Creek, about 2 miles southwest of the Catawba site. Similarly, discussions with personnel at the Catawba Cultural Preservation Project did not reveal the presence of any known archaeological or other traditional cultural properties at the Catawba site that might be of interest to the Catawba Indian Nation.

Examination of archaeological and historic site files at the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology (SCIAA) indicated that no prehistoric or historic properties have been recorded at the Catawba site itself. However, no formal archaeological surveys have been completed at the plant. The nearest recorded archaeological sites are located along Catawba transmission line rights-of-way, southwest of the site, which were surveyed in 1978 (Brockington 1980), and by a more recent survey along SCH 274, running north-south to the west of the plant site (Joy and Stine 2000). There are six archaeological sites within 1.6 km (1 mi) of the plant, the closest being situated in a transmission line right-of-way at a distance of about 1 km (0.6 mi). None of these sites has been evaluated as being potentially eligible for the National Register of Historic Places.

Examination of historical maps and aerial photographs that include the Catawba site reveal the past presence of several historic properties either close to or within the plant site boundaries. Copies of these maps are located at either the South Carolina Department of Archives and

History or the Historical Center of York County. Documents examined, along with results, include the following:

- York District, South Carolina Map, Surveyed by Gordon Moore, 1820, Improved for Mills Atlas 1825. This map shows the location of Hill's Old Ironworks on the south side of Allison Creek, southwest of the Catawba site and the Thorn's Ferry and Road that passed in an east-west direction to the south of the site. The ferry landing was located at the south end of Long Island, southeast of the site, and now is inundated by Lake Wylie. The boundary of the 1763 Catawba Indian Nation Reservation also is indicated.

- Map of York District Post Offices, 1802 - 1861. There are no post offices indicated within the Catawba site during this period. The closest post offices were at Hill's Ironworks, Clay Hill, and McElwee's Store, all to the southwest near Allison Creek.

- Grants of Land Made by Commissioner of Locations for York District, South Carolina, During the Years 1841-42 in the Catawba Indian Boundary, prepared by Mr. and Mrs. J. Thomas Williams, 1983. This map shows lands in the vicinity of the site being owned by the Biggers, Faris, Mitchell, and Partlow families.

- Geonostic Map of York District, 1858. This map shows churches and mineralogical, geological, and agricultural features. Nothing in these categories was shown at the current Catawba site.

- York County South Carolina, Geological and Agricultural Map, 1873. This map shows the Thorn's Ferry Road south of the plant site, along with the location of Mason's Ferry just upriver from the plant. A road from Allison Creek to this ferry crossed just northwest of the present Catawba site.

- York County, South Carolina, copyright 1910 by Jones and Walker, Rock Hill, South Carolina. This map was the first to show the Concord Church and Cemetery, along with several residences that once existed on lands now included within the Catawba site. Several homes, along with family names, are shown along Concord Road and along a road that extended north from the Concord Church vicinity through the site and across Beaver Dam Creek. In addition to the church, some 12 homes and/or structures are indicated within the plant boundary. The Concord Cemetery, which is located adjacent to the Catawba site boundary, is discussed below.

- U.S. Geological Survey Clover, SC - NC, 15' Quadrangle Map, 1947. This map shows the location of the Concord Road and Church, along with 12 homes or structures that were located either within or very close to the Catawba site.

- U.S. Department of Agriculture Soil Survey Map of York County, South Carolina, 1961. This map, actually an aerial photograph, shows the location of Concord and the associated road, cleared field or pasture areas along the road, and the presence of at least six structures in the vicinity of the Catawba site.

The Concord Cemetery is the only acknowledged cultural resource property adjacent to the Catawba site today, although the historical records listed above indicate that a church was once situated adjacent to the cemetery, and there were several residences in proximity along the Old Concord Road. Presently, the cemetery is located just north of the northwest corner of the plant's cooling tower yard and is fenced and protected within the plant site boundary. Since 1974 the cemetery has been owned and managed (including access) by the Concord Cemetery Association. Two tombstone surveys (Caldwell and Hart 1997; Hill 2001) have been conducted and indicate that over 150 persons are buried in the cemetery, the earliest occurring in 1834 and the most recent in 1995. The earliest interments were members of the Faris family, owners in the 1840s of parts of Long Island and other tracts south of the Catawba site.

2.2.10 Related Federal Project Activities and Consultations

The staff reviewed the possibility that activities of other Federal agencies (including FERC) might impact the renewal of the Catawba OLs. Any such activities could result in cumulative environmental impacts and the possible need for such a Federal agency to become a cooperating agency in the preparation of this SEIS (10 CFR 51.10(b)(2)).

Duke's McGuire Nuclear Station (McGuire) is located approximately 48 km (30 mi) north of Catawba. Duke also is requesting that the NRC renew the OLs for McGuire.

The Federal Power Commission, now FERC, issued a license (FERC Project No. 2232) to Duke Power Company on September 17, 1958, for the Catawba-Wateree Project. This license expires in 2008, and Duke plans to seek a renewal of the license. The Catawba-Wateree Project consists of 11 lakes on the Catawba River, which were formed by hydroelectric power plant dams. Lake Wylie, from which Catawba draws water, extends 45 km (28 mi) between Mountain Island Dam and Wylie Dam. This lake was formed by impounding the water of the Catawba River in 1904. Following an increase in dam height in 1924, the lake now covers 4917 ha (12,149 ac) at a normal operating level, though fluctuations exist based on hydroelectric generation needs.

The Federal lands closest to the Catawba site are within the Kings Mountain National Military Park. The park is located near Blacksburg, South Carolina, and is operated by the U.S. National Park Service. The park is approximately 27 km (17 mi) northwest of Catawba.

The Native American land closest to the Catawba site is a section of the Catawba Indian Reservation, north of the city of Rock Hill, approximately 10 km (6 mi) southeast of Catawba.

After reviewing the Federal activities in the vicinity of Catawba, the staff determined there were no Federal project activities that could result in cumulative impacts or would make it desirable for another Federal agency to become a cooperating agency for preparing this SEIS.

NRC is required under Section 102 of NEPA to consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved. NRC consulted with FWS, and the consultation correspondence is included in Appendix E.

2.3 References

10 CFR Part 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for Protection Against Radiation."

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

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

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

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

Bailey, R.G. 1980. *Descriptions of the Ecoregions of the United States.* U.S. Department of Agriculture, Miscellaneous Publication No. 1391. Washington, D.C.

Bair, Karen. October 21, 2001. "Special Report: Western York County – Vanishing Eden." *The Herald*. Rock Hill, South Carolina.

Brockington, Paul E. 1980. *Test Pits in the Piedmont: An Archaeological Survey of Duke Power Company's Proposed Catawba Transmission Lines*. Institute of Archaeology and Anthropology, University of South Carolina, Columbia, South Carolina.

Brown, Douglas S. 1966. *The Catawba Indians: The People of the River*. University of South Carolina Press, Columbia, South Carolina.

Bureau of Economic Analysis (BEA). 1999. *Regional Accounts Data. 1990 and 1999*. <http://www.bea.doc.gov/bea/regional/reis/> (Accessed April 9, 2002).

Caldwell, T. J. and J. E. Hart, Jr. 1997. "Concord Cemetery." The York County Genealogical and Historical Society Quarterly, December 1997.

Collette, B. B. 1962. "The swamp darters of the subgenus Hololepis (Pisces, Percidae)." *Tulane Studies in Zoology* 9(4):115-211.

Cordell Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends 1999. As cited in Duke Power. Draft Shoreline Management Plan Update for the Catawba – Wateree Hydro Project. FERC No. 2232. Group Health and Safety Department, Lake Management. September 22, 2000.

Duke Energy Corporation (Duke). 1988. *Catawba Nuclear Station 316(a) Demonstration Two Unit Operational Report*. Duke Power Company, Charlotte, North Carolina.

Duke Energy Corporation (Duke). 1993. *Catawba Nuclear Station Supplemental 316a Demonstration Data*. Duke Power Company, York, S.C. January 1993.

Duke Energy Corporation (Duke). 2000a. *Duke Energy Company Catawba Nuclear Station Updated Final Safety Analysis Report*. Revised April 8, 2000. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2000b. *The Catawba: An Update on the Catawba River Basin and the Catawba Reservoirs*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001a. *Applicant's Environmental Report – Operating License Renewal Stage Catawba Nuclear Station, Units 1 and 2.* Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. *Catawba Nuclear Station Units 1 and 2, Offsite Dose Calculation Manual (ODCM)*. Rev. 43, January 2001. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001c. *Catawba Nuclear Station Units 1 and 2, Annual Radiological Environmental Operating Report 2000*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001d. *Catawba Nuclear Station Units 1 and 2, 2000 Annual Radioactive Effluent Release Report (January 1, 2000 Through December 31, 2000)*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2002a. *Application to Renew the Operating Licenses of the McGuire and Catawba Nuclear Power Stations*. "Attachment 2: Catawba River Forage Fish Densities, Population Estimates and Species Composition: 1993-1997." Response to a request for additional information. Docket Nos. 50-369, 50-370, 50-413, and 50-414. February 8, 2002. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2002b. *Application to Renew the Operating Licenses of the McGuire and Catawba Nuclear Power Stations*. "Attachment 3: Number and Percent Composition of Fishes Collected in Electrofishing Samples at Locations 215 and 216 on Lake Wylie during 1991, 1993, 1994, 1995, and 1996." Response to a request for additional information. Docket Nos. 50-369, 50-370, 50-413, and 50-414. February 8, 2002. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2002c. *Application to Renew the Operating Licence of McGuire and Catawba Nuclear Stations*. "Attachment 1: Responses to NRC Request for Additional Information Concerning the Catawba Environmental Report." In response to NRC letter dated December 12, 2001. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2002d. Letter from M.S. Tuckman of Duke Power to U.S. Nuclear Regulatory Commission, Subject: Comments on draft plant-specific Supplement 9 to NUREG-1437, "Generic Environmental Impact Statement of License Renewal of Nuclear Power Plants" Catawba Nuclear Station, Docket Nos. 50-413 and 50-414, August 9, 2002.

Elliott, D. L., C. G. Holladay, W. R. Barchet, H. P. Foote, and W. F. Sandusky. 1986. *Wind Energy Resource Atlas of the United States*. DOE/CH 10093-4, U.S. Department of Energy, Washington, D.C.

Federal Water Pollution Control Act (FWPCA) of 1977, as amended, 33 USC 1251 et seq. (Also known as Clean Water Act).

Gaddy, L. L. 2001. "Biological Assessment for Endangered, Threatened, and Noteworthy Species, Wetlands, and Significant Natural Areas in Association with the Catawba Nuclear Station and Related Power Transmission Lines." *Terra Incognita*. Columbia, South Carolina.

Hill, Jim. 2001. *Old Concord Presbyterian Cemetery*. <http://ns1.rfci.net/wdfloyd/oconcord.html> (Accessed April 9, 2002).

Hudson, Charles. 1970. *The Catawba Nation*. University of Georgia Press, Athens, Georgia.

Joy, Deborah and Linda France Stine. 2000. *Archaeological Survey Report: Improvements to SC 274 between Newport and Five Points, York County, South Carolina*. Legacy Research Associates, Durham, North Carolina.

Kenion, Rita and J. Alan May. 1995. *An Archaeological Survey of the Catawba Indian Reservation: Archaeological Sites on an Ancient Landscape*. Catawba Indian Nation, Rock Hill, South Carolina.

Kissane, Amy C. and John A. Kissane. 1993. *York County Historical and Architectural Inventory – 1992*. The Jaeger Company, Gainesville, Georgia.

Merrell, James H. 1989. *Indian's New World: The Catawbas and Their Neighbors from European Contact through the Era of Removal*. University of North Carolina Press, Chapel Hill, North Carolina.

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

NOAA. 1983. *Local Climatological Data, Annual Summary with Comparative Data – Charlotte, NC.* U.S. National Oceanic and Atmospheric Administration, Environmental Data Service, Asheville, North Carolina.

North Carolina Atlas of Freshwater Mussels and Endangered Fish. 2001. <http://www.ncwildlife.com/pg07_WildlifeSpeciesCon/pg7b1.htm> (Accessed April 9, 2002).

North Carolina Department of Environmental and Natural Resources (NCDENR). 1999. *Catawba River Basinwide Water Quality Plan*. Division of Water Quality, Water Quality Section.

North Carolina. 2001a. *North Carolina Rare, Threatened, and Endangered Species Inventory for Gaston and Cleveland Counties, North Carolina*. <http://www.ncsparks.net/nhp/> (Accessed April 9, 2002).

North Carolina. 2001b. *North Carolina State Demographics. Population Overview: 2000-2020*. Updated: May 16, 2001. <http://demog.state.nc.us/> (Accessed October 9, 2001).

Paterson, C. G. and C. H. Fernando. 1970. "Benthic fauna colonization of a new reservoir with particular reference to the chironomidae." *J. Fish. Res*. Bd. Canada 27:213-232.

Ramsdell, J. V. and G. L. Andrews. 1986. *Tornado Climatography of the Contiguous Unites States*. NUREG/CR-4461, U.S. Nuclear Regulatory Commission, Washington, D.C.

Shankman, Arnold, E. Thomas Crowson, C. Jack Tucker, and Joel Nichols. 1983. *York County, South Carolina: Its People and Its Heritage*. The Donning Company, Norfolk, Virginia.

South Carolina. 1998. *South Carolina Statistical Abstract*. *South Carolina Land Use/Land Cover by County: 1988-1990 - Parts A, B. South Carolina's Information Highway*. <http://www.sciway.net/statistics/scsa98/ag/ag12a.html> (Accessed April 9, 2002).

South Carolina. 2001. *South Carolina Rare, Threatened, and Endangered Species Inventory for York and Cherokee Counties, South Carolina*. Updated September 10, 2001 <http://www.dnr.state.sc.us/pls/heritage/county_species.list?pcounty=cherokee> (Accessed April 9, 2002).

South Carolina Department of Health and Environmental Control (SCDHEC). 1999. *Watershed Water Quality Management Strategy: Catawba-Santee Basin*. Technical Report No. 002-96. Watershed Strategy Coordinator. Columbia, South Carolina.

South Carolina Department of Natural Resources (SCDNR). 2001. *South Carolina Rare, Threatened and Endangered Species Inventory*. <http://www.dnr.state.sc.us/pls/heritage/county_species.select_county_map> (Accessed April 9, 2002).

South Carolina Statistical Abstract. 2000. Population Projections at Five Year Intervals for South Carolina Counties: 1990 Census and Projections. 2000-2025 Revised. Updated on 8/14/01. <http://www.ors.state.sc.us/abstract_99/chap14/pop4.htm> (Accessed April 9, 2002).

The Herald. February 18, 2001. The Herald's York County Magazine.

Thomas, Samuel N., Jr. 1995. *Historical Properties of York County, South Carolina*. York County Historical Commission, McConnells, South Carolina.

U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement Related to the Proposed Catawba Nuclear Station Units 1 & 2, Duke Power Company*. Docket Nos. 50-413 and 50-414, Washington, D.C.

U.S. Census Bureau (USCB). 1990. *American Fact Finder. 1990 Census. Housing Units. By County in South Carolina*. <http://factfinder.census.gov/servlet/BasicFactsTable?_lang=en&_vt_name=DEC_1990_STF1_GCTHA_ST2&_geo_id=04000US45> (Accessed April 9, 2002).

U.S. Census Bureau (USCB). 2000. *American Fact Finder. 2000 Census. Population and Housing by County in South Carolina*. 2000. <http://factfinder.census.gov/servlet/BasicFactsServlet> (Accessed April 9, 2002).

U.S. Department of Agriculture (USDA). 1997. *1997 Census of Agriculture. South Carolina County-Level Data*. Volume 1: Part 40, Chapter 2. <http://www.nass.usda.gov/census/census97/volume1/sc-40/toc297.htm> (Accessed April 9, 2002).

U.S. Department of Energy (DOE). 2001. "U.S. Wind Energy Resource Map." <http://www.eren.doe.gov/wind/we_map.html> (Accessed April 8, 2002).

U.S. Fish and Wildlife Service (FWS). 1996. *Carolina Heelsplitter Recovery Plan*. U.S. Fish and Wildlife Service, Atlanta, GA. 30 pp.

U.S. Fish and Wildlife Service (FWS). 1999. "Proposed rule to remove the bald eagle in the lower 48 states from the list of endangered and threatened wildlife." 64 FR 36453. July 11, 2002.

U.S. Fish and Wildlife Service (FWS). 2001. "Endangered and Threatened Wildlife and Plants: Proposed Designation of Critical Habitat for the Carolina Heelsplitter." 66 FR 36229. July 11, 2001.

U.S. Fish and Wildlife Service (FWS). 2002. Letter from R. L. Banks (FWS) to E. A. Carpenter (NRC). (Re: Request for list of species within the area under evaluation for the Catawba Nuclear Station License Renewal. February 12, 2002.

U.S. Nuclear Regulatory Commission (NRC). 1983. *Final Environmental Statement Related to the Operation of Catawba Nuclear Station Units 1 and 2.* Docket Nos. 50-413 and 50-414. NUREG-0921, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1991. *Offsite Dose Calculations Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors*. NUREG-1301, Washington, D.C.

Voshell, J. R. and G. M. Simmons , Jr. 1978. "The Odonota of a new reservoir in the southeastern United States." *Odonatologia* 7(1):67-76.

Warren, Jr., M. L., B. M. Burr, S. J. Walsh, H. L. Bart, Jr., R. C. Cashner, D. A. Etnier, B. J. Freeman, B. R. Kuhajda, R. L. Mayden, H. W. Robison, S. T. Ross, and W. C. Starnes. 2000. *Diversity, Distribution, and Conservation Status of the Native Freshwater Fishes of the Southern United States*. Fisheries 25(10): 7-29. October 2000.

York County. 1999. *York County Comprehensive Planning*. Planning and Development Services. York, South Carolina.

York County. 2001. *York County Economic Development – Future Trends in Economic Development*. Fort Mill, South Carolina.

3.0 Environmental Impacts of Refurbishment

Environmental issues associated with refurbishment activities are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)] 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 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 and spent fuel disposal).

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

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

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

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.

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

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

Category 1 and Category 2 issues related to refurbishment that are not applicable to Catawba Nuclear Station, Units 1 and 2 (Catawba) because they are related to plant design features or site characteristics not found at Catawba are listed in Appendix F.

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section, if such actions were planned. Duke Energy Corporation (Duke) indicated that it has performed an evaluation of structures and components pursuant to 10 CFR 54.21 and, “based on that review, no major plant refurbishment activities were identified as necessary to maintain the structure and component intended functions consistent with the current licensing basis during the period of extended operations” (Duke 2001). Duke stated that routine replacement of certain components are within the bounds of normal plant maintenance and they will not affect the environment outside the bounds of plant operations as evaluated in the final environmental statement (NRC 1983).

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 (nonattainment and maintenance areas)	3.3	F
SOCIOECONOMICS		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Offsite land use (refurbishment)	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
ENVIRONMENTAL JUSTICE		
Environmental justice	Not addressed[(a)]	Not addressed[(a)]

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

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 Catawba beyond the end of the existing operating licenses. Therefore, refurbishment is not considered in this Supplemental Environmental Impact Statement.

3.1 References

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

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

Duke Energy Corporation (Duke). 2001. *Application's Environmental Report – Operating License Renewal Stage Catawba Units 1 and 2.* Charlotte, North Carolina.

U.S. Nuclear Regulatory Commission (NRC). 1983. *Final Environmental Statement Related to the Operation of Catawba Nuclear Station, Units 1 and 2, Duke Power Company, et al.* Docket Nos. 50-413 and 50-414, NUREG-0921, Washington D.C.

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

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

4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[a] 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 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 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 for Category 1 and, therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the Catawba Nuclear Station, Units 1 and 2 (Catawba). Section 4.1 addresses issues applicable to the Catawba cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation. Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses potential new information that was raised during the scoping period. The results of the evaluation of environmental issues related to operation during the renewal term

---

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

are summarized in Section 4.8. Finally, Section 4.9 lists the references for Chapter 4. Appendix F list Category 1 and Category 2 issues that are not applicable to Catawba because they are related to plant design features or site characteristics not found at Catawba.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to Catawba cooling system operation during the renewal term are listed in Table 4-1. Duke Energy Corporation (Duke) stated in its Environmental Report (ER; Duke 2001) that it is not aware of any new and significant information associated with the renewal of the Catawba operating licenses (OLs). The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. 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 staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, for each of these issues follows Table 4-1.

Table 4-1. Category 1 Issues Applicable to the Operation of the Catawba 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	4.2.1.2.2; 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 wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2

Table 4-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
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
AQUATIC ECOLOGY (PLANTS WITH COOLING-TOWER-BASED HEAT DISSIPATION SYSTEMS)	
Entrainment of fish and shellfish in early life stages	4.3.3
Impingement of fish and shellfish	4.3.3
Heat shock	4.3.3
TERRESTRIAL RESOURCES	
Cooling tower impacts on crops and ornamental vegetation	4.3.4
Cooling tower impacts on native plants	4.3.5.1
Bird collisions with cooling towers	4.3.5.2
HUMAN HEALTH	
Microbiological organisms (occupational health)	4.3.6
Noise	4.3.7

- 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered thermal stratification of lakes during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of temperature 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 Catawba ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. 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 Catawba ER, the staff's site visit, the scoping process, its evaluation of other available information including the National Pollutant Discharge Elimination System (NPDES) permit for Catawba, or discussion with the NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharges 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 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 Catawba ER, the staff's site visit, the scoping process, its evaluation of other available information including the NPDES permit for Catawba, or discussion with the NPDES compliance office. 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 wastewater. Based on information in the GEIS, the Commission found that

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, its evaluation of other available information including the NPDES permit for Catawba, or discussion with the NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, 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 Catawba ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on the distributions 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. 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 Catawba ER, the staff's site visit, the scoping process, 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 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 Catawba ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of low dissolved oxygen in the discharge 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 Catawba ER, the staff's site visit, the scoping process, 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 sublethal 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts regarding stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

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

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

    The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts regarding entrainment of fish and shellfish in early life stages during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts regarding impingement of fish and shellfish during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts regarding heat shock during the renewal term beyond those discussed in the GEIS.

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

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

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

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no cooling tower impacts on native vegetation during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts regarding bird collisions with cooling towers during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, 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 Catawba ER, the staff's site visit, the scoping process, 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.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to Catawba are listed in Table 4-2 and are discussed in Sections 4.1.1 and 4.1.2.

Table 4-2. Category 2 Issues Applicable to the Operation of the Catawba Cooling System 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
SURFACE WATER QUALITY, HYDROLOGY, AND USE			
Water-use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	4.3.2.1, 4.4.2.1	A	4.1.1
HUMAN HEALTH			
Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	4.3.6	G	4.1.2

4.1.1 Water-Use Conflicts

Consumptive water use can adversely impact riparian vegetation and associated animal communities by reducing the amount of water available for plant growth, maintenance, and reproduction. While changes, albeit small, in average annual stream flow downstream of Lake Wylie are inevitable due to the decrease in the total water supply, any changes that might occur in the pool elevation in Lake Wylie are less clear.

Under average conditions, the effect of Catawba consumptive use is a decrease of about 1.2 percent in outflow from Lake Wylie. Water levels in the Catawba River downstream of Lake Wylie Dam fluctuate on a daily basis as a result of releases from the Lake Wylie Hydro Station. However, using the rating table for U.S. Geological Survey (USGS) gauge 02146000, the reduction in outflow attributable to Catawba operations results in a stage decrease of 6 mm (0.2 in.) for the Catawba River downstream of Lake Wylie under average conditions. Under low flow conditions, Catawba consumptive use does not affect downstream conditions because of the minimum release requirement.

Lake Wylie is the seventh of eleven impoundments in the 410-km (255-mi) Catawba-Wateree Project managed by Duke and licensed by Federal Energy Regulatory Commission (FERC). The Catawba-Wateree Project releases water from its dams to optimize hydroelectric generation, provide flood control, and meet minimum release requirements while maintaining a constant and reliable water supply for thermoelectric stations, surrounding communities, and industry. Consumptive water demand by Catawba is only one of numerous considerations in the overall operation of the Catawba-Wateree Project that will define the pool elevation of Lake Wylie.

Total evaporative losses for Lake Wylie are estimated to be 3.68 m^3/s (130 cfs). Consumptive use by Catawba represents 1.47 m^3/s (52 cfs) (1997 through 1999 average) of the total. Since Lake Wylie is managed to maintain a stable pool elevation, consumptive uses by Catawba do not affect pool elevations as long as there is adequate inflow. Under 7Q10 (the estimated 7-day minimum flow occurring on the average once in 10 years) conditions, total outflow from Lake Wylie would be 0.71 m^3/s (25 cfs) greater that inflow. The 7Q10 inflow into the lake is estimated to be 14.6 m^3/s (516 cfs), and the total outflow would be 15.3 m^3/s (541 cfs), including the 11.6 m^3/s (411 cfs) minimum release from Lake Wylie Hydro Station and 3.68 m^3/s (130 cfs) for natural and forced evaporative losses. If Lake Wylie lost 0.71 m^3/s (25 cfs) for 7 days, the lake level would decline 9 mm (0.4 in.). Low water levels in Lake Wylie could be a factor for these riparian areas if prolonged drawdown occurs. However, as indicated above, such drawdowns do not occur. Rather, water levels are quite stable year-round. Under average conditions, Catawba operations do not affect lake levels, and during 7Q10 conditions, the effect of the operations on Lake Wylie pool elevations would be small.

Lake Wylie does not have the typical riparian areas found alongside a river. Most of the shoreline adjoins upland settings; however, there are extensive areas of riparian vegetation adjacent of the headwaters of the reservoir in the area of Interstate 85 and at confluences with major tributaries such as the South Fork River, Catawba Creek, Crowder's Creek, Big Allison Creek, and Little Allison Creek. There are smaller areas of riparian vegetation at the head of some shallow coves. These riparian zones are dominated by species typical of piedmont bottomlands and shallow water areas and include river birch (*Betula nigra*), buttonbush (*Cephalanthus occidentalis),* black willow (*Salix nigra),* red maple (*Acer rubrum*), cattail (*Typha latifolia*), Joe Pye weed (*Eupatorium* sp.), cardinal flower (*Lobelia cardenalis*), pickerel weed (*Pontederia cordata*), and numerous sedges (*Carex* sp.) and rushes (*Juncus* sp.).

White bass (*Morone chrysops*) is the only fish species that makes an appreciable spawning run in Lake Wylie. This spawning run is most evident in the Dutchman's Creek area, which enters Lake Wylie on the extreme northwestern side of the reservoir. Because of the relatively stable lake levels, coupled with the fact that white bass make their spawning migration in the February-April time period, the time of the highest rainfall in the area, the impact of any consumptive loss from Catawba plant operations is considered negligible.

There are a few native freshwater mussels (primarily unionids) in Lake Wylie, but because water levels do not fluctuate significantly, mussel stranding is not an issue. The only mussel of any abundance in Lake Wylie is the nonindigenous Asiatic Clam (*Corbicula* spp.), and this organism is considered a nuisance organism.

Catawba consumptive use of water is not expected to change during the period of the proposed license renewal. It is impossible to reliably predict the quantity of future withdrawals over the renewal term. However, State and Federal regulations are in place to ensure future withdrawals do not adversely impact the aquatic and riparian communities in Lake Wylie and downstream. The impact of the consumptive use of water by Catawba on these and other aquatic communities in Lake Wylie is SMALL, and additional mitigation is not warranted.

4.1.2 Microbiological Organisms (Public Health)

The Catawba River, which was impounded to form Lake Wylie, has an annual average flow rate of 123 m^3/s (4390 ft^3/s). Catawba uses Lake Wylie as a source of condenser cooling and station service water. The station uses closed-loop cooling towers, and the distance from the discharge canal to the nearest dock is approximately 440 m (1360 ft).

Duke, in consultation with public health staff from the SCDHEC, conducted an assessment of whether continued operation of Catawba would induce public health impacts due to the enhancement of thermophilic organisms. Based on Catawba-specific experience, a review of available technical literature on thermophilic organisms, and the fact that there is little heated discharge from Catawba as it utilizes cooling towers, such impacts seem unlikely. A letter from SCDHEC states:

> 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 and dermal protection for workers regularly exposed to known contaminated water, but there seems no significant health threat to off-site persons near such heated recreational waters.

There has been no known impact of Catawba’s operation on public health related to thermophylic microorganisms, and consultation with the SCDHEC indicates that the impact of deleterious microbiological organisms during continued operation of the plant during the renewal term are low.

The staff concludes that the potential impacts to public health from microbiological organisms resulting from operation of the plant cooling water discharge system to the aquatic environment on or in the vicinity of the site are SMALL, and mitigation is not warranted.

4.2 Transmission Lines

Catawba has five, 230-kV transmission lines leaving the site from the switchyard (NRC 1983; Duke 2001). As shown in Table 2-1, the five lines are contained within rights-of-way ranging from 35 to 46 m (115 to 150 ft) in width and from 1 to 40 km (0.7 to 24.4 mi) in length covering a total of 75.7 km (42.4m) and approximately 295 ha (730 ac) (Duke 2001; NRC 1983). The rights-of-way, which were constructed or rebuilt between 1973 and 1983, extend out from Catawba to the north, south, and west (Figure 2-4). The vegetation in the rights-of-way is managed through a combination of mechanical and herbicide treatments. Initial treatments include mowing and/or treatment with Arsenal and Accord. Spot treatments then are applied once every 3 years using Arsenal, Accord, Garlon4A, and Krenite. Herbicide treatments in wetlands are limited to Arsenal and Accord, which are approved for use in wetlands. In addition, Duke cooperates with the South Carolina Department of Natural Resources regarding conservation easements and partners with The Wildlife Federation on vegetation management in some portions of the rights-of-way.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to transmission lines from Catawba are listed in Table 4-3. Duke stated in the Catawba ER (Duke 2001) that it is not aware of any new or significant information associated with the license renewal of Catawba. The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. 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 additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-3. Category 1 Issues Applicable to the Catawba 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
Flood plains 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 rights-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 Catawba ER, the staff's site visit, the scoping process, discussion with the FWS, or its evaluation of other information. Therefore, the staff concludes that there are no impacts regarding power line rights-of-way maintenance during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other information. 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other 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.

- Flood plains and wetlands 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts regarding flood plains and wetlands on the power line rights-of-way during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other 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 the information in the GEIS, the Commission found that

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

  The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other 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 Catawba ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way on land use 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 4-4 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-4. Chronic Effects of Electromagnetic Fields and Category 2 Issue Applicable to the Catawba 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 (NRC 1996), the staff found that without a review of the conformance of each nuclear plant transmission line with the *National Electrical Safety Code* (NESC) criteria (Institute of Electrical and Electronic Engineers [IEEE] 1997), 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 other plants, land use in the vicinity of the transmission lines may have changed, or the power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

The Catawba 230-kV switchyard is connected to the primary Duke transmission system by five 230-kV, double-circuit, overhead transmission lines. An evaluation was performed to determine if the transmission lines meet the requirements of NESC. Duke completed an evaluation of the transmission lines and determined that, for all spans, the measured clearances from the sagged plan and profile of each of the five 230-kV transmission lines exceed the original design vertical clearance requirement (Duke 2001). The utility did not perform any specific modeling or experimental studies to determine if induced currents would exceed requirements established in NESC. However, upon review of the information provided by Duke, the staff concluded the assessment was adequate to meet the intent of 10 CFR 51.53. The staff also concludes that the impact of the potential for electric shock is SMALL, and additional mitigation is not warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or 2, and will not be so designated 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) contains the following conclusion:

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

This statement is not sufficient to cause the 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 Catawba in regard to radiological impacts are listed in Table 4-5. Duke stated in the Catawba ER that it is not aware of any new and significant information associated with the renewal of the Catawba OLs. No significant new information has been identified by the staff in its 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 additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-5. 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 Catawba ER, the staff's site visit, the scoping process, 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 Catawba ER, the staff's site visit, the scoping process, 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.

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

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 4-6. Duke stated in the Catawba ER that it is not aware of any new and significant information associated with renewal of the Catawba OLs. The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. 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 Catawba ER, the staff's site visit, the scoping process, 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 Catawba ER, the staff's site visit, the scoping process, 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 Catawba ER, the staff's site visit, the scoping process, 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 Catawba ER, the staff's site visit, the scoping process, 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 4-7 lists the Category 2 socioeconomic issues that 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 (NRC 1996), which presents a population characterization method that is based on two factors, "sparseness" and "proximity." Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

Table 4-7. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics During the License Renewal Term

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

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice is to be addressed in the licensee's environmental report and the staff's supplemental environmental impact statement.

In 2000, the population living within 32 km (20 mi) of Catawba was estimated to be approximately 727,200 (Duke 2002a). This total converts to a population density of about 225 persons/km^2 (580 persons/mi^2) living on the land area within a 32-km (20-mi) radius of Catawba. This concentration falls into the GEIS sparseness Category 4 (i.e., having greater than or equal to 46 persons/km^2 [120 persons/mi^2]).

In 2000, an estimated 2,041,465 people lived within 80 km (50 mi) of Catawba, equating to a population density of around 100 persons/km^2 (260 persons/mi^2) on the available land area (Duke 2001, 2002a). Applying the GEIS proximity measures (NRC 1996), Catawba is classified as Category 4 (i.e., having greater than or equal to 73 persons/km^2 [190 persons/mi^2] within 80 km [50 mi] of the site). According to the GEIS, these sparseness and proximity scores identify the nuclear units as being located in a high-population area.

10 CFR Part 51, Subpart A, Appendix B, Table B-1, states that impacts on housing availability are expected to be of small significance at plants located in a high-population area where growth-control measures are not in effect. Catawba is located in a high-population area and York County is not subject to growth-control measures that would limit housing development, although the county does have zoning requirements that govern development in the county. Based on the NRC criteria, Duke expects housing impacts to be SMALL during continued operations of Catawba (Duke 2001).

SMALL impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion is required to meet new demand (NRC 1996). In the GEIS, the staff assumes that an additional staff of 60 permanent workers per unit might be needed during the license renewal period to perform routine maintenance and other activities. Duke expects to perform these routine activities during scheduled outages and does not plan to add additional employees to their permanent staff during license renewal at Catawba (Duke 2001). However, to establish an upper bound on possible increased employment during the license renewal term, staff assumes the hiring by Duke of 60 additional permanent workers, plus 73 indirect jobs,[a] would result in an increased demand for a total of 162 housing units around the Catawba site (or approximately 90 housing units for York County).[b]

The demand for housing units could be met with the construction of new or use of existing, unoccupied housing. Civilian jobs were projected to be approximately 572,000 in 1996 within a 48-km (30-mi) radius of Rock Hill, South Carolina, and the civilian population was around 1.0 million in 2000 (York County 1999). The increase in projected demand for housing units would not create a discernible change in housing availability, change in rental rates or housing values, or spur new construction or conversion.[c]

The staff reviewed the available information relative to housing impacts and the conclusions stated in the Catawba ER (Duke 2001). Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and additional 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 build additional 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. In the GEIS, the staff indicates that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies (NRC 1996).

Analysis of impacts on the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the permitted water withdrawal rate and

---

(a) The multiliplier used for York County is 2.2239. This is the South Carolina employment multiplier for electrical utilities (BEA 1999).
(b) This assumes 55 percent of the new hires reside in York County (see Section 2.2.8.1).
(c) The estimate of 162 housing units (90 units for York County) is likely to be an extreme "upper bound" estimate. Most of the potential new jobs would most likely be filled by existing area residents, thus creating no, or little, net demand for housing.

actual use of water. Duke plans no refurbishment at Catawba, so plant demand for water would not change beyond current needs (Duke 2001).

The staff assumed an increase of 60 employees during the license renewal period, the generation of 133 new jobs, and a net overall population increase of approximately 319 as a result of those jobs.[a] The impact of this increase in the number of workers onsite is expected to be SMALL. The plant-related population increase would require an additional 60 to 96 m^3/day (0.016 to 0.026 MGD) of potable water.[b] Catawba receives its domestic water through the York County west system. In 2000, the town of York provided water services from January through August, and the city of Rock Hill provided domestic water services for the remainder of the year (Duke 2001). The marginal increase in domestic water Catawba would use per year as a result of a hypothetical increase in employment of 60 license renewal employees is well within the residual capacity of the city of Rock Hill water treatment plant.[c] However, at times the town of York's water treatment plant utilization exceeds capacity and, during these times, the town of York could not supply Catawba's needs for water. The town of York is in the process of building a new treatment plant and reservoir to meet expanded needs. However, the city of Rock Hill has more than enough excess capacity to meet the marginal increase in needs represented by an increase of 60 employees. The staff reviewed the available information relative to impacts on public utility services and Duke's conclusions. Thus the staff finds that the impact of increased water use is SMALL and mitigation is not warranted.

4.4.3 Offsite Land Use During Operations

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

In Sections 3.7.5 and 4.7.4 of the GEIS, the staff defined the magnitude of land-use changes as a result of plant operation during the license renewal term as follows:

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

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

(a) Calculated by assuming that the average number of persons per household is 2.4 (133 jobs x 2.4 = 319). Average persons per household is calculated by dividing the population of York (South Carolina) and Mecklenburg (North Carolina) Counties by the total number of households in the Counties (USCB 2000).
(b) Calculated assuming that the average American uses between 50 and 80 gallons of water for personal use per day: 319 people x 80 gallons per person/day = 96 m^3/day (0.026 MGD).
(c) Personal communication and data provided by Matt Snellgrove, York County (South Carolina) Economic Development, November 28, 2001.

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

The staff has identified a maximum of 60 additional employees during the license renewal term plus an additional 73 indirect jobs (for a total of 133 jobs) in the community. In Section 3.7.5 of the GEIS (NRC 1996), the staff stated that if plant-related population growth is less than 5 percent of the study area's total population, offsite land-use changes would be SMALL, especially if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km^2 (60 persons/mi^2), and at least one urban area with a population of 100,000 or more within an 80-km (50-mi) radius. In this case, population growth will be less than 5 percent of the area's total population, the area has established patterns of residential and commercial development, a population density of well over 23 persons/km^2 (60 persons/mi^2), and at least one urban area (Charlotte) with a population of 100,000 or more within the 80-km (50-mi) radius. Consequently, the staff concludes that population changes resulting from license renewal are likely to result in SMALL offsite land-use impacts.

Tax revenue can affect land use because it enables local jurisdictions to provide the public services (e.g., transportation and utilities) necessary to support development. In Section 4.7.4.1 of the GEIS, the staff stated that the assessment of tax-driven, land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven land-use changes during the plant's license renewal term would be SMALL, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. In Section 4.7.2.1 of the GEIS, the staff stated that if tax payments by the plant owner are less than 10 percent of the taxing jurisdictions revenue, the significance level would be SMALL. If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven, land-use changes would be MODERATE.

York County is the only jurisdiction that taxes Catawba directly, and the Clover School District receives 75 percent of the tax revenue as a result of Catawba's presence. Because no major refurbishment or new construction activities are associated with license renewal, no new sources of plant-related tax payments are expected that could significantly influence land use in York County. However, continued operation of the plant would provide a significant continuing source of tax revenues to York County and the Clover School District. As discussed in Section 2.2.8.6 and shown in Table 2-17, Catawba paid an average of $35.3 million in taxes to York County over the 5-year period from 1996 to 2000, or approximately 25 percent of the total property taxes collected by the county. These payments represent a substantial, positive impact on the fiscal condition of York County and the Clover School District.

York County has experienced an increase in population of approximately 25 percent over the last decade (see Table 2-7). The growth is not related directly to the presence of Catawba. York County does not have growth control measures that limit housing. Land use projections for York County show that new commercial and industrial developments are expected to be concentrated in the eastern part of the county, along the I-77 corridor. New residential development is being encouraged in areas of the county that are already developed or undergoing development. The rest of the county (particularly the more rural western part) is expected to remain in agricultural and forest use. In combination, these two factors (lack of growth directly related to the presence of Catawba and directed growth locations) would be expected to result in SMALL land-use impacts from Catawba-related taxes.

The continued collection of taxes from Catawba will help keep tax rates below the levels they otherwise would have to be to fund the schools (particularly in Clover) and the county government. This source of revenue also provides for a higher level of public infrastructure and services than otherwise would be possible. All of these factors contribute to York County's attractiveness as a place to live.

No adverse effects on offsite land use will occur because of license renewal. Consequently, the staff concludes that offsite land-use impacts are likely to be SMALL, and additional mitigation is not 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 1999 for more discussion of this clarification). The issue is treated as such in this Supplemental Environmental Impact Statement (SEIS).

In the year 2000, most of the roadways within York County operated at acceptable levels of service. As discussed in Section 2.2.8.5, the area of greatest potential population growth in York County may be in its western part, even though there is a concerted effort at the county level to preserve the natural resources of the county's western half. The overall county population is expected to increase by 28.5 percent, between 2000 and 2020 (see Table 2-7). It is the intent of the county government to channel this growth into areas already developed in its eastern part. Continued population growth in areas adjacent to Catawba is expected, thus necessitating increases in road construction to handle the increased demand.

However, none of this expected growth is due directly to increases in employment at Catawba. The permanent employment associated with Catawba is currently 1218 employees including Duke employees and contractors (Duke 2001). During periods of refueling, which occur at approximately 18- to 24-month intervals and take 30 to 40 days to complete, an additional 500 workers are hired on a temporary basis (Duke 2001). The "upper bound" potential increase in permanent staff during the license renewal term is 60 additional workers, or approximately 4.9 percent of the current permanent and contract workforce of 1218. The level of access to the Catawba site is over secondary, as opposed to primary, roads. Based on these facts, Duke concluded that the impacts on transportation during the license renewal term would be SMALL, and no mitigative measures would be warranted.

The staff reviewed Duke's assumptions and resulting conclusions and conducted independent onsite interviews and observations of transportation conditions around the Catawba site. The staff concludes that any impact of Catawba license renewal on transportation service degradation is likely to be SMALL and would not require additional mitigation.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA), as amended through 1992, requires that Federal agencies take into account the potential effects of their undertakings on historic properties. The historic review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation in 36 CFR Part 800, as amended. Renewal of an OL for a nuclear power plant is an undertaking that could possibly affect either known or potential historic properties that may be located at the plant. Therefore, in accordance with the provisions of NHPA, the NRC is required to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Officer (SHPO) before proceeding. If it is determined that historic properties are present, the NRC is required to assess the possible adverse effects of the undertaking.

On May 30, 2000 Duke wrote to the South Carolina SHPO requesting its comment on the Catawba license renewal process and on the determination by Duke that the continued operation of Catawba would have no effect on historic properties (Huff 2000). In a response dated May 30, the South Carolina SHPO stated that relicensing should not have an effect on National Register eligible or listed properties (Brock 2000).

Areas within a nuclear plant site boundary can be placed into one of the following three categories:

(1) Areas with no potential for historic or archaeological resources include areas where past disturbances related to construction of the power station and appurtenant facilities have taken place to such an extent that any cultural resources that once existed are no longer present. No further archaeological investigations are recommended for these areas.

(2) Areas with low potential for historic or archaeological resources include areas that are relatively undisturbed but possess characteristics which would normally indicate a low

probability for most types of cultural resources to occur. For the most part, these lands have a degree of slope greater than 15 percent. For most of these areas, further archaeological work would not be necessary, although there could be smaller areas within the larger zone where specific ground conditions could require investigation.

(3) Areas with moderate-to-high potential for archaeological resources include areas that are relatively undisturbed by past activities and that have a likelihood for prehistoric and historic archaeological sites according to local models of prehistoric and historic land use and settlement patterning. Archaeological investigation is recommended prior to undertaking any ground-disturbing activities in these areas.

According to the Catawba ER (Duke 2001), the plant site is small in terms of total acreage, and consequently, plant features take up much of the available landscape. The plant includes about 122 ha (301 ac) that is covered by water or highly disturbed by past construction of power generation and maintenance facilities, parking lots, and roads. The remaining acreage (60 ha [149 ac]) consists of either pine or mixed hardwood-pine forested areas. Forested or generally undisturbed areas occur primarily along the southern and eastern sectors of the exclusion zone. Given the potential for historical period archaeological resources (e.g., dwelling and outbuilding foundations, dumps, privies, etc.; see Section 2.2.9.2), forested areas within the exclusion zone should be treated as having moderate-to-high potential for historic or archeological resources.

Duke has indicated that no additional land-disturbing activities at the plant site or along the existing transmission line rights-of-way are planned for the license renewal period. In the event that ground disturbance should occur, Duke stated that it will ensure that any archaeological and historical resources that might be encountered will be protected by adherence to existing conditions in the Catawba Nuclear Site Environmental Work Practices (Duke 2001). This work practice calls for construction activities to halt immediately until Duke Environmental Management staff at the site and State Historic Preservation Office personnel have been notified and the issue has been resolved.

Based on the presently known cultural resources status at Catawba, the existence of written procedures to provide immediate reaction and notification in the event of inadvertent discovery of cultural resources, and the staff's cultural resource analysis and consultation, it is the staff's conclusion that the potential impacts on historic and archaeological resources during the license renewal period are expected to be SMALL, and additional mitigation is not warranted.

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 minority[a] or low-income populations. The memorandum accompanying Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). Although compliance with the executive order is not mandatory for independent agencies, the NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" (NRC 2001).

The staff examined the geographic distribution of minority and low-income populations within 80 km (50 mi) of Catawba, employing the 1990 Census (USCB 1991) for low-income populations and the 2000 Census (USCB 2000) for minority populations. The populations within an 80-km (50-mi) radius of Catawba encompassed counties in both North and South Carolina. The analysis was also supplemented by field inquiries to the planning department and a social service agency in York County.[b]

For the purpose of the staff's review, a minority population is defined to exist if the percentage of each minority and aggregated minority category within the census block groups potentially affected by the license renewal of Catawba exceeds the corresponding percentage of minorities in the entire states of North and South Carolina by 20 percent, or if the corresponding percentage of minorities within the census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group[c] exceeds the corresponding percentage of low-income population in the entire states of

---

(a) The NRC Guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native, Asian, Native Hawaii or other Pacific Islander, or Black races, or Hispanic ethnicity. "Other" races and multi-racial individuals may be considered as a separate minority category as well as multi-racial individuals (NRC 2001).

(b) York County was the focus of this inquiry because Catawba is located in the County. The staff contacted several organizations working with low-income and minority populations, including the Catawba Indian Tribe through their Catawba Cultural Center. The staff concluded that any findings of environmental justice issues in the county would warrant further field of inquiries in the neighboring Counties. For reasons stated later in this section, further investigation was not warranted.

(c) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance

North and South Carolina by 20 percent, or if the corresponding percentage of low-income population within a census block group is at least 50 percent. For counties and census block groups within an 80-km (50-mi) radius of Catawba, the percentage of minority and low-income populations is compared to the percentage of minority and low-income populations in North and South Carolina as applicable.

Duke followed the convention of employing census block groups and included the groups located in or partially in the 80-km (50-mi) radius of Catawba (Duke 2001). Using this convention, the 80-km (50-mi) radius includes 1407 and 1461 census block groups in the 2000 and 1990 censuses, respectively. The "more than 20 percentage points above the comparison area" criterion was used to determine whether a census tract should be counted as containing a minority or low-income population (Duke 2001). Because the 20 percentage points is a lower threshold, the 50 percent criteria was not needed.

The staff followed the convention of employing census block groups and counts of individuals in minority or low-income status. Figure 4-1 shows the distribution of minority populations (shaded areas) within the 80-km (50-mi) radius. Minority populations are concentrated to the southeast, south, and southwest of the site. Beginning initially at approximately 42 km (26 mi) from the site, minority populations are concentrated in Fairfield, Lancaster, Kershaw, Chester, and Union Counties. Minority populations exist east of Catawba in Anson County along the 80-km (50-mi) radius. Pockets of minority populations exist in York County (around Rock Hill and the town of York) and in other counties around the Catawba site. A fairly large block of minority populations exists in Mecklenburg County, North Carolina, which encompasses much of the Charlotte metropolitan area.

Data from the 1990 census characterize low-income populations within an 80-km (50-mi) radius of Catawba in North and South Carolina (USCB 1991). Applying the NRC criterion of more than 20 percentage points above the comparison areas, the census block groups containing low-income populations were identified. Figure 4-2 shows the locations of the low-income populations within 80 km (50 mi) of Catawba. Census block groups containing low-income populations are concentrated around Charlotte, North Carolina. There is a small pocket of low-income population group in York County, South Carolina, around the town of York. Also, between approximately 64 to 80 km (40 to 50 mi) to the south of the Catawba plant, there is a concentration of low-income population in Union and Chester Counties. To the southeast and slightly on and extending outside the 80-km (50-mi) radius, there are low-income populations in Fairfield and Kershaw Counties.

---

with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts (USCB 2001).

Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of Catawba Based on Census 2000 Block Group Data and Individual Counts

Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of Catawba Based on Census 1990 Block Group Data and Individual Counts

With the locations of minority and low-income populations identified, the staff proceeded to evaluate whether any of the environmental impacts of the proposed action could affect these populations in a disproportionately high and adverse manner. Based on staff guidance (NRC 2001), air, land, and water resources within about 80 km (50 mi) of the Catawba site were examined. Within that area, a few potential environmental impacts could affect human populations. All of these were considered SMALL for the general population.

The pathways through which the environmental impacts associated with Catawba license renewal can affect human populations are discussed in each associated section. The staff then evaluated whether minority and low-income populations could be disproportionately affected by these impacts. The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing through which the populations could be disproportionately affected. In additions, the staff did not identify any location-dependent disproportionate impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Catawba to minority and low-income populations would be SMALL, and no special mitigation actions are warranted.

4.5 Groundwater Use and Quality

The Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that is applicable to Catawba groundwater use and quality is listed in Table 4-8. Duke stated in its ER that “no new information existed for the issues that would invalidate the GEIS conclusions” (Duke 2001). The staff has not identified any significant new information during its independent review of the Catawba ER, the staff’s site visit, the scoping process, or its evaluation of other available information. 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 4-8. 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

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues 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 ground-water use conflicts.

  As discussed in Section 2.2.2, Catawba 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 Catawba ER, the staff's site visit, the scoping process, 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.

The Category 2 issue related to groundwater use that is applicable to Catawba is listed in Table 4.9 and discussed in Section 4.5.1.

Table 4-9. Category 2 Issue Applicable to Groundwater Use and Quality 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
GROUNDWATER USE AND QUALITY			
Groundwater-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	4.8.1.3, 4.4.2.1	A	4.5.1

4.5.1 Groundwater-Use Conflicts (makeup water)

Reductions in the total surface water supply in Lake Wylie and downstream could reduce the water available to groundwater users. In some regions, surface water is a significant source of recharge to groundwater aquifers. However, the geohydrology and relatively stable pool of Lake Wylie make such impacts negligible for Catawba.

Catawba is located in the Piedmont physiographic province of the southeastern United States. Groundwater in this area is derived predominately from infiltration of local precipitation. Therefore, groundwater resources are less impacted by recharge from surface water than from local precipitation.

As stated in Section 4.1.1, the lake level will decline only 9 mm (0.4 in.) in 7 days under drought conditions as a result of consumptive use by Catawba. Such a small change in the lake surface elevation would have no detectable impact on groundwater users. Also, as stated in Section 4.1.1, consumptive use of water by Catawba operations results in a stage decrease of 6 mm (0.24 in.) for the Catawba River downstream of Lake Wylie under average conditions. Such a small change in river elevation would have no detectable impact on groundwater users.

Catawba consumptive use of surface water is not expected to change during the period of the proposed license renewal. It is impossible to reliably predict the quantity of future withdrawals and groundwater demands by other water users over the renewal term. However, there are State and Federal regulations in place to ensure future withdrawals do not adversely impact the groundwater resources around Lake Wylie and downstream. The impact of the consumptive use of surface water by Catawba on groundwater use is considered to be SMALL, and additional mitigation is not warranted.

4.6 Threatened or Endangered Species

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

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

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

Duke maintains contacts with agencies responsible for protected and sensitive species to ensure compliance of its activities. In addition to its on-going dialogues, Duke provided information to the U.S. Fish and Wildlife Service (FWS) regarding license renewal application.

With respect to Catawba, the FWS (Banks 2001) responded that, based on its review of the GEIS

> the Service believes that all issues concerning fish and wildlife resource have been adequately identified.

The staff sent a letter to FWS requesting a list of threatened, endangered, and proposed species, and critical habitat (NRC 2001). The FWS responded with a letter dated February 12, 2002 (FWS 2002), which is provided in Appendix E of the SEIS. Because there is likely no effect on threatened or endangered species or critical habitat from the continued operation of Catawba during the renewal period, no further consultation under 50 CFR Part 402 or further discussion with USFWS is necessary.

4.6.1 Aquatic Species

The Carolina heelsplitter is the only Federal- or State-listed aquatic species with the potential to occur in Lake Wylie or in streams in the transmission line rights-of-way. All known occurrences of this species in the Catawba River system are limited to small tributary streams located downstream of Lake Wylie (FWS 1996). An October 2001 survey conducted by Duke in the Catawba River downstream of Lake Wylie failed to locate the species (Duke 2002b); thus, it is highly unlikely this species could be found in Lake Wylie as a consequence of downstream movement of spawn. This species has not been observed in Lake Wylie or in streams along the transmission line rights-of-way.

The staff has conducted a site visit, reviewed the information provided by the applicant and other available reports, and contacted the FWS, the South Carolina Department of Natural Resources (SCDNR), and the North Carolina Department of Environment and Natural Resources (NCDENR). Based on this information, it is the staff's conclusion that the impacts on aquatic endangered, threatened, proposed, or candidate species of up to an additional 20 years of operation and maintenance of Catawba and associated transmission lines would be SMALL, and additional mitigation is not warranted.

4.6.2 Terrestrial Species

The bald eagle is the only Federal- or State-listed terrestrial species observed at Catawba or along the transmission line rights-of-way. Bald eagles are rarely observed as transients at the Catawba site or along the transmission line rights-of-way. Dwarf-flowered heartleaf and Georgia aster are the only other species known to occur in the vicinity of the Catawba site or the transmission line rights-of-way, but neither of the species have been observed in these areas during field surveys. The towers and transmission lines do not pose a hazard to birds. There have been no reports of collisions or electrocutions of endangered or threatened species along the transmission lines or at the cooling towers. Transmission line maintenance activities are conducted so as to minimize impacts. Vegetation management protocols for the transmission lines have been developed in cooperation with the SCDNR. In addition, Duke has conducted several rare species surveys along the transmission line rights-of-way, the most recent in the spring of 2001.

The staff has reviewed the information provided by the applicant and has contacted the FWS, the SCDNR, and the NCDENR. Based on the site visit, review of the Catawba ER (Duke 2001), other reports, and consultation with the FWS, the SCDNR, and the NCDENR, it is the staff's conclusion that the impacts on endangered, threatened, proposed, or candidate species of up to an additional 20 years of operation and maintenance of Catawba and associated transmission lines would be SMALL, and additional 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 information that is both new and significant related to any of the applicable Category 1 issues associated with the Catawba 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 additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 10 Category 2 issues applicable to Catawba operation during the renewal term and for environmental justice. For nine issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of Catawba would be of SMALL significance in the context of the standards set forth in the GEIS and that mitigation would not be warranted. For offsite land use (license renewal), the staff determined that impact to tax-driven land use changes would be

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

4.9 References

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

36 CFR Part 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property*, Part 800, "Advisory Council on Historic Preservations."

50 CFR Part 402. Code of Federal Regulations, Title 50, *Wildlife and Fisheries*, Part 402, "Interagency Cooperation – Endangered Species of 1973."

Banks. 2001. Letter from U.S. Fish and Wildlife Service to B. Miller, Duke Power Company. Subject: Duke Power License Renewal Application for McGuire and Catawba Nuclear Stations (April 24, 2001).

Brock, D. 2002. Letter from Deputy State Historic Preservation Officer, South Carolina Department of Cultural Resources, to J. R. Huff, Duke Power. May 30, 2000.

Bureau of Economic Analysis (BEA). 1999. *BEA RIMS II Regional Multipliers*. U.S. Department of Commerce. Washington, D.C.

Council on Environmental Quality (CEQ). 1997. *Environmental Justice: Guidance Under the National Environmental Policy Act*. Executive Office of the President, Washington, D.C.

Duke Energy Corporation (Duke). 2001. *Applicants Environmental Report – Operating License Renewal Stage Catawba Nuclear Station, Units 1 and 2.* Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2002a. *Application to Renew the Operating License of McGuire and Catawba Nuclear Stations*. "Responses to NRC Request for Additional Information Concerning the Catawba Environmental Report." Attachment to NRC Letter dated December 12, 2001. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2002b. *Application to Renew the Operating License of McGuire and Catawba Nuclear Stations*. "Attachment 2: Catawba River Fish Forage Densities, Population Estimates, and species Composition 1993-1997." Response to request for additional information. Dockets Nos. 50-369, 50-370, 50-413, and 50-414. February 8, 2002, Charlotte, North Carolina.

Executive Order 12898. “Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.” 59 FR 7629. February 16, 1994.

Huff, J. R. 2000. Letter from Scientist-Duke Power, to Ms. Nancy Brock, State Historic Preservation Office, South Carolina Department of Cultural Resources. May 30, 2000.

Institute of Electrical and Electronic Engineers, Inc. (IEEE). 1997. *National Electrical Safety Code*. New York.

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

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

National Historic Preservation Act (NHPA). 16 USC 470 et seq.

National Institute of Environmental Health Sciences (NIEHS). 1999. *NIESH Report on Health Effects from Exposure to Power Line Frequency and Electric and Magnetic Fields*. National Institutes of Health: Research Triangle Park, North Carolina.

U.S. Census Bureau (USCB). 1991. *1990 Census-Population and Housing; Public Law 94-171 Data*. Washington D.C.

U.S. Census Bureau (USCB). *American Fact Finder. 2000 Census. Population and Housing by County in South Carolina*. 2000. <http://factfinder.census.gov/servlet/BasicFactsServlet/> (accessed April 9, 2002).

U.S. Census Bureau (USCB). 2001. *Glossary - Definition and Explanations–Decennial Census terms*. http://www.census.gov/main/www.glossary.html (Accessed November 21, 2001).

U.S. Fish and Wildlife Service (FWS). 1996. *Carolina Heelsplitter Recovery Plan*. U.S. Fish and Wildlife Service, Atlanta, Georgia.

U.S. Fish and Wildlife Service (FWS). 2002. Letter from U.S. Fish and Wildlife Service to C. Carpenter, U.S. Nuclear Regulatory Commission. February 12, 2002. (Copy included in Appendix E.)

U.S. Nuclear Regulatory Commission (NRC). 1983. *Final Environmental Statement Related to the Operations Catawba Nuclear Station Units 1 and 2*. Docket Nos. 50-413 and 50-414. NUREG-0921, Washington, D.C.

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

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

U.S. Nuclear Regulatory Commission (NRC). 2001. "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues." Attachment D to NRR Office Instruction LIC-203, June 21, 2001, Washington D.C.

York County. 1999. *York County Comprehensive Planning*. Planning and Development Services. South Carolina.

5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999a).[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 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) Single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

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

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

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

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

5.1 Postulated Plant Accidents

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

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

Design-Basis Accidents

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

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

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

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

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

Based on information in the GEIS, the Commission found that

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

Duke Energy Corporation (Duke) stated in its Environmental Report (ER; Duke 2001a) that it is not aware of any new and significant information associated with the renewal of the OLs for Catawba Nuclear Station, Units 1 and 2 (Catawba). The staff has not identified any significant new information during its independent review of the Catawba ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS.

Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, whether or not there are serious offsite consequences. In the GEIS, the staff assessed the impacts of severe accidents during the license renewal period, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Severe accidents initiated by external phenomena such as tornadoes, floods, earthquakes, and fires have not traditionally been discussed in quantitative terms in FESs and were not specifically considered for the Catawba site in the GEIS (NRC 1996). However, in the GEIS, the staff did evaluate existing impact assessments performed by NRC and by the industry at 44 nuclear plants in the United States and concluded that the risk from beyond design-basis earthquakes at existing nuclear power plants is SMALL. Additionally, the staff concluded that the risks from other external events are adequately addressed by a generic consideration of internally initiated severe accidents.

Based on information in the GEIS, the Commission found that

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

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

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

The staff has not identified any significant new information with regard to the consequences from severe accidents during its independent review of the Catawba ER, the staff's site visit, the scoping process, 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 Catawba. The results of its review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives

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

5.2.1 Introduction

Duke submitted an assessment of SAMAs for Catawba as part of the ER (Duke 2001a). The assessment was based on Revision 2b of the Catawba Probabilistic Risk Assessment (PRA) (Duke 2001b), which is a full scope Level 3 PRA that includes the analysis of both internal and external events. The internal events analysis is an updated version of the Individual Plant Examination (IPE) model (Duke Power Company 1992), and the external events analysis is based on the Individual Plant Examination for External Events (IPEEE) model (Duke Power Company 1994). In identifying and evaluating potential SAMAs, Duke took into consideration the insights and recommendations from the Catawba PRA, as well as other studies, such as the Severe Accident Mitigation Design Alternative (SAMDA) analysis for Watts Bar (NRC 1995a) and NUREG-1560 (NRC 1997c). In the ER, Duke concluded that none of the candidate SAMAs evaluated were cost-effective for Catawba.

After reviewing Duke's SAMA assessment, the staff issued a request for additional information (RAI) to Duke by letter dated November 19, 2001 (NRC 2001). Key questions concerned (1) further information on several candidate SAMAs, especially those that mitigate the consequences of a station blackout (SBO) event; (2) details on the PRA used for the SAMA analysis, including results as they pertain to containment failure and releases; and (3) the impact of including elements of averted risk that were omitted in the ER. Duke submitted additional information by a letter dated February 1, 2002 (Duke 2002a), which provided details on the updated PRA, the requested PRA results, and other information identified in the RAI (NRC 2001). Duke provided additional information in a telephone conference call with the staff on February 25, 2002 (NRC 2002a). In these responses, Duke included supplemental tables showing the impacts of including averted replacement power costs for SAMAs that have the potential to reduce core damage frequencies and averted offsite property damage costs for SAMAs that have the potential to improve containment performance – both of which were omitted in the original analysis. Also, Duke presented its position on the value of providing back-up hydrogen control capability during SBO events. Duke's responses addressed the staff's concerns and reaffirmed that none of the SAMAs would be cost-beneficial. However, based on review of the cost and benefit information provided by Duke, the staff concludes that two SAMAs are cost-beneficial under the assumptions presented. One cost-beneficial SAMA involves plant and procedure modifications to enable the existing hydrogen control (igniter) system to be powered from an ac-independent power source in SBO events. Duke has not implemented this SAMA at Catawba; this issue is currently being addressed by the NRC as part of the resolution of Generic Safety Issue 189 - Susceptibility of Ice-Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident (NRC 2002b). The other cost-beneficial SAMA involves installing a watertight wall around the 6900/4160 V transformers in the basement of the turbine building. Duke has not implemented this SAMA at Catawba; this issue has been identified for follow-up as a current operating plant issue at Catawba. By letter dated August 8, 2002, Duke committed to designing and scheduling the installation of flood protection for the 6900/4160 V transformers (Duke 2002c).

The staff's assessment of SAMAs for Catawba follows.

5.2.2 Estimate of Risk for Catawba, Units 1 and 2

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

5.2.2.1 Duke's Risk Estimates

The Catawba PRA model, which forms the basis for the SAMA analysis, is a Level 3 risk analysis; that is, it includes the treatment of core damage frequency, containment performance, and offsite consequences. The model, which Duke refers to as PRA, Revision 2b (Duke 2001b), consists of an internal events analysis based on an updated version of the original IPE (Catawba PRA, Revision 1; Duke Power Company 1992) and an external events analysis based on the current version of the IPEEE (Duke Power Company 1994). The calculated total core damage frequency (CDF) for internal and external events in Revision 2b of the Catawba PRA is 5.8×10^{-5} per year.

The Catawba PRA is a "living" PRA. The original version of the IPE has been updated to reflect various design and procedural changes, such as those related to the improvements identified in the IPE and to reflect operational experience. The CDF for internal and external events was reduced from 7.8×10^{-5} per year (Revision 1) to 5.8×10^{-5} per year (Revision 2b). The Level 1 PRA changes associated with the Catawba PRA Revision 2b model included:

- incorporation of updated data for component reliability, unavailabilities, initiating event frequencies, common cause failures, and human error probabilities
- conversion from a sequence-based solution to a single-top fault tree
- modifications to reflect changes to the plant configuration.

The most significant plant enhancement incorporated was providing back-up cooling to one of the two high-head charging pumps. In an event in which normal cooling to the high-head charging pumps is lost, a means to provide back-up cooling from the drinking water supply was implemented to reduce the likelihood of a reactor coolant pump seal loss-of-coolant accident (LOCA). Another important change occurred in the interfacing systems LOCA (ISLOCA) evaluation. The generic database adopted for the Revision 2b analysis had significantly higher failure rates for valve ruptures. This resulted in a significant increase in the CDF contributed by the ISLOCA, an important risk contributor.

The breakdown of the CDF from Revision 2b to the PRA is provided in Table 5-3. Internal event initiators represent about 80 percent of the total CDF and are composed of transients (24 percent of total CDF), LOCAs (29 percent of total CDF), internal flood (24 percent of total CDF), and reactor pressure vessel rupture (2 percent of total CDF). Remaining contributors together account for less than 3 percent of total CDF. External event initiators represent about 20 percent of the total CDF and are composed of seismic initiators (15 percent of total CDF), tornado initiators (4 percent of total CDF), and fire initiators (2 percent of the total CDF). Although not explicitly reported in Table 5-3, SBO events account for 43 percent of the total CDF for internal and external events in Revision 2b of the PRA (Duke 2002a).

Table 5-3. Catawba Core Damage Frequency (Revision 2b of PRA)

Initiating Event	Frequency (per year)	Percent of Total CDF
Transients	1.4×10^{-5}	24
Loss-of-coolant accident (LOCA)	1.7×10^{-5}	29
Internal flood	1.4×10^{-5}	24
Anticipated transient without scram (ATWS)	3.0×10^{-7}	<1
Steam generator tube rupture (SGTR)	3.6×10^{-8}	<1
Reactor pressure vessel rupture	1.0×10^{-6}	2
Interfacing system LOCA (ISLOCA)	2.5×10^{-7}	<1
CDF from internal events	$\mathbf{4.7 \times 10^{-5}}$	**81**
Seismic	8.5×10^{-6}	15
Tornado	2.1×10^{-6}	4
Fire	1.2×10^{-6}	2
CDF from external events	$\mathbf{1.1 \times 10^{-5}}$	**19**
Total CDF	$\mathbf{5.8 \times 10^{-5}}$	**100**

The Level 2 (also called containment performance) portion of the Catawba PRA model, Revision 2b, is essentially the same as the IPE Level 2 analysis. However, the following changes were made:

- modification of the containment event tree (CET) logic regarding the potential for corium contact with the containment liner

- recognition that the refueling water storage tank inventory would drain through a failed reactor vessel in some sequences (e.g., SBO); this was factored into the CET logic.

These changes resulted in a slight increase in the potential for early containment failure as a result of corium contact with the containment liner and a reduction in basemat melt-through due to reactor cavity flooding via the reactor vessel breach.

The offsite consequences and economic impact analyses (i.e., Level 3 PRA Analyses) were carried out using the NRC-developed MELCOR Accident Consequence Code System 2 (MACCS2) code. Inputs for this analysis include plant and site-specific input values for core radionuclide inventory, source term and release fractions, meteorological data, projected population distribution, and emergency response evacuation modeling.

Duke estimated the dose to the population within 80 km (50 mi) of the Catawba site from all initiators (internal and external) to be 0.314 person-sieverts (Sv) (31.4 person-rem) per year (Duke 2001a). The breakdown of the total population dose by containment end-state is summarized in Table 5-4. Internal events account for approximately 0.21 person-Sv

Table 5-4. Breakdown of Population Dose by Containment End-State (Total dose = 0.314 person-Sv [31.4 person-rem] per year)

Containment End State	Percent of Total Dose – Internal Initiators	Percent of Total Dose – External Initiators	Percent of Total Dose – All Initiators
STGR[(a)]	0.2	<0.1	0.2
ISLOCA[(a)]	8.3	0.0	8.3
Containment isolation failure	<0.1	1.0	1.0
Early containment failure	13.2	9.9	23.1
Late containment failure	45.1	22.1	67.2
Basemat melt-through	<0.1	<0.1	<0.1
No containment failure	0.1	<0.1	0.1
Total	**66.9**	**33.1**	**100**

(a) Containment bypass events

(21.0 person-rem) per year, and external events account for approximately 0.104 person-Sv (10.4 person-rem) per year. As can be seen from this table, early and late containment failures account for the majority of the population dose.

5.2.2.2 Review of Duke's Risk Estimates

Duke's determination of offsite risk impacts at Catawba is based on the Revision 2b of the Catawba PRA and a separate MACCS2 analysis. For the purposes of this review, the staff considered the Catawba study in terms of the following major elements:

- the Level 1 and 2 risk models that form the bases for the September 1992 IPE submittal (Duke Power Company 1992)

- the major modifications to the IPE models that have been incorporated in Revision 2b of the PRA (Duke 2001b)

- the external events models that form the basis for the June 1994 IPEEE submittal (Duke Power Company 1994)

- the analyses performed to translate fission product release frequencies from the Level 2 PRA model into offsite consequence measures (Duke 2001a).

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 Catawba IPE is described in a staff report dated June 7, 1994 (NRC 1994). In that review, the staff evaluated the methodology, models, data, and assumptions used to estimate the 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), which means the IPE was of adequate quality to be used to look for design or operational vulnerabilities. The staff's review primarily focused on the licensee's ability to examine Catawba for severe accident vulnerabilities and not specifically on the detailed findings or quantification estimates. Overall, the staff concluded that the Catawba IPE was 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 risk models are used in conjunction with insights, such as those from risk importance, sensitivity, and uncertainty analyses.

The staff's review of the Catawba IPEEE is described in a safety evaluation report dated April 12, 1999 (NRC 1999b). Duke did not identify any fundamental weaknesses or vulnerabilities to severe accident risk with regard to the external events. In the safety evaluation report, the staff concluded that the IPEEE met the intent of Supplement 4 to Generic Letter 88-20 (NRC 1991), and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities.

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 (MAAP) code to analyze postulated accidents and develop radiological source terms for each of 29 containment release categories used to represent the containment end-states. These source terms were incorporated as input to the MACCS2 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 1990) for the closest corresponding release scenarios. The staff concludes that the assignment of source terms is acceptable.

The plant-specific input to the MACCS2 code includes the Catawba reactor core radionuclide inventory, emergency response evacuation modeling based on Catawba evacuation time estimate studies, release category source terms from the Catawba PRA, Revision 2b, analysis (same as the source terms used in the IPE), site-specific meteorological data, and projected population distribution within a 80-km (50-mi) radius for the year 2040.

MACCS2 requires a file of hourly meteorological data consisting of wind speed, wind direction, atmospheric stability category, and precipitation. For the Catawba SAMA analysis, the meteorological data was obtained from the meteorological tower located on the Catawba site; the meteorological data used in MACCS2 contained data for one year, January 1 through December 31, 1991.

The Catawba PRA, Revision 2b, and the SAMA offsite consequence analyses use three distinct evacuation schemes in order to adequately represent evacuation time estimates for the permanent resident population, the transient population, and the special facility population (schools, hospitals, etc.). The three groups are defined by the time delay from initial notification to start of evacuation. For each evacuation scheme, the fraction of the population starting their evacuation is included. For the permanent resident evacuation schemes, it was assumed that 5 percent of the population would delay evacuation for 24 hours after being warned to evacuate. The delay time and fraction of population for the remaining two schemes was developed from information given in the latest update to the Catawba evacuation time estimate study for the 10-mile Emergency Planning Zone (EPZ). The evacuation schemes include additional information such as evacuation distance, average evacuation speed, sheltering, and shielding considerations. In the Catawba evacuation model, only the 10-mile EPZ is assumed to be involved in the initial evacuation. The MACCS2 model assumes that persons outside of the 10-mile EPZ will wait 24 hours before evacuating (provided that radiological conditions warrant evacuation).

The staff reviewed the Duke responses (Duke 2002a) to questions regarding meteorological data, population data, and emergency planning. The responses confirmed that Duke used appropriate values for the consequence analysis.

The staff also reviewed the Duke responses (Duke 2002a) to questions regarding the low frequency of steam generator tube ruptures (SGTR) accidents (3.6×10^{-8} per year). Duke explained the low value as largely due to the use of IPE success criteria, under which sequences are categorized as successes if core damage occurs beyond 24 hours, an assumption not in accordance with current, generally accepted industry practice. Duke indicated that the next revision of the Catawba PRA will reflect this correction. The staff notes that the impact of this correction can be sizable, as demonstrated in Duke's revision to the McGuire PRA, in which the frequency of SGTR accidents increased by a factor of 600 (NRC 2002d). However, even with the higher SGTR frequency, the maximum benefit associated with completely eliminating SGTR events at McGuire was estimated to be about $100,000 (present worth for the 20-year license renewal period). Previous analyses of severe accidents mitigation alternatives (e.g., for advanced light water reactors) have shown that implementation costs for alternatives to prevent or mitigate SGTR events would be expensive (on the order of several million dollars). The staff concludes it is unlikely that a cost-beneficial alternative could be implemented to substantially reduce SGTR risk given the low expected benefits and the high implementation costs.

The staff concludes that the methodology used by Duke to estimate the CDF and offsite consequences for Catawba provides an acceptable basis from which to proceed with an assessment of the risk reduction potential for candidate SAMAs. Additionally, the risk profile used is similar to other PWRs with ice-condenser containments. Accordingly, the staff bases its assessment of offsite risk on the CDF and population 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 elements:

- The core damage cut sets from Revision 2b of the Catawba 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 Catawba (including early containment failure, containment isolation failure, and containment bypass) were reviewed for possible implementation.

In addition, Duke reviewed the Watts Bar SAMDA analysis (NRC 1995a), and insights from the staff's generic report on the IPE (NRC 1997c) to identify additional SAMAs.

As a starting point for the core damage cut set review, Duke developed a listing of the top 100 cut sets (severe accident sequences) based on internal initiators and the top 100 cut sets for external initiators. These 200 sequences include all potential core damage sequences with at least a 0.08 percent contribution to the total CDF. Additionally, some cut sets contributing as little as 0.01 percent to the total CDF were considered. Duke reviewed the cut sets to identify potential SAMAs that could reduce CDF. A cutoff value of 5.8×10^{-7} per year (for internal and external event initiators) was used to screen events. To account for the cumulative effect of cut sets below this cutoff value, the basic events importance measure was also used to identify potential enhancements, as discussed below. Duke indicated in response to the requests for additional information (RAIs) that the estimated CDF for the 200 cut sets is 4.1×10^{-5} per year, which is about 71 percent of the total CDF (Duke 2002a).

For each seismic initiator cut set, Duke calculated the associated offsite risk based on the population dose and CDF for the plant damage states (PDSs) attributable to the seismic initiator. Duke conservatively 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 ($200,000 per person-Sv) 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 cut sets above the cutoff frequency. The present worth of averted risk for all of the seismic cut sets combined was estimated to be about $316,000 (not including the cost of replacement power and offsite property damage, the significance of which is discussed in Section 5.2.6.2). On the basis of the small risk reduction achievable (0.08 person-Sv [8.0 person-rem]) and the large costs associated with substantial seismic upgrades (estimated at several million dollars), Duke eliminated seismic SAMAs from further consideration.

Duke reviewed the F-V Basic Event Importance Ranking presented in the Catawba PRA report, Revision 2b, and identified several 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. Five potential enhancements for reducing CDF were identified through this process and are presented in Table 5-5.

In the ER, Duke stated that two design options – installing a watertight wall around the 6900/4160 V transformers in the turbine building basement and moving the 6900/4160 V transformers – were evaluated as part of a previous design study for Catawba to address concerns raised in the IPE over a turbine building flood causing an extended loss of offsite power. Neither of these options were considered cost-effective at that time. At the staff's request (NRC 2001), Duke provided further information regarding the addition of a watertight wall as a potential SAMA (Duke 2002a; NRC 2002a). This plant modification is included as an additional SAMA in Table 5-5.

Duke also considered potential alternatives to reduce containment failure modes of concern for Catawba. These alternatives included nine containment-related improvements evaluated as part of the staff's assessment of SAMDAs for Watts Bar (NRC 1995a) and five containment-related improvements (e.g., procedures for reactor coolant system depressurization, procedures to cope with and reduce induced SGTR) derived from the staff's generic report on the individual plant examination program (NRC 1997c). Duke eliminated those alternatives that were either (1) already implemented at Catawba or (2) not applicable to the Catawba containment. Based on the screening, Duke designated nine of the containment-related SAMAs for further study. The list of the potential enhancements to improve containment performance is presented in Table 5-6.

In the Catawba ER, Duke identified the installation of back-up power to the igniters and the installation of back-up power to air-return fans as two separate SAMAs. However, in responses to staff RAIs, Duke indicated that the availability of air-return fans would be essential to the effective operation of igniters in an SBO; therefore, Duke treated the combined modification as a single SAMA. Accordingly, these two hydrogen control related SAMAs are shown as a single SAMA in Table 5-6. This effectively reduces the number of containment-related SAMAs to eight.

Table 5-5. SAMA Cost/Benefit Screening Analysis – SAMAs that Reduce CDF

Potential Alternative	Sequences/Failures Addressed	Risk Reduction		Total Benefit (per unit)	Cost of Enhancement (per unit)
		CDF[(a)]	Population Dose [(b)] (person-rem [(c)])		
Man standby shutdown system (SSS) 24 hours/day with trained operator	Turbine building flood with a failure of diesel generators to run and operators fail to initiate SSS seal injection following a loss of offsite power (LOOP) event	5.4 $\times 10^{-6}$	4.1	$241,000	>$2.5 M[(d)(e)]
Install automatic swap-over to high pressure recirculation	LOCA cut sets with failure of operators to establish high pressure recirculation	1.5 $\times 10^{-5}$	1.1	$448,000	>$1 M
Replace reactor vessel with stronger vessel	Failure of reactor pressure vessel with failure to prevent core damage following a reactor pressure vessel breach	1.0 $\times 10^{-6}$	< 0.1	$30,000	>$1 M
Install third diesel generator	LOOP events, which includes turbine building flood and LOOP initiators.	1.6 $\times 10^{-5}$	14.0	$754,000	>$2 M
Install automatic refill to upper storage tank	Loss of instrument air with a failure of nuclear service water system sources and operators fail to refill UST from condensate grade sources	4.0 $\times 10^{-6}$	0.3	$120,000	>$1 M
Install watertight wall around the 6900/4160 V transformers in turbine building basement	Turbine building flood causing an extended loss of offsite power	1.4 $\times 10^{-5}$	12.4	$663,000	$250,000

(a) Total CDF = 5.8×10^{-5} per year
(b) Total population dose = 31.4 person-rem per year
(c) One person-Sv = 100 person-rem
(d) Cost estimates for manning the standby shutdown system apply on a per site rather than per unit basis. In order to provide a consistent basis for comparison with the estimated benefits (which are per unit), the estimated site costs were divided by two.
(e) M = million

Table 5-6. SAMA Cost/Benefit Screening Analysis – SAMAs that Improve Containment Performance

Potential Alternative	Risk Reduction		Total Benefit (per unit)	Cost of Enhancement (per unit)
	CDF	Population Dose (person-rem)[a]		
Install independent containment spray system	N/A	28.4	$918,000[b]	>$1 M[c]
Install filtered containment vent system	N/A	28.4	$918,000[b]	>$1 M
Install back-up power to igniters and install back-up power to air-return fans	N/A	28.4	$918,000[b]	$540,000
Install containment inerting system	N/A	28.4	$918,000[b]	>$1 M
Install additional containment bypass instrumentation (ISLOCA)	N/A	2.6	$84,000	>$1 M
Add independent source of feedwater to reduce induced SGTR	N/A	< 0.1	< $3,200	>$1 M
Install reactor cavity flooding system	N/A	7.3	$239,000	>$1 M
Install core retention device	N/A	< 0.1	< $3,200	>$1 M

(a) One person-Sv = 100 person-rem
(b) Total benefit based on eliminating all early and late containment failures
(c) M = million

5.2.3.2 Staff Evaluation

It should be noted that Duke has made extensive use of PRA methods to gain insights regarding severe accidents at Catawba. Risk insights from various Catawba risk assessments 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) provide back-up cooling water to the centrifugal charging pumps, (2) improve plant personnel's awareness of the standby shutdown system importance, (3) improve standby shutdown system availability by administratively controlling and limiting the times when the standby shutdown system may be taken out of service, and (4) decrease the time required for service water system and component cooling water system maintenance. Examples of plant improvements being planned for implementation by Duke based on IPEEE findings are:

(1) addition of spacers and stiffening of side rails on the diesel generator battery racks

(2) relocation of an instrument to avoid a potential seismic interaction with adjacent piping

(3) replacement of a valve to eliminate seismic spatial interaction with a nearby spent fuel cooling line

(4) addition of instructions in the pre-fire plan for the electrical bus switching area

(5) replacement of reciprocal air compressors with centrifugal compressors, and routing cables for the new compressors to give sufficient redundancy in case of fires

(6) reinstallation of missing door bolts in the auxiliary shutdown panel cabinets (NRC 1999).

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

Duke's effort to identify potential SAMAs focused on areas found to be risk-significant in the Catawba 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 Catawba. Duke made a reasonable effort to use the Catawba PRA to search for potential SAMAs and to review insights from other plant-specific risk studies and previous SAMA analyses for potential applicability to Catawba. The staff reviewed the set of potential enhancements considered in Duke's SAMA identification process. These enhancements include improvements oriented toward reducing the CDF and risk from major contributors specific to Catawba and improvements identified in the previous SAMDA review for Watts Bar (NRC 1995a) that would be applicable to Catawba.

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. The staff requested additional information (NRC 2001) from Duke on less expensive alternatives that would yield similar benefits. In response, Duke provided additional information on (1) the cost to provide alternative power to hydrogen igniters for SBO, (2) the cost to provide passive autocatalytic recombiners (PARs) as an alternative to igniters, (3) the cost to install a dedicated line from the Wylie hydroelectric station as an alternative source of ac power, and (4) the cost to install a watertight wall around the 6900/4160 V transformers. This information was responsive to the staff's requests and provided additional depth to the SAMAs considered. These additional alternatives are further evaluated, along with the other SAMAs, in the sections that follow.

The staff concludes that Duke has used a systematic process for identifying potential design improvements for Catawba 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 Attachment H to the Catawba ER describes the process used by Duke to determine the risk reduction potential for each enhancement.

For each seismic initiator cut set, Duke calculated the associated offsite risk based on the population dose 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 cut set. For each (non-seismic) sequence/enhancement, Duke evaluated the severe accident sequences. In general, where an alternative impacted more than one severe accident sequence, Duke determined the cumulative risk reduction achievable by each SAMA. This was performed by identifying which basic events in the cut sets would be affected by the implementation of the particular SAMA and assuming that implementation of the basic event(s) would be completely eliminated by the SAMA. For each containment-related improvement, Duke assumed that all of the population dose 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, filtered containment vent, back-up power to igniters, back-up power to air-return fans, containment inerting system, and reactor cavity flooding system), the total population dose for all affected failure modes was assumed to be completely eliminated by implementing the alternative. For example, installation of a standpipe in containment for reactor cavity flooding, which could reduce the likelihood of both early containment failure associated with reactor vessel breach and late containment failure due to basemat melt-through, was assumed to completely eliminate the associated early and late containment failures.

The staff questioned Duke (NRC 2001) regarding the estimated risk reduction associated with addition of a third diesel generator (DG). This SAMA was estimated to provide about a 60 percent reduction in the CDF for SBO sequences (from 2.5×10^{-5} per year to 9.0×10^{-6} per year). Duke indicated that the risk reduction was based on eliminating all failures to start, failures to run, and common cause failures of the existing two DGs. However, it was assumed that the third DG would not be seismically qualified; therefore, it would not be effective in seismic events. Since seismic events account for approximately one-third of the SBO CDF, the limited risk reduction estimated for the third DG appears reasonable. Duke also considered the additional benefit if the third diesel were seismically qualified similar to the existing DGs. Duke estimated that an additional reduction in CDF of about 4.0×10^{-7} per year would be achieved by eliminating all random failures of DGs in seismic events. This risk reduction is limited because the seismic results are dominated by seismic failures in the 4-kV power system for which improving diesel generator availability provides no benefit. The staff concludes that Duke's risk reduction estimates for this SAMA are reasonable.

An estimate of the risk reduction for the SAMA involving installation of a dedicated power line to the Wylie hydroelectric station was not provided in Duke's RAI response. However, the risk reduction would be comparable to that for adding a third DG, because the seismic fragility of the hydroelectric unit is expected to be similar to that for the seismically qualified DGs.

The staff notes that Duke evaluated the risk reduction potential for each SAMA in a bounding fashion. Each SAMA was assumed to completely eliminate all sequences that the specific enhancement was intended to address; therefore, the benefits are generally overestimated and conservative, including SAMAs related to SGTR events. 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 4-1, 4-2, and 5-1 of Attachment H 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 one SAMA, which involved installing a third DG, 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 this alternative were found to have a high importance in the Catawba PRA. Because the safety benefits ($754,000) of the potential SAMA was significantly less than the estimated implementation costs ($2 million), the cost estimate was not 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 SAMDA for operating reactors and advanced LWRs. The staff notes that Duke's estimated implementation costs of $1 million or greater are consistent with the values reported in previous analyses for major hardware 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. For example, Duke estimated the cost to install a third DG to be approximately $2 million; this value is less than the cost estimates reported in previous SAMDA analyses for a similar design change.

Duke's estimate of the cost to install a dedicated line from the Wylie hydroelectric station as an alternate source of ac power also appears reasonable. This line would be buried to eliminate weather-related common cause failures. The estimated cost ($8 million) is greater than, but comparable to the cost estimates for a similar modification provided by Duke (Duke 2002b) for the McGuire Nuclear Station ($3 million) and by Dominion Power (NRC 2002c) for the Surry Nuclear Power Station ($2 to 5 million). Even the lowest of these estimates is far greater than the calculated benefit of $750,000 for Catawba.

The staff questioned Duke regarding the costs of less expensive alternatives that could offer similar risk reduction benefits, particularly with regard to installation of a watertight wall to address turbine flooding events and to improvements to control hydrogen in SBO events. Duke's estimate of the cost to install a watertight wall around the 6900/4160 V transformers in the turbine building basement is $250,000 per unit (NRC 2002a). The estimated cost breakdown is $75,000 for engineering, $25,000 for materials, and $150,000 for installation labor. These costs appear reasonable given the constraints in installing the modification in an existing plant.

In a February 1, 2002, response to staff RAIs (Duke 2002a), Duke provided additional information on the costs associated with installing a passive hydrogen control system based on the use of PARs in lieu of the present ac-dependent hydrogen igniters and the costs of powering a subset of the current hydrogen igniters from a back-up generator. For scoping purposes, Duke provided supplementary information regarding the cost of back-up power to the igniters and air-return fans in response to a follow-up RAI (NRC 2002a).

Duke's estimate of the cost to establish a capability to power a subset of igniters from a back-up generator was $205,000 for each unit. This modification, as defined by Duke, would involve pre-staging a single, dedicated generator for each unit outdoors on a concrete pad (for ventilation and exhaust considerations), and supplying the necessary power cables and circuit breakers to enable connection to the igniter branch circuits. The breakdown of this cost is $5,000 for engineering, $50,000 for materials, $110,000 for installation labor, and $40,000 for maintenance and operation. This cost estimate does not include an enclosure, tornado protection for the generator, or any seismic design. Duke further noted that providing electric power to hydrogen igniters during a SBO will not be effective without also powering at least one of the containment air-return fans and that this will further increase the cost of this option. When one air-return fan is added to this estimate, the combined cost is $540,000 per unit. The breakdown of this cost is $50,000 for engineering, $210,000 for materials, $240,000 for installation labor, and $40,000 for maintenance and operation. Duke points out there will be additional costs not included in these estimates.

The staff requested additional information on PARs because PARs are to be installed in French PWRs by 2007 to mitigate the consequences of hydrogen combustion events. In response (Duke 2002a), Duke estimated that the installation of PARs would cost more than $750,000 per unit, which is well above the estimated benefit (see Table 5-7, Section 5.2.6.2). This cost estimate is consistent with independent staff cost estimates for installing PARs.

The staff asked for further information on the basis for the greater than $1 million cost estimate for installing an automatic swap-over to high pressure recirculation. Duke (NRC 2002a) referenced NUREG-0498, Supp. 1 (NRC1995a), which estimated a cost of about $2.1 million for a similar alternative (i.e., "automate the alignment of emergency care cooling system [ECCS] recirculation to the high-pressure charging and safety injection pumps"). This would reduce the potential for related human errors made during manual realignment. This cost estimate is considerably higher than the estimated averted risk benefit for Catawba of about $448,000. (Benefits are discussed further in Section 5.2.6.)

The staff concludes that the cost estimates provided by Duke are reasonable and adequate for the purposes of this SAMA evaluation. As noted in Section 5.2.6.2, further attention will be placed on the costs associated with SBO-related plant improvements by the NRC as part of the resolution of Generic Safety Issue 189 (GSI-189) - Susceptibility of Ice-Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident (NRC 2002b). Also, as noted in Section 5.2.6.2, the need for additional evaluation and possible implementation of the watertight wall around the 6900/4160 V transformers has been identified as a current operating plant issue. Duke has made a commitment to design and install flood protection around these transformers (Duke 2002c).

5.2.6 Cost-Benefit Comparison

The cost-benefit comparison as evaluated by Duke and the staff evaluation of the cost-benefit analysis are described in the following sections.

5.2.6.1 Duke Evaluation

In the analysis provided by Duke in the ER, Duke did not include the following factors in its cost-benefit evaluation: replacement power costs for SAMAs that have the potential to reduce CDF and averted offsite property damage costs for SAMAs that have the potential to improve containment performance. 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 the cost-benefit analysis for each affected SAMA. In response to the RAI (Duke 2002a), Duke updated the benefit estimates to include averted replacement power costs and averted offsite property damage costs.

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]). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOEC +AOE + AOSC) - COE

where APE = present value of averted public exposure ($)
AOEC = present value of averted offsite property damage costs ($)
AOE = present value of averted onsite exposure costs ($)
AOSC = present value of averted onsite cleanup costs ($)
COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA, and it is not considered cost-beneficial. Duke's derivation of each of the associated costs is summarized below.

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (person-rem/year)
x monetary equivalent of unit dose ($2000 per person-rem)
x present value conversion factor (10.76 based on a 20-year period
with a 7-percent discount rate)

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. Duke used the following expression when calculating the APE for the 20-year license renewal period:

APE = $\$2.20\times10^4$ x (Change in public exposure)

Averted Offsite Property Damage Costs (AOC)

For SAMAs that reduce CDF, the AOCs were calculated using the following formula:

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

Duke derived the values for averted offsite property damage costs based on information provided in Section 5.7.5 of NUREG/BR-0184 (NRC 1997b). A discount factor of 7 percent and a 4-percent rate of inflation were used. Duke used the following expression when calculating the AOC for the 20-year license renewal period:

AOC = $\$3.92\times10^9$ x (Change in annual CDF)

Originally, as part of the ER, Duke did not include the AOC for containment-related SAMAs. In response to staff RAIs (Duke 2002a), Duke incorporated AOC as follows.

For containment-related SAMAs (which impact population dose but not CDF), Duke estimated the combined AOC and APE costs based on a conversion factor of $3000/person-rem, which Duke attributed to NUREG/CR-6349 (NRC 1995b). Duke used the following expression when calculating these costs (for containment-related SAMAs) for the 20-year license renewal period:

AOC + APE = $\$3.23\times10^4$ x (Change in public exposure)

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor

Duke derived the values for averted occupational exposure based on information provided in Section 5.7.3 of NUREG/BR-0184 (NRC 1997b). Best estimate values provided for immediate occupational dose 33 person-Sv (3300 person-rem) and long-term occupational dose [200 person-Sv (20,000 person-rem) over a 10-year cleanup period] were used. The present value of these doses was calculated using the equations provided in NUREG/BR-0184 in conjunction with a monetary equivalent of unit dose of $2000 per person-rem, a discount rate of 7 percent, and a time period of 20 years to represent the license-renewal period. Duke used the following expression when calculating the AOE for the 20-year license renewal period:

AOE = $\$3.1\times10^8$ x (Change in annual CDF)

Averted Onsite Cleanup Costs (AOSC) (Not Including Replacement Power Costs)

The AOSCs, as calculated by Duke, include averted cleanup and decontamination costs. NUREG/BR-0184, Section 5.7.6.2 states that long-term replacement power costs must also be considered (NRC 1997b). Duke did not include this cost in the ER. However, Duke did add it in the responses (Duke 2002a) to the staff's RAIs.

Averted cleanup and decontamination costs (ACC) are calculated using the following formula:

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

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in NUREG/BR-0184 (NRC 1997b) as $\$1.5 \times 10^9$ (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. Duke used the following expression when calculating the ACC for the 20-year license renewal period:

$$ACC = \$1.18 \times 10^{10} \text{ x (Change in annual CDF)}$$

Averted Power Replacement Cost (APRC)

The Duke estimate of the annual power replacement cost for Catawba is based on an assumed discount rate of 7 percent for the 20-year license renewal period.

The estimated present power replacement costs of a severe accident occurring in each year of the license renewal period is given by (equation from NUREG/BR-0184, page 5.44):

$$PV_{RP} = [\$1.2 \times 10^8/0.07][1 - \exp(-0.07 \text{ x } 20)]^2$$

$$PV_{RP} = \$9.73 \times 10^8$$

Then, to estimate the net present value of power replacement over the 20-year license renewal (equation from NUREG/BR-0184, page 5.44):

$$U_{RP} = [PV_{RP}/0.07][1 - \exp(-0.07 \text{ x } 20)]^2$$

$$U_{RP} = \$7.89 \times 10^9$$

$$APRC = U_{RP} \text{ x (Change in annual CDF)}$$

Since the APRC from the NUREG is in 1990 dollars, an assumption is made to include a 4 percent inflation rate over 11 years to bring the value into 2001 dollars; therefore,

$$APRC = \$1.21 \times 10^{10} \text{ x (Change in annual CDF)}$$

Duke Results

The total benefit associated with each of the 14 SAMAs evaluated by Duke (six that reduce CDF and eight that improve containment performance) is provided in Tables 5-5 and 5-6. Two of the SAMAs have a positive net value (i.e., the total benefit is greater than the cost of the enhancement). These SAMAs involve installing a watertight wall around the 6900/4160 V transformers and installing back-up power to igniters and air-return fans. All of the remaining

SAMAs have a negative net value even given the bounding risk reduction benefits inherent in these estimates.

5.2.6.2 Staff Evaluation

The cost-benefit analysis provided by Duke (Duke 2001a; Duke 2002a) was based primarily on NRC's *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997b). In the original Catawba ER, Duke did not include averted replacement power costs for SAMAs that reduce CDF and averted offsite property damage costs for SAMAs that improve containment performance. However, the impact of these factors was included in supplemental analyses provided by Duke in response to the staff's RAIs (Duke 2002a; NRC 2002a). The APRC were assessed appropriately and the values calculated by Duke are consistent with independent staff assessments.

Duke used a conversion factor of $3,000/person-rem to determine the averted offsite property damage and APE costs. This effectively assumes a $1,000/person-rem conversion factor as a surrogate for averted offsite property damage, in addition to the accepted $2,000/person-rem conversion factor for averted offsite public exposure costs. Because offsite property damage costs are plant and site-specific, it would be more consistent with standard practice to actually calculate the property damage using the MACCS code. Nevertheless, the averted offsite costs values (for health effects and property damage) calculated by Duke provide reasonably good agreement with typical site values and are acceptable for purposes of estimating the value of containment-related SAMAs. Inclusion of averted replacement power and offsite property damage costs did not result in identification of any additional cost-beneficial SAMAs, and would not call into question Duke's decision to eliminate seismic SAMAs from consideration given the large costs associated with seismic SAMAs.

Based on the staff evaluation, two SAMAs (which involve installing a watertight wall around the 6900/4160 V transformers and installing back-up power to igniters and air-return fans) are potentially cost-beneficial and are discussed below. Several of the containment-related SAMAs (Table 5-6) have total benefits that are only slightly less than the estimated cost to implement the enhancement, specifically, installation of an independent containment spray system, a filtered containment vent system, and a containment inerting system. However, the estimated risk reduction in Table 5-6 is based on the bounding assumption that all early and late containment failures would be completely eliminated. Realistically, only a small fraction of the total risk would be eliminated by any one SAMA. Also, the cost to implement any of these three SAMAs would be substantially (i.e., a factor of 5) greater than $1 million, as each SAMA would involve a major hardware modification. Thus, these three SAMAs would not be cost-beneficial. All of the remaining SAMAs have costs that are at least a factor of two higher than the dollar equivalent of the associated benefits. This difference is considered to provide ample margin to cover uncertainties in the risk and cost estimates since estimates for these factors were generally evaluated in a conservative manner. This is true even when considering the 3-percent versus 7-percent discount rate sensitivity case or the use of a 40-year versus 20-year time period.

The positive net value of the watertight wall is due in part to the relatively large (approximately 24 percent) contribution of internal floods to total CDF. Duke assumed that the watertight wall would completely eliminate the turbine building flood initiators. The net value of this SAMA is approximately \$400,000 (the difference between the estimated benefit and estimated cost in Table 5-5). This value is based on risk reduction estimates derived from PRA Revision 2b, and is consistent with the NRC's *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997b): the value assumes a 7-percent discount rate and includes averted onsite costs and averted power replacement costs.

Duke (NRC 2002a) provided a revised risk reduction estimate for the watertight wall based on an updated PRA model which accounts for recently installed reactor coolant pump seals that use O-ring materials that perform better at high temperature. This plant modification is expected to reduce the probability of a reactor coolant pump seal LOCA following a loss of seal cooling. Since a large fraction of the core damage sequences initiated by the turbine building flood involve seal LOCAs, the modification will reduce the CDF contribution from the flood and the risk reduction associated with the watertight wall. Using the revised PRA model, Duke estimates that the watertight wall will provide a CDF reduction of 1.0×10^{-5} per year and a population dose reduction of 0.151 person-Sv (15.1 person-rem) per year.

Based on the revised risk reduction values, the watertight wall would have an estimated benefit of \$550,000 (positive net value of \$300,000). Use of a 3-percent discount rate would increase the net value to about \$500,000. If averted onsite costs and averted power replacement costs are neglected in the analysis, the estimated benefit would be approximately \$214,000 (negative net value of \$36,000). However, using either a 3-percent discount rate or 40-year time period, the net value would remain positive even when averted onsite costs and averted power replacement costs are neglected. Based on this information, the staff concludes that the installation of the watertight wall would be cost-beneficial. The need for additional evaluation and possible implementation of the watertight wall around the 6900/4160 V transformers will be addressed as a current operating plant issue. Duke has made a commitment to design and install flood protection around these transformers (Duke 2002c).

The positive net value of installing back-up power to igniters is due in part to the relatively high frequency of SBO events for Catawba (which account for 43 percent of the total CDF of 5.8×10^{-5} per year based on Revision 2b of the PRA), combined with the vulnerability of ice-condenser containments to hydrogen combustion in SBO events, as described in NUREG/CR-6427 (NRC 2000). This NUREG provided a simplified Level 2 analysis for the purpose of investigating the importance of direct containment heating (DCH). The NUREG found that early containment failure is dominated by hydrogen combustion events rather than DCH events and that no ice-condenser plant is inherently robust to all credible DCH or hydrogen combustion events in station blackout. The study concluded that all ice-condenser plants would benefit from reducing SBO frequency or from providing some means of hydrogen control that is effective in SBO events. It should be noted that the NUREG contains several assumptions that may be justified for purposes of dispositioning the DCH issue but are not necessarily consistent with the best-estimate philosophy of PRA (such as a bounding assumption that random ignition prior to vessel breach will not occur). Accordingly, the NUREG is useful for understanding the uncertainties associated with early containment failure probabilities, but should not be interpreted as providing a realistic or best-estimate evaluation of the potential for early containment failure as a result of hydrogen combustion during SBO events.

In light of the issues raised in NUREG/CR-6427 concerning the likelihood of early containment failure in SBO events, the staff requested Duke to provide a reevaluation of the benefits associated with the hydrogen control measures (install back-up power to igniters and air-return fans) assuming a containment response consistent with the findings in NUREG/CR-6427 (i.e., using the containment failure probabilities for DCH and non-DCH events reported in the study, in place of the conditional failure probabilities implicit in the baseline PRA). Under these assumptions, Duke estimated that the averted population dose from eliminating early containment failures would rise from a base case value of 0.073 person-Sv (7.3 person-rem) per year to 0.12 person-Sv (12.0 person-rem) per year. The benefit values based on use of the NUREG/CR-6427 containment failure probability for Catawba are reported in Table 5-7. Also shown are the benefit values for the sensitivity case involving use of a 3-percent discount rate instead of a 7-percent discount rate. All of the values in Table 5-7 include averted offsite property damage.

A number of points are worth noting regarding the Duke base case results and these sensitivity assessments:

- Not all early and late releases can be eliminated by providing hydrogen control. For example, late failures due to long-term containment over-pressure could still occur. Also, the non-safety related, non-seismic back-up power source may not be available in large seismic and tornado events if it is not designed to withstand such events. An upper bound estimate can be provided by assuming that all containment failures, early and late, would be eliminated. More realistically, most of the early and some of the late releases would be eliminated. The assumption that hydrogen control would eliminate all early failures is considered to provide a reasonable estimate of the risk reduction benefit. Accordingly, the estimated benefits shown in Table 5-7 are based on eliminating all early containment failures.

Table 5-7. Sensitivity Results for Hydrogen Control SAMAs
(all benefits based on eliminating early failures only)

SAMA	Estimated Cost (per unit)	Estimated Benefits for Hydrogen Control SAMAs Under Various Assumptions (per unit)		
		Based on Revision 2b of the PRA	Based on conditional containment failure probabilities from NUREG/CR-6427	Based on a 3% discount rate compared to a 7% discount rate in the base case
Back-up power to igniters and air-return fans	$540,000	$236,000	$387,000	$329,000
PARs	$750,000	$236,000	$387,000	$329,000
Back-up power to igniters only	$205,000	Duke: no benefit, since air-return fans are needed	Duke: no benefit, since air-return fans are needed	Duke: no benefit, since air-return fans are needed

- It is Duke's position that powering the igniters without also powering the air-return fans would not achieve effective hydrogen control. According to Duke, in order to realize the stated benefits, the air-return fans must also have a back-up power source. More than half of the cost of the SAMA to provide back-up power to igniters and air-return fans comes from powering the fans. Based on available technical information, it is not clear that operation of the air-return fans is necessary to provide effective hydrogen control. The need to also supply back-up power to the air-return fans is being further assessed by the NRC as part of the resolution of GSI-189. If only the igniters need to be powered during SBO, a less-expensive option of powering a subset of igniters from a back-up generator, addressed by Duke in responses to RAIs (Duke 2002a; NRC 2002a), is within the range of averted risk benefits and would warrant further consideration.

- If a 3-percent discount rate is assumed in contrast to the 7-percent discount rate assumed in the base case analysis, the SAMA is cost-beneficial if back-up power to the air-return fans is not needed. This further supports the position that the benefits are large and that a hydrogen-related SAMA may be cost-beneficial.

- 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 40-year rather than a 20-year period in the value analyses) is bounded by the sensitivity study that assumed a 3-percent discount rate.

The NRC has recognized that ice-condenser containments like Catawba's are vulnerable to hydrogen burns in the absence of power to the in-place hydrogen ignitor system. This is sufficiently important for all PWRs with ice-condenser containments that NRC has made the issue a Generic Safety Issue, GSI-189 - Susceptibility of Ice-Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident (NRC 2002b). As part of the resolution of GSI-189, NRC is evaluating potential improvements to hydrogen control provisions in ice-condenser plants to reduce their vulnerability to hydrogen-related containment failures in SBO. This will include an assessment of the costs and benefits of supplying igniters from alternate power sources, such as a back-up generator, as well as containment analyses to establish whether air-return fans also need an ac-independent power source, as part of this modification. The need for plant design and procedural changes will be resolved as part of GSI-189 and addressed for Catawba and other ice-condenser plants as a current operating license issue.

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 Catawba. As a result of this assessment, Duke concluded in the ER that no additional mitigation alternatives are cost-beneficial and warrant implementation at Catawba. Based on its review of SAMAs for Catawba, the staff concludes that two of the SAMAs are cost-beneficial under certain assumptions. These SAMAs involve installing a watertight wall around the 6900/4160 V transformers and providing back-up power to the hydrogen igniters for SBO events.

Based on the analyses presented, the staff concludes that installing a watertight wall around the transformer is cost-beneficial. However, as this SAMA does not relate to adequately managing the effects of aging during the period of extended operation, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54. The staff intends to pursue this matter as a current operating license issue. By letter dated August 8, 2002, Duke committed to designing and scheduling the installation of flood protection for the 6900/4160 V transformers (Duke 2002c).

Duke's position, regarding the SAMA that would establish hydrogen control in SBO events by providing back-up power to igniters, is that this SAMA is not cost-effective because back-up power would need to be supplied to the air-return fans from ac-independent power sources in order to ensure mixing of the containment atmosphere, and the cost of powering both the igniters and the air-return fans would exceed the expected benefit. However, based on available technical information, it is not clear that operation of air-return fans is necessary to provide effective hydrogen control. If only the igniters need to be powered during SBO, a less-expensive option of powering a subset of igniters from a back-up generator, addressed by Duke in responses to RAIs (Duke 2002a; NRC 2002a), is within the range of the averted risk benefits and would warrant further consideration. Even if air-return fans are judged to be necessary to ensure effective hydrogen control in SBOs, the results of sensitivity studies suggest that this combined SAMA might also be cost-beneficial.

The staff concludes that the SAMA that would establish hydrogen control in SBO events by providing back-up power to igniters is cost-beneficial under certain assumptions, which are being examined in connection with resolution of GSI-189. However, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54. The need for plant design and procedural changes will be resolved as part of GSI-189 and addressed for Catawba and all other ice-condenser plants as a current operating license issue.

5.3 References

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

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

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

10 CFR Part 100, Code of Federal Regulations, Title 10, *Energy*, Part 100, “Reactor Site Criteria.”

Duke Energy Corporation (Duke). 2001a. *Applicant’s Environmental Report–Operating License Renewal Stage Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. Probabilistic Risk Assessment Revision 2b, Catawba Nuclear Station, dated April 18, 2001.

Duke Energy Corporation (Duke). 2002a. Letter from M. S. Tuckman of Duke Energy Corporation to U.S. Nuclear Regulatory Commission. Subject: Response to Request for Additional Information in Support of the Staff Review of the Application to Renew The Facility Operating Licenses of McGuire Nuclear Station Units 1 and 2 and Catawba Nuclear Station Units 1 and 2, February 1, 2002.

Duke Energy Corporation (Duke). 2002b. Letter from M. S. Tuckman of Duke Energy Corporation to U.S. Nuclear Regulatory Commission. Subject: Response to Request for Additional Information in Support of the Staff Review of the Application to Renew The Facility Operating Licenses of McGuire Nuclear Station Units 1 and 2 and Catawba Nuclear Station Units 1 and 2, January 31, 2002.

Duke Energy Corporation (Duke). 2002c. Letter from Gary R. Peterson of Duke Power to U.S. Nuclear Regulatory Commission, Subject: Duke Energy Corporation, Catawba Nuclear Station, Units 1 and 2, Docket Numbers 50-413 and 50-414, Severe Accident Mitigation Alternatives, August 8, 2002.

Duke Power Company. 1992. Letter from M. S. Tuckman, (Duke) to Document Control Desk (NRC). Subject: Catawba Units 1 and 2 Individual Plant Examination (IPE) Submittal, dated September 10, 1992.

Duke Power Company. 1994. Letter from D. L. Rehn, (Duke) to Document Control Desk (NRC). Subject: Individual Plant Examination of External Events (IPEEE) Submittal, Catawba Nuclear Station, dated June 21, 1994.

U.S. Nuclear Regulatory Commission (NRC). 1988. Generic Letter 88-20, “Individual Plant Examination for Severe Accident Vulnerabilities,” November 23, 1988.

U.S. Nuclear Regulatory Commission (NRC). 1990. *Severe Accident Risks - An Assessment for Five U.S. Nuclear Power Plants*. NUREG-1150, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1991. "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," Supplement 4 to Generic Letter 88-20, June 28, 1991.

U.S. Nuclear Regulatory Commission (NRC). 1994. Letter from Robert E. Martin (NRC) to David L. Rehn (Duke Power Company), Subject: Safety Evaluation of Catawba Nuclear Station, Units 1 and 2, Individual Plant Examination (IPE) Submittal, June 7, 1994.

U.S. Nuclear Regulatory Commission (NRC). 1995a. *Final Environmental Statement Related to the Operation of Watts Bar Nuclear Plant Units 1 and 2*. NUREG-0498, Supplement 1. U.S. Nuclear Regulatory Commission, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1995b. *Cost-Benefit Considerations in Regulatory Analysis*. NUREG/CR-6349. U.S. Nuclear Regulatory Commission, Washington, D.C.

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

U.S. Nuclear Regulatory Commission (NRC). 1997a. *SECPOP90: Sector Population, Land Fraction, and Economic Estimation Program*. NUREG/CR-6525, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997b. *Regulatory Analysis Technical Evaluation Handbook*. NUREG/BR-0184, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997c. *Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance*. NUREG-1560, Washington, D.C.

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

U.S. Nuclear Regulatory Commission (NRC). 1999b. Letter from Peter S. Tam (NRC) to G. R. Peterson (Duke Energy Corporation), Subject: Catawba Nuclear Station–Review of Individual Plant Examination of External Events (IPEEE), April 12, 1999.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Assessment of the DCH Issue for Plants with Ice-Condenser Containments*. NUREG/CR-6427, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001. Letter from J. H. Wilson (NRC) to M. S. Tuckman (Duke Energy Corporation), Subject: Request for Additional Information Related to the Staff’s Review of the Severe Accident Mitigation Alternatives Analysis for Catawba Nuclear Station, Units 1 and 2, December 10, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2002a. Note to File from J. H. Wilson (NRC). Subject: Information Provided by Duke Energy Corporation Related to Severe Accident Mitigation Alternatives in its License Renewal Application for Catawba Nuclear Station, Units 1 and 2, March 14, 2002 (Accession No. ML020740179).

U.S. Nuclear Regulatory Commission (NRC). 2002b. Memorandum from F. Eltawila (NRC) to A. Thadani (NRC), Subject: Generic Issue Management Control System Report - First Quarter FY 2002, February 13, 2002.

U.S. Nuclear Regulatory Commission (NRC). 2002c. Note to file from A. Kugler (NRC). Subject: Information Provided by VEPCo in Relation to Severe Accident Mitigation Alternatives in Its License Renewal Application for the Surry Nuclear Power Station, Units 1 and 2, January 23, 2002 (Accession No. ML020250545).

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, 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 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 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 the issues that are related to the uranium fuel cycle and solid waste management during the license renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to the Catawba Nuclear Station, Units 1 and 2 (Catawba). The generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based, in part, on the generic impacts provided in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR 51.52(c),

---

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

Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." The GEIS also addresses the impacts from radon-222 and technetium-99.

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 Catawba from the uranium fuel cycle and solid waste management are listed in Table 6-1.

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

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

Duke Energy Corporation (Duke) stated in its Environmental Report (ER; Duke 2001) that it is not aware of any new and significant information associated with the renewal of the Catawba operating licenses (OLs). The staff has not identified significant new information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available information. 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 except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, as discussed below, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

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

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

  The staff has not identified any significant new information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts of the uranium fuel cycle (with regard to individual effects from other than the disposal of spent fuel and HLW) during the renewal term beyond those discussed in the GEIS.

- Offsite radiological impacts (collective effects). In the GEIS, the staff concluded that

  > The 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about 14,800 person rem [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 [National Environmental Policy Act] 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 Catawba ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

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

> For the high level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of 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 which 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 the Department of Energy in the "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980 [DOE 1980]. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a high level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of 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 [Environmental Protection Agency'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 1000 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.

Since the GEIS was originally issued in 1996, the U.S. Environmental Protection Agency (EPA) has published radiation protection standards for Yucca Mountain, Nevada, at 40 CFR Part 197, "Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada," on June 13, 2001 (66 FR 32132). The Energy Policy Act of 1992 (42 USC 10101 et seq) directed that the NRC adopt these standards into its regulations for reviewing and licensing the repository. The Commission published its regulations at 10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada," on November 2, 2001 (66 FR 55792). These standards include the following: (1) 0.15 mSv/year (15 mrem/year) dose limit for members of the public during the storage period prior to repository closure, (2) 0.15 mSv/year (15 mrem/year) dose limit for the reasonably maximally exposed individual for 10,000 years following disposal, (3) 0.15mSv/year (15 mrem/year) dose limit for the reasonably maximally exposed individual as a result of a human intrusion at or before 10,000 years after disposal, and (4) a groundwater protection standard that states for 10,000 years of undisturbed performance after disposal, radioactivity in a representative volume of groundwater will not exceed (a) 0.19 Bq/L (5 pCi/L) (radium-226 and radium-228), (b) 0.56 Bq/L (15 pCi/L) (gross alpha activity), and (c) 0.04 mSv/year (4 mrem/year) to the whole body or any organ (from combined beta and photon emitting radionuclides).

On February 15, 2002, subsequent to the receipt of a recommendation by the Secretary, Department of Energy, the President recommended the Yucca Mountain site for the development of a repository for the geologic disposal of spent nuclear fuel and high-level nuclear waste. The U.S. Congress approved this recommendation on July 9, 2002. This development does not represent new and significant information with respect to the offsite radiological impacts related to spent fuel and HLW disposal during the renewal term.

The staff has not identified any significant new information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts of the uranium fuel cycle with regard to spent fuel and HLW disposal 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 Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 on-site land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. 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 Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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.

- <u>Onsite spent fuel</u>. Based on information in the GEIS, the Commission found that

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

The staff has not identified any significant new information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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.

- <u>Nonradiological waste</u>. 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 staff has not identified any significant new information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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.

- <u>Transportation</u>. 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.

Catawba meets the fuel-enrichment and burnup conditions set forth in Addendum 1 to the GEIS. The staff has not identified any significant new information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no transportation impacts associated with license renewal beyond those discussed in the GEIS.

There are no Category 2 issues for the uranium fuel cycle and solid waste management.

6.2 References

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

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

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

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

40 CFR Part 197. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 197, "Public Health and Radiation Protection Standards for Yucca Mountain, Nevada."

Duke Energy Corporation (Duke). 2001. *Applicant's Environmental Report – Operating License Renewal Stage Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

Energy Policy Act of 1992, 42 USC 10101, et seq.

U.S. Department of Energy (DOE). 1980. *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste*. DOE/EIS 00046-G, Volumes 1-3, Washington, D.C.

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

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

7.0 Environmental Impacts of Decommissioning

Environmental issues associated with decommissioning, which result from continued plant operation during the renewal term, were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437 (NRC 1996, 1999)[a]. 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 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 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 Catawba Nuclear Station, Units 1 and 2 (Catawba).

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to Catawba decommissioning following the renewal term are listed in Table 7-1. Duke Energy Corporation (Duke) stated in its Environmental Report (ER; Duke 2001) that it is aware of no new and significant information regarding the environmental impacts of Catawba license renewal. The staff has not identified any new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues,

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

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
DECOMMISSIONING	
Radiation doses	7.3.1; 7.4
Waste management	7.3.2; 7.4
Air quality	7.3.3; 7.4
Water quality	7.3.4; 7.4
Ecological resources	7.3.5; 7.4
Socioeconomic impacts	7.3.7; 7.4

the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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 new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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 new and significant information during its independent review of the Catawba ER (Duke 2001), the staff's site visit, the scoping process, 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. Code of Federal Regulations, Title 10, *Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

Duke Energy Corporation (Duke). 2001. *Applicant's Environmental Report – Operating License Renewal Stage Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

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

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

8.0 Environmental Impacts of Alternatives to Operating License Renewal

This chapter examines the potential environmental impacts associated with denying the renewal of the operating licenses (OLs) (i.e., the no-action alternative); the potential environmental impacts from electric generating sources other than Catawba Nuclear Station, Units 1 and 2 (Catawba); the possibility of purchasing electric power from other sources to replace power generated by Catawba and the associated environmental impacts; the potential environmental impacts from a combination of generating and conservation measures; and other generation alternatives that were deemed unsuitable for replacement of power generated by Catawba. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance (i.e., SMALL, MODERATE, or LARGE) developed using the Council on Environmental Quality guidelines and set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

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

The impact categories evaluated in this chapter are the same as those used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999)[a] with the additional impact category of environmental justice.

8.1 No-Action Alternative

NRC's regulations (10 CFR Part 51, Subpart A, Appendix A) implementing the National Environmental Policy Act (NEPA) specify that the no-action alternative be discussed in an NRC environmental impact statement (EIS). For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the Catawba OLs, and Duke Energy Corporation (Duke) would then decommission both units when plant operations cease. Replacement of

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

Catawba's electricity generation capacity would be met by (1) demand-side management and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than Catawba, Units 1 and 2, or (4) some combination of these options.

Duke will be required to comply with NRC decommissioning requirements whether or not the OLs are renewed. If the Catawba OLs are renewed, decommissioning activities may be postponed for up to an additional 20 years. If the OLs are not renewed, Duke would conduct decommissioning activities according to the requirements in 10 CFR 50.82.

The environmental impacts associated with decommissioning under both license renewal and the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of this Supplemental Environmental Impact Statement (SEIS), and the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586 dated August 1988.[a] The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

The environmental impacts for the socioeconomic, historic and archaeological resources, and environmental justice impact categories are summarized in Table 8-1 and discussed in the following paragraphs. In some cases, impacts associated with the no-action alternative would be positive. For example, closure of Units 1 and 2 would eliminate any impingement and entrainment of fish and shellfish and any negative impacts resulting from thermal discharges to Lake Wylie.

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

Impact Category	Impact	Comment
Socioeconomic	SMALL to MODERATE	Decrease in employment, higher-paying jobs, and tax revenues
Historic and Archaeological Resources	SMALL	Land occupied by Units 1 and 2 would likely be retained by Duke
Environmental Justice	SMALL to MODERATE	Loss of employment opportunities and social programs

(a) The NRC staff is currently supplementing NUREG-0586 for reactor decommissioning. In October 2001, the staff issued supplement 1 to NUREG-0586 dealing with Decommissioning of Nuclear Power Reactors (NRC 2001a) for public comment. The staff is currently finalizing the Supplement for publication as a final document.

- Socioeconomic: When Catawba ceases operation, there will be a decrease in employment and tax revenues associated with the closure. Impacts on employment (primary and secondary) and population would occur over a wide area. Employees at Catawba reside in a number of counties in South and North Carolina. The majority live in York County, South Carolina (55 percent) and Gaston and Mecklenburg Counties, North Carolina (15 and 14 percent, respectively) (Duke 2001).

  Tax-related impacts would occur in York County and the town of Clover, which is within York County. In 2000, Duke paid property taxes for Catawba to York County in the amount of $35,861,194, or 21.9 percent of the real and personal property taxes paid in the county (see Table 2-17). Approximately 75 percent of the property taxes paid by Catawba are allocated in support of the Clover School District in York County.

  The no-action alternative would result in the loss of the taxes attributable to Catawba as well as the loss of plant payrolls 20 years earlier than if the OLs were renewed. Given the relatively large percentage of revenue in York County and the Clover School District derived from Catawba, the decline in property tax revenue would have a LARGE impact on the school district and SMALL to MODERATE impact on the county depending on future economic growth in the county. The ability of the two jurisdictions to provide public services and road maintenance (York County) and school services (Clover School District and to a lesser extent the remaining three school districts) would be adversely impacted.

  There would also be an adverse impact on housing values (probably concentrated in upper scale homes due to the higher salaries and wages paid by Catawba) and the York County economy if Catawba were to cease operations.

  Duke employees working at the Catawba site currently contribute time and money to community activities, including schools, churches, charities, and other civic activities. It is likely that with a reduced presence in the community following decommissioning, community involvement by Duke and its employees in the region would be less.

- Historic and Archaeological Resources: The potential for future adverse impacts to known or unrecorded cultural resources at the Catawba site following decommissioning will depend on the future use of the land occupied by the existing plant. Following decommissioning, the land occupied by the Catawba site probably would be retained by Duke for other corporate purposes. Eventual sale or transfer of the land occupied by Catawba, however, could result in adverse impacts to cultural resources if the land-use pattern were changed too dramatically. Catawba is located on Lake Wylie and is surrounded by upscale housing developments. Land use at the site could change to residential-housing use should Duke sell or transfer the site. However, given the site’s small size of approximately 158 ha (391 ac), of which 106 ha (262 ac) is nonforested and contains the generation and maintenance facilities, parking lots, open water, and roads and the fact that the site is free of significant archaeological and historical sites, the impacts of this alternative on historic and archaeological resources are considered SMALL.

- Environmental Justice: Current operations at Catawba have no disproportionate impacts on the minority and low-income populations of York County and the other counties surrounding the plant, and no environmental pathways have been identified that would cause disproportionate impacts on these populations. Closure of Catawba would result in decreased employment opportunities in York County and surrounding counties, thus tax revenues would decrease possibly leading to negative and disproportionate impacts on minority or low-income populations. Because Catawba is located in a relatively urban area with extensive employment opportunities, the environmental justice impacts under the no-action alternative are considered SMALL to MODERATE.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electric power to replace the power generated by Catawba, assuming that the OLs are not renewed. The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would be most likely to occur or to have the least environmental impacts. The following generation alternatives are considered in detail:

- coal-fired generation at the Catawba site and at an alternate greenfield site[a] (Section 8.2.1)

- natural-gas-fired generation at the Catawba site and at an alternate greenfield site (Section 8.2.2)

- nuclear generation at the Catawba site and at an alternate greenfield site (Section 8.2.3).

The alternative of purchasing power from other sources to replace power generated at Catawba is discussed in Section 8.2.4. Other power generation and conservation alternatives considered by the staff and found not to be reasonable replacements for Catawba are discussed in Section 8.2.5. Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

(a) A greenfield site is assumed to be an undeveloped site with no previous construction.

Each year the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an annual energy outlook. The latest report, *Annual Energy Outlook 2002 with Projections to 2020,* was issued in December 2001 (DOE/EIA 2001a). In this report, EIA projects that combined-cycle[a] or combustion turbine technology fueled by natural gas is likely to account for approximately 88 percent of new electric generating capacity between the years 2000 and 2020. Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[b] requirements. Coal-fired plants are projected by EIA to account for approximately 9 percent of new capacity during this period. Coal-fired plants are generally used to meet baseload requirements. Renewable energy sources, primarily wind, geothermal, and municipal solid waste units, are projected by EIA to account for the remaining 3 percent of capacity additions. EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants are projected by EIA to have the lowest generation cost in 2005 through 2020, followed by coal-fired plants and then wind generation (DOE/EIA 2001a).

EIA projects that oil-fired plants will account for very little of new generation capacity in the United States during the 2000 to 2020 time period because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). However, oil as a back-up fuel to natural-gas-fired generation (combined cycle) is considered.

EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States during the 2000 to 2020 time period because natural gas and coal-fired plants are projected to be more economical (DOE/EIA 2001a). In spite of this projection, a new nuclear plant alternative for replacing power generated by Catawba is considered in Section 8.2.3. Since 1997, the NRC has certified three new standard designs for nuclear power plants under the procedures in 10 CFR Part 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR Part 52, Appendix A), the System 80+ Design (10 CFR Part 52, Appendix B), and the AP600 Design (10 CFR Part 52, Appendix C). The submission to the NRC of these three applications for certification indicates continuing interest in the possibility of licensing new nuclear power plants. NRC has established a New Reactor Licensing Project Office to prepare for and manage future reactor and site licensing applications (NRC 2001b).

(a) In a combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

(b) A baseload plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for baseload generation (i.e., these units generally run near full load).

8.2.1 Coal-Fired Generation

The coal-fired alternative is analyzed for both the Catawba site and an alternate greenfield site. The staff assumed the construction of four 600 megawatt electric (MW[e]) units, which is consistent with the Catawba Environmental Report (ER; Duke 2001). This assumption will slightly overstate the impacts of replacing the 2258 MW(e) generated by Catawba.

Coal and lime or limestone for a coal-fired plant sited at Catawba most likely would be delivered by railroad via the existing rail line. Lime[(a)] or limestone is used in the scrubbing process for control of sulfur dioxide (SO_2) emissions. Rail delivery also would be the most likely option for delivering coal and lime/limestone to an alternate greenfield site for the coal-fired plant. A coal slurry pipeline is also a technically feasible delivery option; however, the associated cost and environmental impacts make a slurry pipeline an unlikely transportation alternative. Construction at an alternate site could necessitate the construction of a new transmission line to connect to existing lines and a rail spur to the plant site.

The coal-fired plant is assumed to utilize tangentially fired, dry-bottom boilers and consume bituminous, pulverized coal with an ash content of approximately 10 percent by weight (Duke 2001). Annual coal consumption would be approximately 5.76 million MT/yr (6.35 million tons/yr) (Duke 2001). The Catawba ER (Duke 2001) assumes a heat rate[(b)] of 2.7 J fuel/J electricity (9364 Btu/kWh) and a capacity factor[(c)] of 0.8. After combustion, 99.9 percent of the ash (approximately 572,000 MT/yr [630,000 tons/yr]) would be collected and disposed of at the plant site. In addition, approximately 304,000 MT/yr (335,000 tons/yr) of scrubber sludge would be disposed of at the plant site (Duke 2001).

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the Catawba ER (Duke 2001). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only up to an additional 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant).

(a) In a typical wet scrubber, lime (calcium hydroxide) or limestone (calcium carbonate) is injected as a slurry into the hot effluent combustion gases to remove entrained sulfur dioxide. The lime-based scrubbing solution reacts with sulfur dioxide to form calcium sulfite which precipitates and is removed in sludge form.

(b) Heat rate is a measure of generating station thermal efficiency. In English units, it is generally expressed in British thermal units (Btu) per net kilowatt-hour (kWh). It is computed by dividing the total Btu content of fuel burned for electric generation by the resulting net kWh generation.

(c) The capacity factor is the ratio of electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

8.2.1.1 Closed-Cycle Cooling System

For purposes of this SEIS, the staff assumed that a coal-fired plant located at Catawba would use the existing closed-cycle cooling system. The staff also assumed that an alternate greenfield site would use a closed-cycle cooling system.

The overall impacts of the coal-fired generating system are discussed in the following sections and summarized in Table 8-2. The extent of impacts at an alternate greenfield site would depend on the location of the particular site selected.

Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation at Catawba and an Alternate Greenfield Site Using Closed-Cycle Cooling

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE to LARGE	Use of unused portion of Catawba site plus additional offsite, undisturbed land would be needed. Additional offsite land impacts for coal and limestone mining. Degree of impact depends on characteristics of land being converted: MODERATE for a previously disturbed site; LARGE for an undisturbed site.	SMALL to LARGE	Uses up to 700 ha (1700 ac) for plant infrastructure and waste disposal; additional land impacts for coal and limestone mining; possible impacts for transmission line and rail spur. Degree of impact dependent on whether alternate site is previously disturbed: SMALL to MODERATE for a previously disturbed site; LARGE for a greenfield site.
Ecology	MODERATE to LARGE	Uses undeveloped areas at Catawba plus significant amount of previously undisturbed offsite land. Potential for habitat loss and fragmentation and reduced productivity and biological diversity.	SMALL to LARGE	Impact depends on whether site is previously developed (SMALL) or greenfield (MODERATE to LARGE). Factors to consider include location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Surface Water Use and Quality	SMALL	Closed-cycle cooling would use existing intake structures; surface water use should remain the same as current uses for Catawba.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body; new intake structures required.

Table 8-2. (contd)

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Groundwater Use and Quality	SMALL	Less groundwater withdrawn for potable use because of smaller workforce.	SMALL to LARGE	Impacts SMALL if groundwater used only for potable water; MODERATE to LARGE if groundwater used as makeup cooling water (impacts would be site/aquifer specific).
Air Quality	MODERATE	Sulfur oxides • 5757 MT (6346 tons/yr) Nitrogen oxides • 7196 MT/yr (7932 tons/yr) Particulates • 288 MT/yr (317 tons/yr) of total suspended particulates which would include 192 MT/yr (212 tons/yr) of PM_{10} Carbon monoxide • 1439 MT/yr (1586 tons/yr) Small amounts of mercury and other hazardous air pollutants and naturally occurring radioactive materials – mainly uranium and thorium.	MODERATE	Potentially same impacts as the Catawba site, although pollution control standards may vary.
Waste	MODERATE	Total waste volume would be approximately 907,300 MT/yr (1 million tons/yr) of ash, spent catalyst, and scrubber sludge requiring approximately 227 ha (560 ac) for disposal during the 40-year life of the plant.	MODERATE	Same impacts as Catawba site; waste disposal constraints may vary.
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.	SMALL	Same impact as Catawba site.

Table 8-2. (contd)

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Socio-economics	SMALL to LARGE	During construction, impacts would be SMALL to MODERATE. Up to 2500 workers during the peak of the 5-year construction period, followed by reduction from current Catawba work-force of 1218 to 250. Tax base preserved. Impacts during operation would be SMALL.	SMALL to LARGE	Construction impacts depend on location, but could be SMALL to LARGE. If plant is located in a rural area impacts could be LARGE. Tax impacts on receiving county could be SMALL to LARGE. York County would experience loss of Catawba tax base and employment with potentially MODERATE to LARGE impacts. Impact to Clover School District (York County) would be LARGE. Impacts during operation would be SMALL.
		Transportation impacts of commuting operating personnel would be SMALL due to a smaller workforce. Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts associated with train trips to and from the plant would be MODERATE to LARGE.		Transportation impacts during operation would be SMALL to MODERATE. Transportation impacts associated with construction workers could be MODERATE to LARGE. For rail transportation of coal and lime/limestone, the impact is considered SMALL to MODERATE. For barge transportation, the impact is considered SMALL.
Aesthetics	MODERATE	MODERATE aesthetic impact. Exhaust stacks and stack emissions visible from offsite, would impact residential developments around Lake Wylie. Rail transportation of coal and lime/limestone would have a MODERATE aesthetic impact. Noise impact from plant operations would be MODERATE. Mechanical noise associated with coal handling and plant operation would be audible offsite.	SMALL to LARGE	Impact would depend on the site selected and the surrounding land features and could be LARGE if a greenfield site was selected. If needed, a new transmission line or rail spur would add to the aesthetic impact. Rail transportation impact of coal and lime/limestone would be SMALL to MODERATE, again depending on the characteristics of the alternate site. Barge transportation of coal and lime/limestone would have a SMALL aesthetic impact. Noise impact from plant operations would be MODERATE.

Table 8-2. (contd)

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Historic and Archaeological Resources	SMALL	Some construction would affect previously developed parts of the Catawba site; cultural resource inventory should minimize any impacts on undeveloped lands. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on undeveloped land for cultural resources at the existing site.	SMALL	Alternate location would necessitate cultural resource studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on undeveloped sites for cultural resources.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 968 operating jobs at Catawba could reduce employment prospects for minority and low-income populations. Impacts dependent on the economic vitality and expansion of Charlotte and surrounding area, including York County.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup at site. Could be SMALL to LARGE. York County would lose tax revenue and 673 jobs with SMALL to MODERATE impacts. Clover School District (York County) would be significantly impacted, which may have a MODERATE to LARGE impact on minority and low-income populations.

- **Land Use**

  The existing facilities and infrastructure at the Catawba site would be used to the extent practicable. Specifically, the staff assumed that the coal-fired replacement plant alternative would use the existing closed-cycle cooling system, switchyard, offices, and transmission line rights-of-way. Additional land beyond the current Catawba site of 158 ha (391 ac) would be needed to construct a new coal-fired plant while the existing nuclear units continue to operate. In the GEIS (NRC 1996), the staff estimated that approximately 700 ha (1700 ac) would be needed to construct a 1000-MW(e) coal plant at a greenfield site. If a coal-fired station with a capacity of more than 2200 MW(e) were built while the nuclear units were still in operation, the use/conversion of more land than is available at the Catawba site would be required.

The coal-fired generation alternative would require converting a significant quantity of land to industrial use for the plant, coal storage, and landfill disposal of ash, spent selective catalytic reduction catalyst (used for control of nitrogen oxide emissions), and scrubber sludge. It is unlikely that there would be enough land within the present boundary of the existing Catawba site for landfill disposal of all waste products. Disposal of scrubber sludge, alone, over a 40-year plant life would require approximately 227 ha (560 ac) (Duke 2001). Additional land-use changes would occur offsite in an undetermined coal-mining area to supply fuel for the plant. In the GEIS, the staff estimated that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing of the waste to support a 1000-MW(e) coal plant during its operational life (NRC 1996).

A replacement coal-fired plant for Catawba Units 1 and 2 would have a total generating capacity of 2400 MW(e) and would affect proportionately more land. Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Catawba Units 1 and 2. In the GEIS, the staff estimated that approximately 405 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant (NRC 1996).

If the assumption is made that 700 ha (1700 ac) would be enough to accommodate the expansion and addition of four 600-MW(e) coal fired units at the Catawba site while Units 1 and 2 are still in operation and then decommissioned, then an impact on previously undisturbed lands could occur (Duke 2001). The degree of impact would be dependent on the characteristics of the land being converted. The impact of a coal-fired generating unit on land use at the Catawba site is best characterized as MODERATE to LARGE. The impact would definitely be greater than the OL-renewal alternative.

In the GEIS, the staff estimates that a 1000-MW(e) coal-fired plant would require approximately 700 ha (1700 ac) (NRC 1996). For an alternate greenfield site, Duke believes that 700 ha (1700 ac) is a sufficient size to accommodate a 2400-MW(e), coal-fired generation plant (Duke 2001). Land at the site would be used for an ash and sludge waste area. Additional land could be needed for a transmission line and for a rail spur to the plant site, depending on the infrastructure in existence at the alternate site. This alternative would result in SMALL to LARGE land-use impacts, depending on whether the alternate site had been developed previously or not and what new infrastructure might be required.

- **Ecology**

Locating a coal-fired plant at the Catawba site would alter ecological resources because of the need to convert most of the currently unused land to industrial use for the plant, coal storage, and ash and scrubber sludge disposal. However, some of this land would have been previously disturbed. Additional offsite, undisturbed land amounting to 405 ha

(1000 ac) would need to be converted to industrial use for the plant, coal storage, and ash and scrubber sludge disposal (Duke 2001). Use of the existing closed-cycle cooling and intake/ discharge system would limit operational impacts on the aquatic ecosystem. There could be potential habitat loss and fragmentation, and reduced productivity and biological diversity could result from disturbing previously undisturbed land.

Siting a coal-fired plant at Catawba would have a MODERATE to LARGE ecological impact that would be greater than renewal of the OLs.

At an alternate greenfield site, the coal-fired generation alternative would introduce construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts may alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of makeup cooling water from a nearby surface water body could have adverse aquatic resource impacts. If needed, construction and maintenance of a transmission line and a rail spur would have ecological impacts. Overall, the ecological impacts are dependent on whether a site had been previously developed (SMALL) or an undeveloped greenfield site (MODERATE to LARGE impact).

- **Water Use and Quality**

Surface water. The coal-fired generation alternative at the Catawba site is assumed to use a closed-cycle cooling system, which would minimize incremental water use and quality impacts (Duke 2001). Surface water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

For a coal-fired plant located at an alternate site, the staff assumed that a closed-cycle cooling system would be employed (Duke 2001). New intake structures to provide water needs for the facility would have to be constructed. Impacts would be dependent on the volume of water withdrawn for makeup relative to the amount of water available from the intake source and the characteristics of the surface water. Plant discharges would comply with all appropriate permits (Duke 2001). Some erosion and sedimentation would likely occur during construction (NRC 1996). The overall impacts are characterized as SMALL to MODERATE.

Groundwater. The staff assumed that a coal-fired plant located at the Catawba site would follow the current practice of obtaining cooling and service water from Lake Wylie and potable water from the Rock Hill Utilities Department (Duke 2001). The three groundwater wells that supply limited specific uses at the Catawba site probably would continue to be used. The overall impacts are characterized as SMALL.

Use of groundwater for cooling at a coal-fired plant located at an alternate site is a possibility. Consumptive use is estimated by Duke to be less than 1.5 m^3/s (52.2 cfs), which is based on the evaporation rates at Catawba's existing once-through cooling system (Duke 2001). Groundwater withdrawal at an alternate site may require a permit from the appropriate State agency.[a] The impacts of withdrawal for the coal-fired plant on the aquifer would be site specific and dependent on aquifer recharge and other withdrawals. The overall impacts could be SMALL to LARGE.

- **Air Quality**

The air-quality impacts of coal-fired generation vary considerably from those of nuclear generation due to emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x), particulates, carbon monoxide, and hazardous air pollutants such as mercury, and naturally occurring radioactive materials.

The Catawba site is located in the Metropolitan Charlotte Interstate Air Quality Control Region (40 CFR 81.75). This region is designated as in attainment or unclassified for all criteria pollutants in 40 CFR 81.334.[b] However, the county is at risk as being classified as nonattainment regarding ozone in the future, pending implementation of a new 8-hour standard.

A new coal-fired generating plant located at the Catawba site would likely need a prevention of significant deterioration (PSD) permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR Part 60, Subpart Da. The standards establish limits for particulate matter and opacity (40 CFR 60.42a), SO_2 (40 CFR 60.43a), and NO_x (40 CFR 60.44a). Obtaining air permits for construction of a conventional coal-fired plant potentially could require emission offsets from other Duke generating facilities.

The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR Part 51 Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified

---

(a) Any withdrawal of water in South Carolina that exceeds approximately 0.004 m^3/sec (0.007 cfs) must be reported to South Carolina Department of Health and Environmental Control (SCDHEC). If the well is located in Beaufort, Jasper, Georgetown, Horry, or Colleton counties, it must be permitted. (Personal communication with Charles Williams, Geologist, Bureau of Water (SCDHEC), December 19, 2001.

(b) Existing criteria pollutants under the Clean Air Act are ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen oxide. Ambient air quality standards for criteria pollutants are set out at 40 CFR Part 50.

under the Clean Air Act. As previously mentioned, York County is classified as attainment or unclassified for criteria pollutants, except ozone.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. EPA issued a new regional haze rule on July 1, 1999 cited in the *Federal Register* (FR) as 64 FR 35714 (EPA 1999). The rule specifies that for each mandatory Class I Federal area located within a state, the state must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least impaired days over the same period (40 CFR 51.308(d)(1)).

South Carolina has only one area (Cape Romaine Wildlife Area) designated in 40 CFR 81.426 as a mandatory Class I Federal area in which visibility is an important value. There are more Class I areas in the region of the North Carolina-Tennessee border in the Smoky Mountains. None of these Class I areas are within 80 km (50 mi) of the Catawba site.

In 1998, EPA issued a rule requiring 22 eastern states, including South Carolina, to revise their state implementation plans to reduce NO_x emissions. Nitrogen oxide emissions contribute to violations of the national ambient air quality standard for ozone. The total amount of NO_x that can be emitted by each of the 22 states in the year 2007 ozone season (May 1 to September 30) is specified in 40 CFR 51.121(e). For South Carolina, the amount is 111,656 MT (123,105 tons). Any new coal-fired plant sited in South Carolina would be subject to this limitation. For North Carolina, the amount is 149,708 MT (165,022 tons).

Impacts for particular pollutants are as follows:

<u>Sulfur oxides</u>. Duke states in the Catawba ER that an alternative coal-fired plant located at the Catawba site would use wet scrubber technology utilizing lime/limestone for flue gas desulfurization (Duke 2001).

A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO_2

emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new coal-fired power plant would not add to net regional SO_2 emissions, although it might do so locally. Regardless, SO_2 emissions would be greater for the coal alternative than the OL renewal alternative.

Duke estimates that, by using the best technology to minimize SO_2 emissions, the total annual stack emissions from a coal-fired plant would be approximately 5757 MT (6346 tons) of SO_2 (Duke 2001).

Nitrogen oxides. Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for SO_2 emissions is not used for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants specified in 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 and cited as 63 FR 49442 (EPA 1998), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_2) in excess of 200 ng/J of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

Duke estimates that by using low-NO_x burners with overfire air and selective catalytic reduction, the total annual NO_x emissions for a new coal-fired power plant would be approximately 7196 MT (7932 tons) (Duke 2001). This level of NO_x emissions would be greater than the OL renewal alternative.

Particulates. Duke estimates that the total annual stack emissions would include 288 MT (317 tons) of filterable total suspended particulates (particulates that range in size from less than 0.1 micrometer (μm) up to approximately 45 μm). The 288 MT would include 192 MT (212 tons) of PM_{10} (particulate matter having an aerodynamic diameter less than or equal to 10 μm). Fabric filters or electrostatic precipitators would be used for particulate control (Duke 2001). In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the OL renewal alternative.

Fugitive dust would be generated during construction of a coal-fired plant. In addition, exhaust emissions would come from vehicles and motorized equipment used during construction.

Carbon monoxide. Duke estimates that the total carbon monoxide emissions would be approximately 1439 MT (1586 tons) per year (Duke 2001). This level of emissions is greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, EPA issued regulatory findings (65 FR 79825) on emissions of hazardous air pollutants from electric utility steam generating units (EPA 2000a). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000a). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA, also found that (1) there is a link between coal use and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000a). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000a).

Uranium and thorium. Coal contains uranium and thorium. Uranium concentrations are generally in the range of 1 to 10 parts per million. Thorium concentrations are generally about 2.5 times greater than uranium concentrations (Gabbard 1993). One estimate is that a typical coal-fired plant released roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium in 1982 (Gabbard 1993). The population dose equivalent from the uranium and thorium releases and daughter products produced by the decay of these isotopes has been calculated to be significantly higher than that from nuclear power plants (Gabbard 1993).

Carbon Dioxide. A coal-fired plant also would have unregulated carbon dioxide emissions that could contribute to global warming.

Summary. The GEIS analysis did not quantify emissions from coal-fired power plants, but implied that air impacts would be substantial. The analysis in the GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO_x and NO_x emissions as potential impacts (NRC 1996). Adverse human health effects, such as cancer and emphysema, have been associated with the products of coal combustion. The appropriate characterization of air impacts from coal-fired generation would be MODERATE. The impacts would be clearly noticeable, but would not destabilize air quality.

Siting a coal-fired generation plant at a site other than Catawba would not significantly change air-quality impacts, although it could result in installing more or less stringent pollution-control equipment to meet applicable local requirements. Therefore, the impacts are deemed similar to those utilizing the existing Catawba site, or MODERATE.

- **Waste**

  Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalysts, and scrubber sludge. Four 600-MW(e) coal-fired plants would generate approximately 907,300 MT (1 million tons) of this waste annually. The waste would be disposed of onsite, accounting for approximately 227 ha (560 ac) of land area over the 40-year plant life. There would not be sufficient space on the existing Catawba site for disposal of this quantity of waste. Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs. Disposal of the 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 could be available for other uses. Construction-related debris will also be generated during construction activities.

  In May 2000, EPA issued a "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels" cited as 65 FR 32214 (EPA 2000b). EPA concluded that some form of national regulation is warranted to address coal combustion waste products because (1) the composition of these wastes could present danger to human health and the environment under certain conditions; (2) EPA has identified 11 documented cases of proven damages to human health and the environment by improper management of these wastes in landfills and surface impoundments; (3) present disposal practices are such that, in 1995, these wastes were being managed in 40 to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and (4) gaps in State oversight of coal combustion wastes have been identified. Accordingly, EPA announced its intention to issue regulations for disposal of coal combustion waste under subtitle D of the Resource Conservation and Recovery Act (RCRA).

  For all of the preceding reasons, the appropriate characterization of impacts from waste generated from burning coal is MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

  Siting the coal fired plant at a site other than Catawba 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 exposes workers to risks from coal and limestone mining, worker and public risks from coal and lime/limestone transportation, worker and public risks from disposal of coal combustion wastes, and public risks from inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

In the GEIS, the staff stated that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates from coal-fired plants, but did not identify the significance of these impacts (NRC 1996). In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993).

Regulatory agencies, including EPA and State agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal are characterized as SMALL.

- **Socioeconomics**

Construction of the coal-fired alternative would take approximately 5 years. The staff assumed that construction would take place while the Catawba nuclear units continue operation and would be completed by the time Units 1 and 2 permanently cease operations. The workforce would be expected to vary between 1200 and 2500 workers during the 5-year construction period (NRC 1996). These workers would be in addition to the 1218 workers currently employed at the Catawba site. During construction of the new coal-fired plant, communities near Catawba would experience demands on housing and public services that could have SMALL to MODERATE impacts. These impacts would be tempered because Catawba is in an urban area and workers could commute to the site from many communities. Nearby communities to Catawba would be impacted by the loss of the construction jobs once construction is completed. Duke estimates that the completed coal plant would employ approximately 250 workers (Duke 2001).

If the coal-fired replacement plant were constructed at the Catawba site and Units 1 and 2 were decommissioned, there would be a loss of 968 permanent high-paying jobs (1218 for the two nuclear units down to 250 for the coal-fired plant), with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. These impacts may be offset by nearness to the Charlotte metropolitan area and the overall economic growth taking place in York County. The coal-fired plant would provide a new tax base to offset the loss of tax base associated with decommissioning of the nuclear units. For all of these reasons, the appropriate characterization of nontransportation socioeconomic impacts for operating a coal-fired plant constructed at the Catawba site is considered SMALL.

Construction of a replacement coal-fired power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. York County, and particularly the Clover School District, would bear the brunt of Catawba operational job losses and would lose a large amount of its tax base. These losses could have potentially SMALL to MODERATE socioeconomic impacts to the county but LARGE impacts to the Clover School District. Communities around the new site would have to absorb the impacts of a large, temporary workforce (up to 2500 workers at the peak of construction) and a permanent workforce of approximately 250 workers. In the GEIS, the staff stated that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction workforce would need to move to the area to work (NRC 1996). Alternate sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at a rural site could be MODERATE to LARGE, depending on the relative location of the site to towns and cities which might be able to accommodate such impacts.

For transportation related to commuting of plant operating personnel, the impacts are considered SMALL. The maximum number of plant operating personnel would be approximately 250 compared to the current commuting workforce of 1218. Therefore, traffic impacts associated with plant personnel commuting to a coal-fired plant would be expected to be SMALL compared to the current impacts from Catawba operations.

However, during the 5-year construction period of the replacement coal-fired units, up to 2500 construction workers would be working at the site in addition to the 1218 workers currently at the Catawba site. The addition of these workers could place significant traffic loads on existing highways near the Catawba site. Such impacts would be MODERATE to LARGE.

Coal and lime/limestone would likely be delivered to the Catawba site by trains of approximately 115 cars each on the site's rail spur. Each open-top rail car holds about 90 MT (100 tons) of coal. Additional rail cars would be needed for lime/limestone delivery. In all, approximately 550 trains per year would deliver the coal and lime/limestone for the 4 coal-fired units. An average of roughly 22 train trips per week would occur, because for each full train delivery, there would be an empty return train. On several days per week, there could be three trains per day using the rail spur to the site. Socioeconomic impacts associated with rail transportation, such as delays at rail crossings, would likely be MODERATE to LARGE.

Transportation-related impacts associated with commuting construction workers at an alternate site are site dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but can be characterized as SMALL to MODERATE due to a smaller workforce.

At an alternate site, coal and lime/limestone would likely be delivered by rail, although barge delivery is feasible for an alternate coastal location. Socioeconomic impacts associated with rail transportation would likely be SMALL in a rural area and MODERATE in a more crowded suburban area.

- **Aesthetics**

The four coal-fired power plant units could be as much as 60 m (200 ft) tall and would be visible in daylight hours over many miles. The four exhaust stacks would be as much as 185 m (600 ft) high (Duke 2001). The stacks would likely be highly visible in daylight hours for distances up to 16 km (10 mi). Emissions from the stack would be a factor not present with the current nuclear units. The new stacks, and the associated stack emissions, would have a significant impact for the Lake Wylie community surrounding the Catawba site.

The plant units and associated stacks would also be visible at night because of outside lighting. The Federal Aviation Administration (FAA) generally requires that all structures exceeding an overall height of 61 m (200 ft) above ground level have markings and/or lighting so as not to impair aviation safety (FAA 2000). Visual impacts of a new coal-fired plant could be mitigated by landscaping and color selection for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting, provided the lighting meets FAA requirements, and appropriate use of shielding. Overall, the addition of the coal-fired units and the associated exhaust stacks at the Catawba site would have a MODERATE aesthetic impact.

Coal-fired generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operations are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to existing Catawba operations are considered to be MODERATE.

At an alternate site, there would be an aesthetic impact from the buildings and exhaust stacks. This impact could be LARGE if a greenfield site is selected. There would also be an aesthetic impact if a new transmission line and/or rail spur is needed. Noise impacts associated with rail delivery of coal and lime/limestone would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. In a more suburban location, the impacts are considered MODERATE. This is due to the frequency of train transport, the fact than many people are likely to be within hearing distance of the rail route, and the impacts of noise on residents in the vicinity of the facility and rail line. At a more rural location, the impacts could be SMALL. Noise and light from the plant would be detectable offsite. Noise associated with barge transportation of coal and lime/limestone would be SMALL. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities. Overall the aesthetic impacts associated with locating at an alternate site can be categorized as SMALL to LARGE, depending on the characteristics of the site.

- **Historic and Archaeological Resources**

At the Catawba site, or an alternate site, a cultural resource inventory would likely be needed for any property that has not been previously surveyed. Other lands acquired to support the existing Catawba site would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Catawba site or at an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission line rights-of-way, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL for both the existing Catawba site (and land purchased to support the site) or at an alternate greenfield site.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the Catawba site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of Catawba Units 1 and 2 would result in a decrease in employment of approximately 968 operating employees. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, Catawba is located in an urban area with many employment possibilities. Overall, impacts are expected to be SMALL to MODERATE.

Impacts at other sites would depend upon the site chosen and the nearby population distribution. If a replacement coal-fired plant were constructed at an alternate site, York County, and in particular the Clover School District, would experience a loss of tax revenue that could affect their ability to provide services and programs. York County would also lose 673 jobs. These impacts would be SMALL to MODERATE for York County and MODERATE to LARGE for the Clover School District. Impacts at the alternate site would vary between SMALL to LARGE, depending on the population makeup and distribution and the economy.

8.2.1.2 Once-Through Cooling System

This section discusses the environmental impacts of constructing a coal-fired generation system at an alternate site using a once-through cooling system. The impacts (SMALL, MODERATE, or LARGE) of this option are the same as the impacts for a coal-fired plant using the closed-cycle cooling system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-3 summarizes the incremental differences.

Table 8-3. Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Greenfield Site with Once-Through Cooling

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	Reservoir or other sufficient cooling source required
Ecology	Impact dependent on ecology at the site
Surface Water Use and Quality	Increased water withdrawal and more thermal load on receiving body of water
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Elimination of cooling towers
Historic and Archaeological Resources	No change
Environmental Justice	No change

8.2.2 Oil and Natural-Gas-Fired (Combined Cycle)

The environmental impacts of the oil and natural-gas-fired alternative are examined in this section for both the Catawba site and an alternate site[(a)]. For this alternative, Duke considered two variations on the natural gas theme: (1) an oil and natural gas combined-cycle and (2) natural gas alone in a combined-cycle plant.

The staff reviewed the environmental impacts of each option described in the Catawba ER and independently verified Duke's conclusions. The staff decided to report on its findings for the oil and natural gas (combined-cycle) option because the environmental and socioeconomic impacts of both options are almost identical. Two exceptions were identified. The first exception is the oil storage tank, which would be needed at either the Catawba site or the alternate site. The second exception is the need to construct an oil pipeline to the Catawba site. Whether an oil pipeline would be required at an alternate site would depend on the characteristics and infrastructure at the site.

For the Catawba site, the staff assumed that the plant would use the closed-cycle cooling system. The plant would consist of five 482-MW(e) combined-cycle units to replace the current power generated by Units 1 and 2. The total generation from the replacement power source would be 2410 MW(e) and, as such, would slightly overestimate the impacts from an exact replacement of Catawba's 2258 MW(e) generating capacity (Duke 2001).

The Catawba site is not located near a natural gas pipeline capable of supplying the quantities of gas required to operate the new gas-fired units. The nearest interstate pipeline is located 26 km (16 mi) from the site. However, a new pipeline would likely be needed to supply the gas capacities required for a replacement baseload gas-fired plant located at Catawba (Duke 2001).

If a new natural-gas-fired plant were built elsewhere to replace Catawba, a new transmission line may be needed to connect to existing lines. In addition, construction or upgrade of a natural gas pipeline from the plant to a supply point where an adequate and reliable supply of gas would be available also may be required. One potential source of natural gas is liquefied natural gas (LNG) imported to either the Cove Point facility in Maryland or the Elba Island facility in Georgia. Both facilities are expected to be reactivated in 2002 (DOE/ EIA 2001a).

(a) Duke does not consider fuel oil a viable, stand-alone fuel because it is not price-competitive when natural gas is readily available. Duke views the fuel oil option as an emergency, backup fuel source during the winter season and is likely to ensure adequate fuel supplies, especially where baseload generation is required (Duke 2001). As such, Duke does not consider the air emissions from fuel oil in their analysis. Aesthetics and other potential impacts from oil transmission lines and oil storage are considered.

LNG imported to either facility would need to be vaporized and transported to the South Carolina location via pipeline.

It is assumed that a replacement natural-gas-fired plant would use combined-cycle combustion turbines (Duke 2001). The following assumptions are made for the oil and natural-gas-fired plants (Duke 2001):

- five 482-MW(e) units, each consisting of two 172-MW combustion turbines and a 138-MW heat recovery boiler
- natural gas with an average heating value of 56 MJ/kg (23,882 Btu/lb) as the primary fuel
- use of low-sulfur No. 2 fuel oil as backup fuel
- heat rate of 2 J fuel/J electricity (6,800 Btu/kWh)
- capacity factor of 0.8
- gas consumption of 3.2 billion m^3/yr (113 billion ft^3/yr).

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.2 are from the Catawba ER (Duke 2001). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only up to an additional 20 years, the impact of operating the natural-gas-fired alternative for 40 years is considered a reasonable projection of the operating life of the plant.

8.2.2.1 Closed-Cycle Cooling System

The overall impacts of the combined-cycle fuel oil/natural-gas-generating system are discussed in the following sections and summarized in Table 8-4. The extent of impacts at an alternate site will depend on the location of the particular site selected.

- **Land Use**

  The Catawba site is adequate to support a combined-cycle facility (Duke 2001). For siting at Catawba, existing facilities and infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required. Specifically, the staff assumed that the oil/natural-gas-fired replacement plant alternative would use the existing closed-cycle cooling system, switchyard, offices, and transmission line rights-of-way.

Table 8-4. Summary of Environmental Impacts of Oil and Natural-Gas-Fired Generation at Catawba and an Alternate Greenfield Site Using a Closed-Cycle Cooling System

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	Catawba site sufficient to accommodate new plant. Use existing infrastructure to maximum extent possible. Construction of both oil and gas pipelines required. Up to 235 ha (582 ac) potentially disturbed for each right-of-way. Impacts would be less if pipelines are constructed in existing rights-of-way.	MODERATE to LARGE	81 ha (200 ac) for power-block, offices, roads, switchyard, and parking areas required. Additional land (up to 1500 ha [3600 ac]) possibly impacted for transmission line, oil and natural-gas pipelines, and rail spur. Use of previously undeveloped greenfield site increases impacts.
Ecology	SMALL to MODERATE	Uses undeveloped areas at Catawba site plus land for a new oil and gas pipeline.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and possible transmission and oil/gas pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity. Undeveloped greenfield site may increase impacts.
Water Use and Quality (Surface Water)	SMALL	Uses existing closed-cycle cooling system including existing intake and discharge structures. Surface water use should be less than current uses at Catawba, Units 1 and 2.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body. New intake and discharge structures required.

Table 8-4. (contd)

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Water Use and Quality (Groundwater)	SMALL	Less groundwater withdrawn for potable use because of smaller workforce.	SMALL to LARGE	Impacts SMALL if groundwater used only for potable purposes; MODERATE to LARGE if groundwater employed as makeup cooling water. Impacts would be site/aquifer specific.
Air Quality	MODERATE	Sulfur oxides • 31 MT/yr (34 tons/yr) Nitrogen oxides • 469 MT/yr (517 tons/yr) Carbon monoxide • 437 MT/yr (482 tons/yr) PM_{10} particulates • 260 MT/yr (287 tons/yr) Some hazardous air pollutants.	MODERATE	Potential impacts are the same as for the Catawba site, although pollution control standards may vary.
Waste	SMALL	Minimal waste products from fuel combustion.	SMALL	Minimal waste products from fuel combustion. Impacts from combustion of No. 2 fuel oil as a backup are considered SMALL.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.

Table 8-4. (contd)

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Socio-economics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 800 additional workers during the peak of the 2- to 3-year construction period, followed by reduction from the current 1218 Catawba workforce to 150. Tax base preserved. Impacts during operation would be SMALL to MODERATE, due to loss of employment in York County, which may be offset by proximity to Charlotte economy. Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be MODERATE. Up to 800 additional workers during the peak of the 2- to 3-year construction period in addition to workers currently employed at Catawba.	SMALL to LARGE	Impacts depend on site characteristics. During construction, impacts would be SMALL to MODERATE. Tax impacts on receiving county could be SMALL to LARGE. Up to 800 additional workers during the peak of the 3-year construction period. York County would experience loss of Catawba tax base and employment with potentially MODERATE to LARGE impacts. Clover School District in York County would be significantly impacted. Transportation impacts associated with construction workers would be SMALL to LARGE and would be dependent on population density and road infrastructure at alternate site. Impacts during operation would be SMALL due to smaller workforce.

Table 8-4. (contd)

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Aesthetics	SMALL to MODERATE	Lake Wylie area impacted. SMALL to MODERATE aesthetic impact from plant and stacks, fuel oil storage tanks, lighting, and mechanical noise associated with operation.	SMALL to LARGE	SMALL if previously developed site and site disturbance minimal. Impacts increased to strongly MODERATE with construction of a transmission line and oil/gas pipeline to previously developed site. LARGE impact if a greenfield site used.
Historic and Archaeological Resources	SMALL	Any potential impacts can be effectively managed.	SMALL	Same as Catawba site; any potential impacts can be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction. Loss of 1016 operating jobs at Catawba could reduce employment prospects for minority and low-income populations. Nearness to Charlotte economic area may mitigate impacts.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup at site could be SMALL to LARGE. York County would lose tax revenue and jobs, which could have a MODERATE impact. Impact on Clover School District would be LARGE. Nearness to Charlotte economic area may mitigate impacts.

Additional land-use impacts could come from gas and oil construction rights-of-way. Up to 235 ha (582 ac) could be potentially disturbed for each right-of-way. The nearest trunk oil line is 24 km (15 mi) from the Catawba site. The nearest interstate gas pipeline is located 26 km (16 mi) from the Catawba site. Land-use impacts from the construction of the pipelines are considered SMALL to MODERATE and would depend on whether the pipelines can use existing rights-of-way or not. If new land has to be disturbed, then the impacts could be MODERATE.

For construction at an alternate site, Duke assumed that less than 81 ha (200 ac) would be needed for the plant and associated infrastructure (Duke 2001). Additional land could be impacted for construction of a transmission line and natural gas and oil pipelines to serve the plant. In the GEIS, the staff estimates that approximately 1500 ha (3600 ac) would be needed for a 1000 MW(e) plant (NRC 1996). As reported by Duke in the Catawba ER (Duke 2001), “the environmental impacts of providing both gas and fuel oil for a very large baseload facility would be substantial.” If legislation requiring reduction of CO_2 levels were passed, conversion of combustion facilities to natural gas would be required to meet the new standards. Natural gas may not be available in the quantities that would be required to offset CO_2 emissions from coal-fired-gas generation. The present interstate natural gas pipeline system in the Duke service area is not capable of supporting the quantities of gas required by this size station operating at 90 percent capacity factor.

Selection of a greenfield site also would increase the impact of the new facility. Partially offsetting these offsite land use requirements would be the elimination of the need for uranium mining to supply fuel for Catawba Units 1 and 2. In the GEIS, the staff estimates that approximately 400 ha (1000 ac) would be affected for mining and processing the uranium during the operating life of a 1000 MW(e) nuclear power plant (NRC 1996). Overall, land-use impacts at an alternate location would be MODERATE to LARGE.

- **Ecology**

At the Catawba site, there would be ecological, land-related impacts for siting of the gas-fired plant; however, the impacts would be SMALL considering the smaller footprint of the new facility (compared to the existing nuclear facilities) and the fact that land at the site is previously disturbed. Significant ecological impacts could be associated with bringing a new underground gas and oil pipeline to the Catawba site. Impacts could include wildlife habitat loss and reduced productivity, and habitat fragmentation and local reduction in biological diversity. The degree of impact would depend on where and how the pipelines are constructed and the ecological state of the areas through which the pipelines traverse (e.g., existing or new rights-of-way, above or belowground). Potential impacts are rated SMALL to MODERATE.

Ecological impacts at an alternate site would depend on the nature of the land converted for the plant and the possible need for a new transmission line and oil and gas pipelines. Construction of a transmission line and an oil and gas pipeline to serve the plant would be expected to have temporary ecological impacts. Ecological impacts are the same as with the existing Catawba site and could be exacerbated if threatened or endangered species were involved. A previously undisturbed greenfield site may only heighten the impacts. At an alternate site, the cooling water intake and discharge could have aquatic resource impacts. Overall, the ecological impacts of this alternative are considered MODERATE to LARGE.

- **Water Use and Quality**

Surface water. The gas-fired generation alternative at the Catawba site is assumed to use a closed-cycle cooling system, which would minimize incremental water use and quality impacts (Duke 2001). Modifications to meet EPA requirements for altered cooling systems would be undertaken. Water requirements for combined-cycle generation are much less than for conventional steam electric generators, and evaporation from combined cycle cooling towers would be less than from the existing Catawba nuclear units (Duke 2001). There also would be sediment impacts to adjacent waters during construction. Surface water impacts are expected to remain SMALL.

For a gas-fired plant located at an alternate site, it is assumed that a closed-cycle cooling system would be employed (Duke 2001). New intake structures to provide water needs for the facility would need to be constructed. Impacts would be dependent on the volume of water withdrawn for makeup relative to the amount of water available from the intake source and the characteristics of the surface water. Plant discharges would comply with all appropriate permits (Duke 2001). Some erosion and sedimentation probably would occur during construction (NRC 1996). The overall impacts to surface water quality are characterized as SMALL to MODERATE.

Groundwater. The staff assumed that a gas-fired plant located at Catawba would follow the current practice of obtaining cooling and service water from Lake Wylie and potable water from the Rock Hill Utilities Department (Duke 2001). The three groundwater wells that supply limited special uses at the Catawba site probably would continue to be used. The overall impacts are characterized as SMALL.

A natural-gas-fired plant at an alternate site may use groundwater. Consumptive use is estimated by Duke to be considerably less than the 63,515 m^3/day (16.8 mgd), which is based on the evaporation rates at Catawba's existing cooling system for conventional steam electric generation (Duke 2001). Groundwater withdrawal at an alternate site may require a State permit. The impacts of such a withdrawal rate on an aquifer would be site specific and dependent on the recharge rate and other withdrawal rates from the aquifer. The overall impacts could be SMALL to LARGE.

- **Air Quality**

Natural gas is a relatively clean-burning fuel. The gas-fired alternative would release similar types of emissions, but in lesser quantities than the coal-fired alternative. Hence, it would be subject to the same type of air quality regulations as a coal-fired plant.

A new gas-fired generating plant located at Catawba would likely need a PSD permit and an operating permit under the Clean Air Act. A new combined-cycle, natural-gas power plant would also be subject to the new source performance standards for such units at 40 CFR Part 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x. York County is at risk of being in ozone nonattainment. Obtaining air permits for construction of a combined-cycle plant would potentially require emission offsets from other Duke generating facilities.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. On July 1, 1999, the EPA issued a new regional haze rule (64 FR 35714) (EPA 1999). The rule specifies that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). If a natural-gas-fired plant were located close to a mandatory Class I area, additional air pollution control requirements could be imposed. However, the closest mandatory Class I Federal areas to the Catawba site are the Linville Gorge Wilderness Area located approximately 145 km (90 mi) northwest, the Shining Rock Wilderness Area located approximately 283 km (175 mi) west, and the Great Smoky Mountains National park located approximately 310 km (193 mi) west (40 CFR 81.422).

In 1998, the EPA issued a rule requiring 22 eastern states, including South Carolina, to revise their state implementation plans to reduce nitrogen oxide emissions. Nitrogen oxide emissions contribute to violations of the national ambient air quality standard for ozone (40 CFR 50.9). The total amount of nitrogen oxides which can be emitted by each of the 22 states in the year 2007 ozone season (May 1 through September 30) is set out at 40 CFR 51.121(e). For North Carolina, the amount is 149,708 MT (165,022 tons) and for South Carolina, the amount is 111,674 MT (123,105 tons). Any new natural-gas-fired plant sited in North Carolina or South Carolina would be subject to these limitations.

Duke projects the following emissions for the natural-gas-fired alternative (Duke 2001):

- sulfur oxides - 31 MT/yr (34 tons/yr)
- nitrogen oxides - 469 MT/yr (517 tons/yr)
- carbon monoxide - 437 MT/yr (482 tons/yr)
- PM_{10} particulates - 260 MT/yr (287 tons/yr).

A natural-gas-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming.

In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000a). Natural-gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel (EPA 2000a). Unlike coal and oil-fired plants, EPA did not determine that regulation of emissions of hazardous air pollutants from natural-gas-fired power plants should be regulated under Section 112 of the Clean Air Act.

Construction activities would result in temporary fugitive dust. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process.

The preceding emissions would likely be the same at the Catawba site or at an alternate site. Impacts from the above emissions would be clearly noticeable but would not be sufficient to destabilize air resources as a whole. The overall air-quality impact for a new oil/natural-gas-fired generating plant sited at Catawba or at an alternate site is considered MODERATE.

- **Waste**

A small amount of solid waste (i.e., ash), will result from burning natural gas fuel. Duke expects to produce approximately 42 m^3 (1500 ft^3) of spent SCR catalyst used for NO_X control (Duke 2001). In the GEIS, the staff concluded that waste generation from gas-fired technology would be minimal (NRC 1996). Gas firing results in very few combustion by-products because of the clean nature of the fuel. Waste generation at an operating gas-fired plant would be largely limited to typical office wastes. Construction-related debris would also be generated during construction activities. Overall, the waste impacts would be SMALL for a natural-gas-fired plant sited at the Catawba site or at an alternate site; impacts would be so minor that they would not noticeably alter any important resource attribute.

In the winter, it may become necessary for the replacement baseload natural-gas-fired plant to operate on fuel oil due to lack of gas supply. Combustion of No. 2 fuel oil generates minimal waste products. Overall, the waste impacts associated with fuel oil combustion at a combined cycle plant are expected to be SMALL as well.

- **Human Health**

In the GEIS, the staff identified cancer and emphysema as potential health risks from gas-fired plants (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contributes to health risks. NO_x emissions from the plant would be regulated by the SCDHEC or comparable agency in another state. Human health effects are not expected to be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural-gas-fired alternative sited at the Catawba site or at an alternate site are considered SMALL.

- **Socioeconomics**

Construction of an oil and natural-gas-fired plant would take approximately 2 to 3 years. Peak employment could be as many as 800 workers (Duke 2001). The staff assumed that construction would take place while Catawba Units 1 and 2 continue operation and would be completed by the time they permanently cease operations. During construction, the communities immediately surrounding the Catawba site would experience demands on housing and public services that could have SMALL to MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from cities and towns comprising the Charlotte metropolitan area. After construction, the communities would be impacted by the loss of jobs. The current Catawba workforce (1218 workers) would decline through the decommissioning period to a minimal maintenance size. The new natural-gas-fired plant would replace the nuclear plant tax base at Catawba in York County. Approximately 1068 jobs would be lost because only 150 workers would be needed to operate the gas plant. The impacts would be SMALL to MODERATE and could be moderated by Catawba's location in the economically prosperous Charlotte area.

At an alternate or greenfield site, construction would take approximately 2 to 3 years, take place while the existing nuclear plant continued operation, and would be completed by the time the Catawba nuclear units cease operations (Duke 2001). The size of the construction and operational personnel remain the same as at the Catawba site. Siting at an alternate site would result in the loss of tax revenue and employment in York County with potentially MODERATE to LARGE socioeconomic impacts. Impacts to the Clover School District in York County would be particularly significant. Socioeconomic impacts from locating the facilities at an alternate site would be dependent on the characteristics of the site. Impacts of construction could range between SMALL to MODERATE. Impacts during plant operation would be SMALL (fewer employees) and the tax impacts could be SMALL to LARGE, depending on the relative proportion of taxes paid by the plant to total county taxes at the new location. In the GEIS (NRC 1996), the staff concluded that socioeconomic impacts from constructing a natural-gas-fired plant would not be very noticeable and that the small operational workforce would have the lowest socioeconomic impacts of any nonrenewable technology. Compared to the coal-fired and nuclear alternatives, socioeconomic impacts would be mitigated by the smaller size of the construction workforce, the shorter construction time frame, and the smaller size of the operational workforce.

Overall, socioeconomic impacts resulting from construction of a natural-gas-fired plant at the Catawba site would be SMALL to MODERATE, and may be offset by the continued growth of the economy in the Charlotte and surrounding area. For construction at an alternate site, socioeconomic impacts would be SMALL to LARGE, depending on the characteristics of the alternate site.

Transportation impacts associated with construction and operating personnel commuting to the Catawba site would be SMALL to MODERATE. The impacts can be classified as SMALL to LARGE for siting at an alternate site and would be dependent on the characteristics of the alternate site, including transportation infrastructure.

- **Aesthetics**

The five power plant units with their stacks (approximately 60-m [200-ft] tall) would be visible for several miles in the vicinity of Lake Wylie. Visual impacts from stack emissions also would be present. Fuel oil storage tanks also would be visible offsite, and noise and light from the plant would be detectable offsite (Duke 2001). Construction of the required gas and oil pipelines would also contribute to aesthetic impacts. At the Catawba site, these impacts would result in a SMALL to MODERATE aesthetic impact.

At an alternate site, the buildings and stacks could be visible offsite. Aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities. Overall, the aesthetic impacts associated with a replacement natural-gas-fired plant at an alternate site are categorized as SMALL. The impacts would be greater if new transmission lines and oil/gas pipelines had to be constructed to the alternate site. These impacts are considered MODERATE. The impacts could be LARGE if a greenfield site is developed.

- **Historic and Archaeological Resources**

At both the Catawba site and at an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been surveyed previously. Other lands, if any, that are acquired to support the plant also would likely need an inventory of field cultural resources, an identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the Catawba plant site.

Before construction at an alternate site, similar studies would likely be needed and undertaken. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated rights-of-way where new construction would occur (e.g., roads, transmission lines, pipeline, or other rights-of-way). Hence, impacts to cultural resources can be effectively managed under current laws and regulations and kept SMALL at either the existing Catawba site or at an alternative site.

- **Environmental Justice**

  No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural-gas-fired plant were built at the Catawba site. Some impacts on housing availability and prices during construction might occur in York County, which could disproportionately affect minority and low-income populations. Closure of Catawba would result in a decrease in employment of approximately 1068 permanent operating employees at the site. Resulting economic conditions could reduce employment prospects for minority or low-income populations in York County. The impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs in the county or nearby Charlotte. Overall, impacts are expected to be SMALL to MODERATE.

  Impacts at an alternate site would depend upon the site chosen and the nearby population distribution. Low-income and minority populations at the alternate site could benefit from the plant's relocation, through improvements in job prospects and increased tax base enabling more services to be provided to these populations. These impacts could be SMALL to LARGE. However, if a replacement natural-gas-fired plant were constructed at an alternate site, York County would experience a loss of property tax revenue, as well as approximately 670 jobs of Catawba workers living in the county. This could affect the county's ability to provide services and programs. The Clover School District would experience a significant loss of tax revenue that could affect their ability to provide services and programs to low-income and minority children. Impacts to minority and low-income populations in York County could be MODERATE to LARGE, again potentially offset by other economic growth in the area not related to Catawba.

8.2.2.2 Once-Through Cooling System

This section discusses the environmental impacts of constructing a natural-gas-fired generation system at an alternate location using a once-through cooling system. The impacts (SMALL, MODERATE, or LARGE) of this option are the same as the impacts for a natural-gas-fired plant using closed-cycle cooling. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8.5 summarizes the incremental differences.

Table 8-5. Summary of Environmental Impacts of Oil and Natural-Gas-Fired Generation at an Alternate Site with a Once-Through Cooling System

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	Reservoir or other sufficient cooling source required
Ecology	Impact would depend on ecology at the site
Surface Water Use and Quality	Increased water withdrawal and higher thermal load on receiving body of water
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Elimination of cooling towers
Historic and Archaeological Resources	No change
Environmental Justice	No change

8.2.3 Nuclear Power Generation

Since 1997, the NRC has certified three new standard designs for nuclear power plants under 10 CFR Part 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR Part 52, Appendix A), the System 80+ Design (10 CFR Part 52, Appendix B), and the AP600 Design (10 CFR Part 52, Appendix C). All of these plants are light-water reactors. Although no applications for a construction permit or a combined license based on these certified designs have been submitted to NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants. In addition, recent escalation in prices of natural gas and electricity have made new nuclear power plant construction more attractive from a cost standpoint. Consequently, construction of a new nuclear power plant at the Catawba site using the existing closed-cycle cooling system and at an alternate site using both closed- and open-cycle cooling are considered in this section. The staff assumed that the new nuclear plant would have a 40-year lifetime.

NRC has summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs sited at Catawba or an alternate site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect replacement of Catawba, Units 1 and 2, which have a total capacity of 2258 MW(e). The environmental impacts associated with transporting fuel and waste to and from a light-water cooled nuclear power reactor are summarized in Table S-4 of

10 CFR 51.52. The summary of NRC's findings on NEPA issues for license renewal of nuclear power plants in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, is relevant also, although not directly applicable, for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using closed-cycle cooling is presented in Section 8.2.3.1 and using once-through cooling in Section 8.2.3.2.

8.2.3.1 Closed-Cycle Cooling System

The overall impacts of the nuclear generating system are discussed in the following sections. The impacts are summarized in Table 8-6. The extent of impacts at an alternate site will depend on the location of the particular site selected.

- **Land Use**

  The existing facilities and infrastructure at the Catawba site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that a replacement nuclear power plant would use the existing cooling system, switchyard, offices, and transmission line rights-of-way. A replacement nuclear power plant at Catawba would require approximately 200 ha (500 ac) of new land some of which may be previously underdeveloped land. Additional land beyond the current Catawba site boundary may be needed to construct a new nuclear power plant while the existing Units 1 and 2 continue to operate.

  There would be no net change in land needed for uranium mining because land needed for the new nuclear plant would offset land needed to supply uranium for fuel for the existing Catawba reactors.

  The impact of a replacement nuclear generating plant adjacent to the existing Catawba site is best characterized as SMALL to MODERATE. The impact would be greater than the OL renewal alternative.

  Land-use requirements at an alternate greenfield site would be approximately 200 to 400 ha (500 to 1000 ac) plus the possible need for a new transmission line (NRC 1996). In addition, it may be necessary to construct a rail spur to an alternate site to deliver equipment during construction. Depending on new transmission line routing, siting a new nuclear plant at an alternate site could result in MODERATE to LARGE land-use impacts, and probably would be LARGE for a previously undisturbed greenfield site.

Table 8-6. Summary of Environmental Impacts of New Nuclear Generation at Catawba and at an Alternate Greenfield Site Using Closed-Cycle Cooling

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	Requires approximately 200 ha (500 ac) for the plant.	MODERATE to LARGE	Requires approximately 200 to 400 ha (500 to 1000 ac) for the plant. Possible additional land if a new transmission line is needed. MODERATE impact for previously disturbed alternate site; LARGE impact for a greenfield site.
Ecology	MODERATE	Uses undeveloped areas at current Catawba site plus additional offsite land. Potential habitat loss and fragmentation and reduced productivity and biological diversity on offsite land.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality (Surface Water)	SMALL	Uses existing closed-cycle cooling system.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality (Groundwater)	SMALL	Total water usage similar to current Catawba use.	SMALL to LARGE	Impacts SMALL if groundwater used only for potable purposes; MODERATE to LARGE if groundwater employed as makeup cooling water. Impacts would be site/aquifer specific.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amount of emissions from diesel generators and possibly other sources during operation. Emissions are similar to current releases from Catawba.	SMALL	Same impacts as at Catawba.

Table 8-6. (contd)

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as at Catawba.
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Appendix B, Table B-1.	SMALL	Same impacts as at Catawba.
Socioeconomics	SMALL to LARGE	During construction, impacts would be SMALL to MODERATE. Up to 2500 workers during the peak of the 5-year construction period. Operating workforce assumed to be similar to Catawba. Tax base preserved. Transportation impacts associated with construction and ongoing operation of Catawba could be MODERATE to LARGE. Transportation impacts of commuting plant operating personnel considered SMALL.	SMALL to LARGE	Construction impacts depend on location. Impacts at a rural, greenfield location could be LARGE. York County would experience loss of tax base and employment with MODERATE to LARGE impacts, possibly offset by economic growth in the Charlotte metropolitan area. Transportation impacts associated with comuting construction workers could be MODERATE to LARGE. Impacts during operation would be SMALL to MODERATE.
Aesthetics	SMALL	No exhaust stacks or cooling towers would be needed. Daytime visual impact could be mitigated by landscaping and appropriate color selection for buildings. Visual impact at night could be mitigated by reduced use of lighting and appropriate shielding. Noise impacts would be relatively small and could be mitigated.	SMALL to LARGE	Impacts would depend on the characteristics of the alternate site. Impacts would be SMALL if the plant is located adjacent to an industrial area. New transmission lines would add to the impacts and could be MODERATE. If a greenfield site is selected, the impacts could be LARGE.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be managed effectively.	SMALL	Any potential impacts can likely be managed effectively.

Table 8-6. (contd)

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Environmental Justice	SMALL	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction.	SMALL to LARGE	Impacts will vary depending on population distribution and makeup at the site. Impacts to minority and low-income residents of York County associated with closure of Catawba could be MODERATE to LARGE. Impacts to receiving County is site specific and could range from SMALL to LARGE.

- **Ecology**

  Locating a replacement nuclear power plant at the Catawba site would alter ecological resources because of the need to convert additional land to industrial use. Potential habitat loss and fragmentation and reduced productivity and biological diversity could result. Some of this land, however, may have been previously disturbed. Siting at the Catawba site would have a MODERATE ecological impact that would be greater than renewal of the OLs for the existing reactors.

  At an alternate site, there would be construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts could alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of cooling makeup water from a nearby surface water body could have adverse impacts on aquatic resources. Construction and maintenance of a new transmission line could also have ecological impacts. Overall, the ecological impacts at an alternate site would be MODERATE to LARGE.

- **Water Use and Quality**

  <u>Surface water</u>. A replacement nuclear plant alternative at the Catawba site would most likely use the existing closed-cycle cooling system. Thus, the environmental impacts would be similar to the existing Catawba nuclear units. For a new nuclear plant, water makeup requirements due to evaporative losses in the cooling towers would be comparable to that currently experienced at Catawba (Duke 2001). There would be sediment impacts to adjacent waters during construction. Surface water impacts are expected to remain

SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

For a replacement nuclear plant located at an alternate site, the staff assumed that a closed-cycle cooling system would be employed (Duke 2001). New intake structures to provide water needs for the facility would need to be constructed. Impacts would depend on the volume of water withdrawn for makeup relative to the amount of water available from the intake source and the characteristics of the surface water. Plant discharges would comply with all appropriate permits (Duke 2001). Some erosion and sedimentation would likely occur during construction (NRC 1996). The overall impacts are characterized as SMALL to MODERATE.

Groundwater. The staff assumed that a replacement nuclear plant located at Catawba would follow the current practice of obtaining cooling and service water from Lake Wylie and potable water from the Rock Hill Utilities Department (Duke 2001). The three groundwater wells that supply limited special uses at the Catawba site would also likely continue to be used. The overall impacts to groundwater are characterized as SMALL.

A nuclear power plant sited at an alternative site may use groundwater. Consumptive use is estimated by Duke to be 63,500 m^3/day (16.8 mgd), which is based on the evaporation rates at Catawba's existing cooling system (Duke 2001) for conventional steam electric generation. Groundwater withdrawal at an alternate site may require a permit from the SCDHEC or comparable agency in another state. The impacts of such a withdrawal rate on an aquifer would be site specific and dependent on aquifer recharge and other withdrawal rates from the aquifer. The overall impacts could be SMALL to LARGE.

- **Air Quality**

Construction of a new nuclear plant sited at the Catawba or alternate site would result in fugitive emissions during the construction process. Exhaust emissions also would come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with diesel generators. Emissions would be regulated by the SCDHEC or comparable agency in another state. Overall, emissions and associated impacts are considered SMALL.

- **Waste**

The waste impacts associated with operation of a nuclear power plant are set out in Table B-1 of 10 CFR Part 51 Subpart A, Appendix B, Table B-1. Construction-related debris generated during construction activities would be removed to an appropriate disposal site. Overall, impacts from waste are considered to be SMALL.

Siting the replacement nuclear power plant at a site other than Catawba would not alter waste generation. Therefore, the impacts for that alternative also would be SMALL.

- **Human Health**

Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51 Subpart A, Appendix B, Table B-1. Overall, human health impacts are considered SMALL.

Siting the replacement nuclear power plant at a site other than Catawba would not alter human health impacts. Therefore, the impacts would be SMALL.

- **Socioeconomics**

The construction period and the peak workforce associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). The staff assumed that in the absence of quantified data, a construction period of 5 years and a peak of workers of 2500 would be employed. This workforce would be in addition to the 1218 individuals already employed at the plant. The staff assumed that construction would take place while the existing Catawba units continue operation and would be completed by the time the existing units permanently cease operations. During construction, the communities surrounding the Catawba site would experience demands on housing and public services that could have SMALL to MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from the cities and towns comprising the Charlotte metropolitan area. After construction, the communities would be impacted by the loss of the construction jobs.

Alternate plant sites would need to be analyzed on a case-by-case basis. In the GEIS (NRC 1996), the staff noted that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction workforce would need to move to the area to work. Construction of a replacement nuclear power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. York County would still experience the impact of Catawba operational job loss and loss of tax base, and the communities around the new site would have to absorb the impacts of a large, temporary workforce (up to 2500 workers at the peak of construction) and a permanent workforce of up to 1218 workers. For the Clover School District (York County), the socioeconomic impacts could be MODERATE to LARGE. The socioeconomic impacts to the county at the alternate location could be SMALL to LARGE depending on the degree of economic development, the proportion of the County's property tax base represented by the new plant, etc.

During the 5-year construction period, up to 2500 construction workers would be working at the Catawba site in addition to the 1218 workers already employed there. The addition of the construction workers could place significant traffic loads on existing highways, particularly those leading to the site. Such impacts would be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would be similar to current impacts associated with operation of the existing reactors and are considered SMALL.

Transportation-related impacts associated with commuting construction workers at an alternate location are site dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but can be characterized as SMALL to MODERATE.

- **Aesthetics**

The containment buildings for a replacement nuclear power plant and other associated buildings sited at Catawba would likely be visible in daylight hours over many miles. Visual impacts could be mitigated by landscaping and by selecting a building color that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. No exhaust stacks would be needed. Cooling towers would be visible assuming a closed-cycle cooling system is used.

Noise inputs from operations at a replacement nuclear power plant potentially could be heard offsite under calm wind conditions or when the wind is blowing in the direction of the listener. Mitigation measures, such as reduced or non-use of outside loudspeakers, can be employed to reduce the noise level and keep the impact SMALL.

At an alternate site, there would be an aesthetic impact from the buildings. There would also be a significant aesthetic impact if a new transmission line is needed. Noise and light from the plant would be detectable offsite. The impact of noise and light would be mitigated if the plant is located in an industrial area adjacent to other power plants, or industrial facilities, in which case the impact is SMALL. The impact could be MODERATE if a transmission line needs to be built to the alternate site. The impact could be LARGE if a greenfield site is selected.

- **Historic and Archaeological Resources**

At both the Catawba site and an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Catawba site or another site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated line corridors where new construction would occur (e.g., roads, transmission line rights-of-way, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement nuclear plant were built at the Catawba site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. However, this situation is expected to be mitigated by Catawba's proximity to Charlotte. After completion of construction, it is possible that the ability of the local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for the minority and low-income populations. However, the economic health of York County and the Clover School District should improve as the tax base of the older nuclear units are replaced by the new, higher valued (i.e., less depreciated) plant. Hence, the ability of the County to provide social services should improve because of the higher tax base, assuming assessment rates remain stable. Overall, impacts are expected to be SMALL.

Impacts at an alternate site would depend upon the site chosen and the nearby population distribution. If a replacement nuclear plant were constructed at an alternate site, York County and the Clover School District would experience a significant loss of property tax revenue which could affect their ability to provide services and programs. Impacts to minority and low-income populations in York County could be MODERATE to LARGE, but potentially could be offset by other related economic growth in the area. Impacts to the receiving county could be SMALL to LARGE depending on the relative increase to the tax base resulting from the new plant's construction.

8.2.3.2 Once-Through Cooling System

This section discusses the environmental impacts of constructing a nuclear power plant at an alternate site using once-through cooling. The impacts (SMALL, MODERATE, or LARGE) of this option are the same as the impacts for a nuclear power plant using the closed-cycle system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences.

Table 8-7. Summary of Environmental Impacts of a New Nuclear Power Plant Sited at an Alternate Greenfield Site with Once-Through Cooling

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	Reservoir or other cooling source required
Ecology	Impact would depend on ecology at the site
Surface Water Use and Quality	Increased water withdrawal and more thermal load on receiving body of water
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Elimination of cooling towers
Historic and Archaeological Resources	No change
Environmental Justice	No change

8.2.4 Purchased Electrical Power

If available, purchased power from other sources could potentially obviate the need to renew the Catawba OLs. Duke currently purchases power from other generators, but because there is no certainty that imported power will be available, it does not consider the power-purchase option to be a reasonable replacement for the license renewal alternative (Duke 2001).

Duke includes future power purchases in its Annual Power Plan (Duke 2000). The Plan indicates how Duke will meet customers' energy needs through existing generation, customer demand-side options, short-term purchase power transactions, and new generating resources constructed by Duke. The 2000 plan shows power purchases of 1243 MW for the summer of 2001, gradually decreasing to 121 MW in the winter of 2006 (Duke 2000).

Imported power from Canada or Mexico is unlikely to be available for replacement of Catawba generating capacity. In Canada, 62 percent of the country's electricity capacity is derived from renewable energy sources, principally hydropower (DOE/EIA 2001b). Canada has plans to continue developing hydroelectric power, but the plans generally do not include large-scale projects (DOE/EIA 2001b). Canada's nuclear generation is projected to increase by 1.7 percent by 2020, but its share of power generation in Canada is projected to decrease from 14 percent currently to 13 percent by 2020 (DOE/EIA 2001b). EIA projects that total gross U.S. imports of electricity from Canada and Mexico will gradually increase from 47.9 billion kWh in year 2000 to 66.1 billion kWh in year 2005, and then will decrease gradually to 47.4 billion kWh in year 2020 (DOE/EIA 2001b). Consequently, it is unlikely that electricity imported from Canada or Mexico would be able to replace the Catawba generating capacity.

If power to replace Catawba generating capacity were to be purchased from sources within the United States or a foreign country, the generating technology would likely be one of those described in this SEIS and in the GEIS (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies in Chapter 8 of the GEIS is representative of the purchased electrical power alternative to renewal of the Catawba OLs. Thus, the environmental impacts of imported power would still occur, but would be located elsewhere within the region, the nation, or another country.

8.2.5 Other Alternatives

Other generation technologies are discussed in the following subsections.

8.2.5.1 Oil-Fired Generation

EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States from 2000 to 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Oil-fired operation is more expensive than nuclear or coal-fired operation. Future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline in its use for electricity generation. In Section 8.3.11 of the GEIS, the staff estimated that construction of a 1000-MW(e) oil-fired plant would require about 50 ha (120 ac). Additionally, operation of oil-fired plants would have environmental impacts (including impacts on the aquatic environment and air) that would be similar to those from a coal-fired plant.

8.2.5.2 Wind Power

Most of South Carolina is in a wind power Class 1 region (average wind speeds at 10-m [30-ft] elevation of 0 to 4.4 m/s [0 to 9.8 mph]). Class 1 has the lowest potential for wind energy generation (DOE 2001a). Wind turbines are economical in wind power Classes 4 through 7 (average wind speeds of 5.6 to 9.4 m/s [12.5 to 21.1 mph]) (DOE 2001a). Aside from the coastal areas and exposed mountains and ridges of the Appalachians, there is little wind energy potential in the East Central region of the United States for current wind turbine applications (Elliott et al. 1986). Wind turbines typically operate at a 30 to 35 percent capacity factor compared to 90 to 95 percent for a power plant (NWPPC 2000). Nine offshore wind power projects are currently operating in Europe. The European plants together provide approximately 90 MW, which is far less than the electrical outputs of Catawba (British Wind Energy Association 2002). For the preceding reasons, the staff concludes that locating a wind-energy facility on or near the Catawba site or offshore would not be economically feasible given the current state of wind energy generation technology.

8.2.5.3 Solar Power

Solar technologies use the sun's energy and light to provide heat and cooling, light, hot water, and electricity for homes, businesses, and industry. Solar power technologies, photovoltaic and thermal, currently cannot compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent (NRC 1996), and the capacity factor for solar thermal systems is about 25 percent to 40 percent (NRC 1996). Energy storage requirements limit the use of solar-energy systems as baseload electricity supply.

There are substantial impacts to natural resources (wildlife habitat, land-use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS (NRC 1996), land requirements are high—14,000 ha (35,000 ac) per 1000 MW(e) for photovoltaic and approximately 6000 ha (14,000 ac) per 1000 MW(e) for solar thermal systems. Neither type of solar-electric system would fit at the Catawba site, and both would have LARGE environmental impacts at a greenfield site.

The Catawba site receives approximately 4 to 5 kWh of direct normal solar radiation per square meter per day compared to 7 to 8 kWh of solar radiation per square meter per day in areas of the western United States, such as California, which are most promising for solar technologies (DOE/EIA 2000). Because of the natural-resource impacts (land and ecological), the area's relatively low rate of solar radiation, and its high system cost, solar power is not considered to be a feasible baseload alternative to renewal of the Catawba OLs. Some onsite generated solar power (e.g., from rooftop photovoltaic applications) may substitute for electric power from the grid. Implementation of solar generation on a scale large enough to replace Catawba's generating capacity would likely result in LARGE environmental impacts.

8.2.5.4 Hydropower

South Carolina has an estimated 1133 MW of undeveloped hydroelectric resource (INEEL 1997). This amount is less than the amount needed to replace the 2258 MW(e) capacity of Catawba. As stated in Section 8.3.4 of the GEIS, hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses. In the GEIS (NRC 1996), the staff estimated that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac) per 1000 MW(e). Replacement of Catawba's generating capacity would require flooding more than this amount of land. Due to the relatively low amount of undeveloped hydropower resource in South Carolina and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Catawba's generating capacity, the staff concludes that local hydropower is not a feasible alternative to renewal of the Catawba OLs. Any attempts to site hydroelectric facilities large enough to replace Catawba would result in LARGE environmental impacts.

8.2.5.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. However, geothermal technology is not widely used as baseload generation due to the limited geographical availability of the resource and the immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent. There is no feasible eastern location for geothermal capacity to serve as an alternative to renewal of the Catawba OLs. The staff concludes that geothermal energy is not a feasible alternative to renewal of the Catawba OLs.

8.2.5.6 Wood Waste

A wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). 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 and high construction cost per MW of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggested that the overall level of construction impact per MW of installed capacity 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 (NRC 1996). Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a baseload generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and high inefficiency, the staff has determined that wood waste is not a feasible alternative to renewing the Catawba OLs.

8.2.5.7 Municipal Solid Waste

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2001). Municipal waste combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001c). Mass burning technologies are most commonly used in the United States. This group of technologies process raw municipal solid waste "as is," with little or no sizing, shredding, or separation before combustion. Because of the need for specialized waste-separation and waste-handling equipment for municipal solid waste, the initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities (NRC 1996).

Growth in the municipal waste combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital-intensive projects such as municipal waste combustion facilities more expensive relative to less capital-intensive waste disposal alternatives such as landfills; (2) the 1994 Supreme Court decision (*C&A Carbone, Inc. v. Town of Clarkstown*), which struck down local flow control ordinances that required waste to be delivered to specific municipal waste combustion facilities rather than landfills that may have had lower fees; and (3) increasingly stringent environmental regulations that increased the capital cost necessary to construct and maintain municipal waste combustion facilities (DOE/EIA 2001c).

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

Currently, there are approximately 102 waste-to-energy plants operating in the United States. These plants generate approximately 2800 MW(e), or an average of approximately 28 MW(e) per plant (Integrated Waste Services Association 2001). The staff concludes that generating electricity from municipal solid waste would not be a feasible alternative to replace the 2258 MW(e) baseload capacity of Catawba and, consequently, would not be a feasible alternative to renewal of the Catawba OLs.

8.2.5.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff stated 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 Catawba (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewal of the Catawba OLs.

8.2.5.9 Fuel Cells

Fuel cells work without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Phosphoric acid fuel cells are generally considered first-generation technology. Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations.

DOE projects that by 2003, two second-generation fuel cell technologies using molten carbonate and solid oxide technology, respectively, will be commercially available in sizes up to 2 MW at a cost of $1000 to $1500 per kW of installed capacity (DOE 2001b). For comparison, the installed capacity cost for a natural-gas-fired combined-cycle plant is on the order of $500 to $600 per kW (NWPPC 2000). As market acceptance and manufacturing capacity increase, natural-gas-fueled fuel cell plants in the 50- to 100-MW range are projected to become available (DOE 2001b). At the present time, however, fuel cells are neither economically nor technologically competitive with other alternatives for baseload electricity generation. Consequently, fuel cells are not a feasible alternative to renewal of the Catawba OLs.

8.2.5.10 Delayed Retirement

Through the year 2014, Duke projects that 23 of its generating units with a total capacity of 584 MW will be retired (Duke 2000). Delayed retirement of these 23 units would not come close to replacing the 2258 MW(e) capacity of Catawba. For this reason, delayed retirement of Duke generating units would not be a feasible alternative to renewal of the Catawba OLs.

8.2.5.11 Utility-Sponsored Conservation

Duke has developed residential, commercial, and industrial programs to reduce both peak demands and daily energy consumption. These programs are commonly referred to as demand-side management (DSM). The effects of the DSM programs are captured in the customer load forecast in the Duke Power Plan (Duke 2000).

Duke currently has two residential DSM programs (Duke 2000). The water heater program allows a customer to be billed at a lower rate for all water heating energy consumption in exchange for allowing Duke to control the water heater. The special needs energy products loan program provides loans for heat pumps, central air conditioning systems, and energy-efficiency measures such as insulation, tune-ups of heating and air conditioning systems, and sealing of duct systems. The two residential programs are reflected in Duke's plan for meeting customer loads (Duke 2000). Because these DSM savings are part of the long-range plan for meeting projected demand, they are not available offsets for Catawba.

Duke operates two programs for commercial and industrial customers to provide a source of interruptible capacity (Duke 2000). Participants in the standby generator control program contractually agree to transfer electrical loads from Duke to their standby generators when requested by Duke. Participating customers receive payments for capacity and/or energy based on the amount of capacity and/or energy transferred to their generator. Participants in the interruptible power service program agree to reduce their electrical loads to specified levels when requested by Duke. The two programs are not reflected in Duke's customer load forecast because load control contribution depends upon actuation (Duke 2000).

The staff concludes that additional DSM, by itself, would not be sufficient to replace the 2258 MW(e) capacity of Catawba and that it is not a reasonable replacement for the OL renewal alternative.

8.2.6 Combination of Alternatives

Even though individual alternatives to renewing the Catawba OLs might not be sufficient on their own to replace Catawba's generating capacity due to the small size of the resource or lack of cost-effective opportunities, it is conceivable that a combination of alternatives might be cost-effective.

As discussed in Section 8.2, Catawba Units 1 and 2 have a combined average net capacity of 2258 MW(e). There are many possible combinations of alternatives to replace that power. Table 8-8 contains a summary of the environmental impacts of an assumed combination of alternatives consisting of 1928 MW(e) of combined-cycle oil/natural-gas-fired generation at the Catawba site, using four 482-MW(e) combined-cycle, natural gas units. The existing closed-cycle cooling system would be used at the Catawba site. Closed-cycle cooling would also be employed at an alternate location. Purchases from other power generators could account for 165 MW(e) of power, and 165 MW(e) could be gained from additional DSM measures. The impacts associated with the combined-cycle, oil/natural-gas-fired units are based on the gas-fired generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generating capacity. While the DSM measures would have few environmental impacts, operation of the new gas-fired plant would result in increased emissions and environmental impacts. The environmental impacts associated with power purchased from other generators would still occur, but would be located elsewhere within the region, nation, or another country as discussed in Section 8.2.4. The environmental impacts associated with purchased power are not shown in Table 8-8. The staff concludes that it is very unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with renewal of the Catawba OLs.

Table 8-8. Summary of Environmental Impacts for an Assumed Combination of Generating and Acquisition Alternatives

	Catawba Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	Catawba site is sufficient to accommodate new plant (16 ha [40 ac] needed for power block, roads, and parking area). Possible additional impact for construction of an underground oil/gas pipeline—235 ha (582 ac) potentially disturbed for rights-of-way.	MODERATE to LARGE	50 ha (130ac) for power-block, offices, roads, switchyard, and parking areas. Additional land (up to 705 ha [1742 ac]) possibly impacted for transmission line and for natural gas pipeline— MODERATE. Use of previously undeveloped greenfield site increases impacts to LARGE.
Ecology	SMALL to MODERATE	Uses undeveloped areas at Catawba site, plus land for a new gas pipeline.	SMALL to LARGE	Impact depends on whether greenfield or previously developed site. Impact also depends on ecology of the site, surface water body used for intake and discharge, and possible transmission and oil/gas pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity. Use of undeveloped greenfield site increases impacts.

Table 8-8. (contd)

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Water Use and Quality (Surface Water)	SMALL	Uses existing closed-cycle cooling system existing intake structures. Surface water use should be less than current uses with Catawba, Units 1 and 2.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body. New intake and discharge structures required.
Water Use and Quality (Groundwater)	SMALL	Less groundwater withdrawn for potable use because of smaller workforce.	SMALL to LARGE	Impacts SMALL if groundwater used only for potable purposes. Impacts MODERATE to LARGE if groundwater employed as makeup cooling water. Impacts would be site/aquifer specific.
Air Quality	SMALL	Sulfur oxides • 25 MT/yr (27 tons/yr) Nitrogen oxides • 375 (410 tons/yr) Carbon monoxide • 350 MT/yr (382 tons/yr) PM_{10} particulates • 208 MT/yr (227 tons/yr) Some hazardous air pollutants.	SMALL	Potentially same impacts as at the Catawba site, although pollution control standards may vary.
Waste	SMALL	Minimal waste product from fuel combustion.	SMALL	Minimal waste product from fuel combustion.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.

Table 8-8. (contd)

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 640 additional workers during the peak of the 3-year construction period, followed by reduction from current Catawba Units 1 and 2 workforce by 1098 to around 120 workers; tax base preserved. Impacts during operation would be SMALL to MODERATE, due to loss of employment in York County which may be offset by proximity to Charlotte economy. Transportation impacts associated with construction workers would be SMALL to MODERATE. Transportation impacts during operation would be SMALL due to smaller workforce. During construction, impacts would be MODERATE. Up to 640 additional workers during the peak of the 2- to 3-year construction period in addition to workers currently employed at Catawba. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	SMALL to LARGE	Impacts depend on site characteristics. During construction, impacts would be SMALL to MODERATE. Tax impacts on receiving county could be SMALL to LARGE. Up to 640 additional workers during the peak of the 3-year construction period. York County would experience loss of Catawba Units 1 and 2 tax base and employment with potentially MODERATE to LARGE associated impacts. Transportation impacts associated with construction workers would be SMALL to LARGE and would depend on population density and road infrastructure at alternate site. Impacts during operation would be SMALL due to smaller workforce.

Table 8-8. (contd)

	Catawba Nuclear Station Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Aesthetics	SMALL to MODERATE	Lake Wylie area impacted. SMALL to MODERATE aesthetic impact from plant and stacks, fuel oil storage tanks, lighting, and mechanical noise associated with operation.	SMALL to LARGE	SMALL if previously developed site is used and site disturbance is minimal. Impacts increase to strongly MODERATE with construction of a transmission line and oil/gas pipeline to previously developed site. LARGE if greenfield site developed.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be managed effectively.	SMALL	Same as at Catawba; any potential impacts can likely be managed effectively.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction. Loss of approximately 1098 operating jobs at Catawba could reduce employment prospects for minority and low-income populations. Nearness to Charlotte economic area may mitigate impacts.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup at site could be SMALL to LARGE. Loss of tax revenue for York County could have a MODERATE impact. Impact to Clover School District would be LARGE. Nearness of York County to Charlotte economic area may mitigate impacts.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, renewal of the Catawba OLs, are SMALL for all impact categories (except collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned). Several alternative actions were considered – no-action (discussed in Section 8.1), new generation alternatives (from coal, oil/natural gas, and nuclear discussed in Sections 8.2.1 through 8.2.3, respectively), purchased electrical power (discussed in Section 8.2.4), alternative technologies (discussed in Section 8.2.5), and the combination of alternatives (discussed in Section 8.2.6).

The no-action alternative would require the replacing of electrical generating capacity by (1) DSM and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than Catawba Units 1 and 2, or (4) some combination of these options that would result in decommissioning Catawba Units 1 and 2. For each of the new generation alternatives (coal, natural gas, and nuclear), the environmental impacts would not be less than the impacts of license renewal. For example, the land-disturbance impacts resulting from construction of any new facility would be greater than the impacts of continued operation of Catawba Units 1 and 2. The impacts of purchased electrical power would still occur, but would occur elsewhere. Alternative technologies are not considered feasible at this time and it is very unlikely that the environmental impacts of any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with renewal of the Catawba OLs.

The staff concludes that the alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

8.4 References

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

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

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy,* Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

40 CFR Part 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans."

40 CFR Part 60. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 60, "Standards of Performance for New Stationary Sources."

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

British Wind Energy Association. 2002. < http://www.offshorewindfarms.co.uk/else.html> (Accessed April 9, 2002).

C & A Carbone, Inc. v. Town of Clarkstown, New York, 511 U.S. 383, (U.S. Supreme Court 1994).

Clean Air Act (CAA). 42 USC. 7401, et seq.

Duke Energy Corporation. 2000. *Annual Power Plan*. The Plan is included as Attachment M in Duke's Environmental Report (Duke 2001).

Duke Energy Corporation (Duke). 2001. *Applicants Environmental Report – Operating License Renewal Stage Catawba Nuclear Station Units 1 and 2.* Charlotte, North Carolina.

Elliott, D.L. C.G. Holladay, W.R. Barchet, H.P. Foote, and W.F. Sandusky. 1986. *Wind Energy Resource Atlas of the U.S*. Pacific Northwest Laboratory DOE/CH10093-4, Richland,WA. < http://rredc.nrel.gov/wind/pubs/atlas/ > (Accessed April 9, 2002).

Gabbard, Alex. 1993. "Coal Combustion: Nuclear Resource or Danger," *Oak Ridge National Laboratory Review*. Oak Ridge National Laboratory: Oak Ridge, Tennessee. Summer/Fall 1993. < http://www.ornl.gov/ORNLReview/rev26-34/text/colmain.html > (Accessed April 9, 2002).

Idaho National Engineering and Environmental Laboratory (INEEL). 1997. *U.S. Hydropower Resource Assessment for North Carolina*. DOE/ID-10430(NC). Idaho Falls, Idaho. < http://hydropower.inel.gov/state/nc/nc.pdf > (Accessed April 2, 2002).

Integrated Waste Services Association. 2001. "About Waste to Energy." < http://www.wte.org/waste.html > (Accessed April 2, 2002).

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

Northwest Power Planning Council (NWPPC). 2000. "Northwest Power Supply Adequacy/ Reliability Study Phase I Report." < http://www.nwcouncil.org/library/2000/2000-4a.pdf > (Accessed April 3, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2000. *Energy Consumption and Renewable Energy Development Potential on Indian Lands*. SR/CNEAF/2000-01. Washington, D.C. < http://tonto.eia.doe.gov/FTPROOT/service/neaf0001.pdf > (Accessed April 9, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2001a. *Annual Energy Outlook 2002 With Projections to 2020*. DOE/EIA-0383(2001). Washington, D.C. < http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2002).pdf > (Accessed April 3, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2001b. *International Energy Outlook 2001*. DOE/EIA-0484. Washington, D.C. < http://www.eia.doe.gov/oiaf/fore_pub.html > (Accessed April 3, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2001c. *Renewable Energy 2000: Issues and Trends*. DOE/EIA-0628. Washington, D.C. < http://tonto.eia.doe.gov/FTPROOT/renewables/06282000.pdf > (Accessed April 9, 2002).

U.S. Department of Energy (DOE). 2001a. "U.S. Wind Energy Resource Map." < http://www.eren.doe.gov/wind/we_map.html > (Accessed April 9, 2002)

U.S. Department of Energy (DOE). 2001b. "Advanced Fuel Cells." < http://www.fossil.energy.doe.gov/coal_power/fuelcells/index.shtml > (Accessed April 3, 2002).

U.S. Environmental Protection Agency (EPA). 1998. "Revision of Standards of Performance for Nitrogen Oxide Emissions From New Fossil-Fuel Fired Steam Generating Units; Revisions to Reporting Requirements for Standards of Performance for New Fossil-Fuel Fired Steam Generating Units, Final Rule." 63 FR 49442. September 16, 1998.

U.S. Environmental Protection Agency (EPA). 1999. "Regional Haze Regulations, Final Rule" 64 FR 35714. July 1, 1999.

U.S. Environmental Protection Agency (EPA). 2000a. "Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units." 65 FR 79825. December 20, 2000.

U.S. Environmental Protection Agency (EPA). 2000b. "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels." 65 FR 32214. May 22, 2000.

U.S. Environmental Protection Agency (EPA). 2001. "Municipal Solid Waste Disposal." < http://www.epa.gov/epaoswer/non-hw/muncpl/disposal.htm > (Accessed April 9, 2002).

U.S. Federal Aviation Administration (FAA). 2000. "Obstruction Marking and Lighting." Advisory Circular AC70/7460-11, Washington, D.C.

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

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

U.S. Nuclear Regulatory Commission (NRC). 2001a. *Draft Supplement Dealing with Decommissioning of Nuclear Reactors*. NUREG-0586, Supplement 1. Washington D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001b. "NRC Organizes Future Licensing Project Organization." Press Release No. 01-035, March 30, 2001.

9.0 Summary and Conclusions

By letter dated June 13, 2001, Duke Energy Corporation (Duke) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Catawba Nuclear Station, Units 1 and 2 (Catawba) for an additional 20-year period (Duke 2001a). If the OLs are renewed, State regulatory agencies and Duke 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 OLs are not renewed, then the plant must be shut down at or before expiration of the current OLs (i.e., December 6, 2024, for Unit 1 and February 24, 2026, for Unit 2).

Section 102 of the National Environmental Policy Act (NEPA; 42 USC 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51, which identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[a]

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. The Notice of Intent was published in the *Federal Register* on September 20, 2001, and was cited as 66 FR 48489 (NRC 2001). The staff visited the Catawba site in October 2001, and held public scoping meetings on October 23, 2001, in Rock Hill, South Carolina (NRC 2001). The staff reviewed the Catawba Environmental Report (ER; Duke 2001b) and compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff also considered the public comments received during the scoping process for preparation of this Supplemental Environmental Impact Statement (SEIS) for Catawba. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part I, of this SEIS.

On May 21, 2002, the NRC published the Notice of Availability of the draft SEIS (67 FR 35839) beginning a 75-day comment period. During the comment period, members of the public could comment on the preliminary results of the NRC staff's review. During this comment period, the

---

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

staff held two public meetings in Rock Hill, South Carolina, on June 27, 2002, to describe the results of the NRC environmental review, to answer questions, and to provide members of the public with information to assist them in formulating their comments. At the end of comment period, the staff considered all of the comments received for revision of the draft SEIS. These comments are addressed in Appendix A, Part II, of this SEIS.

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

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

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

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

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss

other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) and in accordance with § 51.23(b).[a]

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

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

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

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

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

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site 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 likely not to be sufficiently beneficial to warrant implementation.

(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."

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

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must 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 Catawba OLs) and alternative methods of power generation. These alternatives are evaluated assuming that the replacement power generation plant is located at either the Catawba site or some other unspecified greenfield location.

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 information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither the scoping process, Duke, nor the staff has identified any new issue applicable to Catawba that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all Category 1 issues that are applicable to Catawba.

Duke's license renewal application presents an analysis of the Category 2 issues that are applicable to Catawba, plus environmental justice and chronic effects from electromagnetic fields. The staff reviewed the Duke analysis for each issue and conducted an independent review of each issue. Six Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at Catawba. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Duke has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of Catawba for the license renewal period (Duke 2001b). In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to Operation of Catawba Nuclear Station, Units 1 and 2* (AEC 1983).

Ten Category 2 issues related to operational impacts and one related to postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. Five of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this SEIS in relation to operation during the renewal term. For all 11 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 appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for Catawba, and the plant improvements already made, the staff concludes that two of the candidate SAMAs are cost-beneficial. Although the staff concludes that these two SAMAs (providing back-up power to the igniters to establish hydrogen control in SBO events and installing a watertight wall around the 6900/4160 V transformers) are cost-beneficial and offer a level of risk reduction, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. However, the hydrogen control SAMA is being pursued as a Generic Safety Issue, and both SAMAs are being evaluated further as current operating license issues.

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

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

The adverse impacts of continued operation identified are considered to be of SMALL significance, and none warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives if Catawba ceases operation at or before the expiration of the current OLs will not be smaller than those associated with continued operation of these units, and they may be greater for some impact categories in some locations.

9.1.2 Irreversible or Irretrievable Resource Commitments

Consideration of the commitment of resources related to construction and operation of Catawba during the 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 up to 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. Duke replaces approximately one third of the fuel assemblies in each of the two units during every refueling outage, which occurs on an 18- to 24-month cycle.

The likely power generation alternatives if Catawba ceases operation on or before the expiration of the current OLs 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 Catawba site was set when the plant was approved and construction began. That balance is now well established. Renewal of the OLs for Catawba and continued operation of the plant will not alter the existing balance, but may postpone the availability of the site for other uses. Denial of the application to renew the OLs will lead to shutdown of the plant and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the Catawba 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 OLs for Catawba. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at Catawba, Chapters 4 through 7 discuss environmental issues associated with renewal of the OLs. Environmental issues associated with the no-action alternative and alternatives involving power generation and use reduction are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the OLs), the no-action alternative (denial of the application), alternatives involving nuclear or coal- and gas-fired generation of power at the Catawba site and an unspecified “greenfield site,” and a combination of alternatives are compared in Table 9-1. Continued use of a closed-cycle cooling system for Catawba is assumed for Table 9-1.

Substitution of once-through cooling for the recirculating cooling system in the evaluation of the nuclear and gas- and coal-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 (except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned [see Chapter 6]). 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 GEIS (NRC 1996, 1999); (2) the Catawba ER (Duke 2001b); (3) consultation with Federal, State, and local agencies; (4) the staff’s own independent review; and (5) the staff’s consideration of public comments received during the scoping process, the recommendation of the staff is that the Commission determine that the adverse environmental impacts of license renewals for Catawba Units 1 and 2 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

	Proposed Action	No-Action Alternative	Coal-Fired Generation		Natural Gas-Fired Generation		New Nuclear Generation		Combination of Alternatives	
Impact Category	**License Renewal**	**Denial of Renewal**	**Catawba Site**	**Alternate Greenfield Site**	**Catawba Site**	**Alternate Greenfield Site**	**Catawba Site**	**Alternate Greenfield Site**	**Catawba Site**	**Alternate Greenfield Site**
Land Use	SMALL	SMALL	MODERATE to LARGE	SMALL to LARGE	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE
Ecology	SMALL	SMALL	MODERATE to LARGE	SMALL to LARGE	SMALL to MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Water Use and Quality–Surface Water	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Use and Quality–Groundwater	SMALL	SMALL	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Transportation	SMALL	SMALL	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Aesthetics	SMALL	SMALL	MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Historic and Archaeological Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE

(a) Except for collective offsite radiological impacts from the fuel cycle and from HLW and spent-fuel disposal, for which a significance level was not assigned. See Chapter 6 for details.

9.4 References

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

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

U.S. Atomic Energy Commission (AEC). 1983. *Final Environmental Statement Related to the Operation of Catawba Nuclear Station, Units 1 & 2, Duke Power Company*. Docket Nos. 50-413 and 50-414, Washington, D.C.

Duke Energy Corporation (Duke). 2001a. *Application for Renewed Operating Licenses, Catawba Nuclear Station Units 1 and 2.* Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. *Applicant's Environmental Report – Operating License Renewal Stage Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

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

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

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants Main Report*, "Section 6.3- Transportation, Table 9-1, Summary of Findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

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

U.S. Nuclear Regulatory Commission (NRC). 2001. "Duke Energy Corporation, Catawba Nuclear Station, Units 1 and 2; Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." 66 FR 48489. September 20, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2002. "Duke Energy Corporation, Catawba Nuclear Station, Units 1 and 2. Notice of Availability of the Draft Supplement 9 to the Generic Environmental Impact Statement and Public Meeting for License Renewal of Catawba Units 1 and 2." 67 FR 35839. May 21, 2002.

Appendix A

Comments Received on the Environmental Review

Appendix A

Comments Received on the Environmental Review

Part I - Comments Received During Scoping

On September 20, 2001, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the *Federal Register* (66 FR 48489), to notify the public of the staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, to support the renewal application for the Catawba Nuclear Station, Units 1 and 2 (Catawba) operating licenses and to conduct scoping. This plant-specific supplement to the GEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), and 10 CFR Part 51. As outlined by Part 51, the NRC initiated the scoping process with the issuance of the Federal Register Notice. The NRC invited the applicant; Federal, State, Native American Tribal, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at scheduled public meetings and/or submitting written suggestions and comments no later than November 22, 2001.

The scoping process included two public scoping meetings, which were held in the Council Chamber at the City Hall, located at 155 Johnston Street, Rock Hill, South Carolina, on October 23, 2001. More than 100 individuals attended the meetings. Each session began with NRC staff members providing brief overviews of the license renewal process and the NEPA process. After the NRC's prepared statements, the meetings were opened for public comments. Twenty four attendees (six of whom spoke at both sessions) provided either oral statements that were recorded and transcribed by a certified court reporter or written statements. The meeting transcripts are an attachment to the scoping meeting summary dated November 29, 2001. In addition to the comments provided during the public meetings, two e-mail messages and one letter were received by the NRC in response to the Notice of Intent.

At the conclusion of the scoping period, the NRC staff and its contractors reviewed the transcripts and all written material received to identify specific comments and issues. Each set of comments from an individual was given a unique identifier (Commenter ID), so that the comments could be traced back to the original transcript or e-mail containing the comment. Specific comments were numbered sequentially within each comment set. Several commenters submitted more than one set of comments (i.e., they made statements in both the afternoon and evening scoping meetings). In these cases, there is a unique Commenter ID for each set of comments.

Table A-1 identifies the individuals who provided comments applicable to the environmental review and the Commenter ID associated with each set of comments. Individuals who

Table A-1. Individuals Providing Comments During Scoping Comment Period

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
A	Doug Echols	Rock Hill, SC	Afternoon Scoping Meeting
B	Vance Stine	Clover, SC	Afternoon Scoping Meeting
C	Mike Channell	York County Office of Emergency Management	Afternoon Scoping Meeting
D	Gary Peterson	Catawba Nuclear Station	Afternoon Scoping Meeting
E	Margot Rott	Catawba Nuclear Station	Afternoon Scoping Meeting
F	Dennis Merrill	York Technical College	Afternoon Scoping Meeting
G	Mark Farris	York County Economic Development Board	Afternoon Scoping Meeting
H	Janet Zeller	Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
I	Steve Taylor	Palmetto Council Boy Scouts	Afternoon Scoping Meeting
J	Lou Zeller	Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
K	John Byrd	Lower Lake Wylie Association	Afternoon Scoping Meeting
L	Tim Morgan	York County Chamber of Commerce	Afternoon Scoping Meeting
M	Don Moniak	Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
N	Mike Bush	Daniel Stowe Botanical Garden	Afternoon Scoping Meeting
O	Ann Barton	York County Adult Day Care Services	Afternoon Scoping Meeting
P	Nate Barber	Winthrop University	Afternoon Scoping Meeting
Q	Don Moniak	Blue Ridge Environmental Defense League	Evening Scoping Meeting
R	Mike Channell	York County Office of Emergency Management	Evening Scoping Meeting

Table A-1. (contd)

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
S	Gary Peterson	Catawba Nuclear Station	Evening Scoping Meeting
T	Margot Rott	Catawba Nuclear Station	Evening Scoping Meeting
U	Angela Viney	South Carolina Wildlife Federation	Evening Scoping Meeting
V	Gregg Jocoy		Evening Scoping Meeting
W	Janet Zeller	Blue Ridge Environmental Defense League	Evening Scoping Meeting
X	Lewis Patrie	Physicians for Social Responsibility	Evening Scoping Meeting
Y	Mary Olson	Nuclear Information and Resource Service	Evening Scoping Meeting
Z	Lou Zeller	Blue Ridge Environmental Defense League	Evening Scoping Meeting
AA	Glenn Carroll	Georgians Against Nuclear Energy	Evening Scoping Meeting
AB	Ed FitzGerald		Evening Scoping Meeting
AC	Trey Eubanks	York, SC	Evening Scoping Meeting
AD	Judith Aplin		Electronic mail
AE	Hugh Jackson	Public Citizen’s Critical Mass Energy and Environment Program	Electronic mail
AF	Edmund FitzGerald	Sierra Club	Written comments at Evening Scoping Meeting
AG	Jesse Riley	Carolina Environmental	Letter

spoke at the scoping meetings are listed in the order in which they spoke at the public meeting, and individuals who provided comments by letter or e-mail are listed in alphabetical order. To maintain consistency with the scoping summary report, (Catawba Scoping Summary Report, dated March 27, 2002), the unique identifier used in that report for each set of comments is retained in this report.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by the commenters. The comments fall into one of several general groups. These groups include:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related federal actions.

- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the license renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the Catawba license renewal application.

- Questions that do not provide new information.

- Specific comments that address issues that do not fall the within or are specifically excluded from the purview of NRC environmental regulations. These comments typically address issues such as the need for power, emergency preparedness, current operational safety issues, and safety issues related to operation during the renewal period.

Each comment applicable to this environmental review is summarized in this section. This information, which was extracted from the Catawba Scoping Summary Report, is provided for the convenience of those interested in the scoping comments applicable to this environmental review. The comments that are general or outside the scope of the environmental review for Catawba are not included here. More detail regarding the disposition of general or nonapplicable comments can be found in the summary report. The ADAMS accession number for the summary report is: ML020870376.

This accession number is provided to facilitate access to the document through the Public Electronic Reading Room (ADAMS) http://www.nrc.gov/reading-rm.html .

The following pages summarize the comments and suggestions received as part of the scoping process that are applicable to this environmental review, and discuss the disposition of the comments and suggestions. The parenthetical alpha-numeric identifier after each comment refers to the comment set (Commenter ID) and the comment number.

Comments in this section are grouped in the following categories:

A.1.1 Comments Concerning Aquatic Ecology Issues

A.1.2 Comments Concerning Terrestrial Resource Issues

A.1.3 Comments Concerning Threatened and Endangered Species Issues

A.1.4 Comments Concerning Air Quality Issues

A.1.5 Comments Concerning Human Health Issues

A.1.6 Comments Concerning Socioeconomic Issues

A.1.7 Comments Concerning Postulated Accident Issues

A.1.8 Comments Concerning Uranium Fuel Cycle and Waste Management Issues

A.1.9 Comments Concerning Alternative Energy Sources

A.1.10 Comments Concerning Safety Issues Within the Scope of License Renewal

A.1 Comments and Responses

A.1.1 Comments Concerning Aquatic Ecology Issues

As stated in 10 CFR Part 51, Table B-1, Category 2 aquatic ecology issues include:

- Entrainment of fish and shellfish in early life stages
- Impingement of fish and shellfish
- Heat shock

Comment: Duke Energy has conducted water testing on Lake Wylie since the early 1970s. The areas we study include water quality, water flow at Catawba's intake and discharge structures and aquatic ecology. Our evaluation of historical data indicates no changes to Lake Wylie's aquatic resources as a result of Catawba's operation. Using scientific data, we concluded that our continued operation would not have an adverse effect on the Lake or River. (E-1)(T-1)

Comment: They've been an excellent steward, certainly, of Lake Wylie, a tremendous resource for us from visitors and convention-related activities. We certainly place that as one of our jewels in our environmental resources, and they've been an excellent steward of Lake Wylie and the Catawba River. (G-3)

Response: *The comments are noted and are supportive of license renewal at Catawba. Aquatic ecology will be discussed in Chapter 2 and Chapter 4 of the SEIS. The comments provide no new information; therefore, they will not be evaluated further.*

A.1.2 Comments Concerning Terrestrial Resource Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 terrestrial resource issues include:

- Cooling tower impacts on crops and ornamental vegetation
- Cooling tower impacts on native plants
- Bird collisions with cooling towers
- Cooling pond impacts on terrestrial resources
- Power line rights-of-way management (cutting and herbicide application)
- Bird collisions with power lines
- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)
- Floodplains and wetland on power line rights-of-way

Comment: One of the other offshoots of the Backyard Wildlife Habitat Program is the WAIT Program that Margot mentioned. And, in fact, Duke Power is one of the founding partners. Having worked to protect and enhance wildlife habitat at the World of Energy in Seneca in 1996, the South Carolina Wildlife Federation, the South Carolina Department of Natural Resources and the National Wild Turkey Federation worked with Duke Power at that site and was so impressed with the outcome that this new wildlife habitat education program was created. (U-1)

Comment: The Catawba Nuclear Station is our most recent WAIT site, and they've gone over and above the standard requirements in creating their WAIT site. They've hosted one of our habitat steward classes in 2000 at Energy Quest. In addition, they initiated partnerships with three schools in the area. York Junior High School, Goldhill Elementary, and Goldhill Middle School are being assisted in the creation of their schoolyard habitats, their outdoor classrooms, by the staff of Catawba Nuclear Station. There are numerous wildlife habitat management and protection initiatives at Catawba Nuclear Station to include osprey towers. To date, four have been installed to encourage an osprey nest on-site. Wood duck boxes have been installed in the standby nuclear service water pond. Wildlife food plots have been planted, wetlands within the site boundary have been identified and signs posted. Selective mowing is in place to provide meadows for wildlife habitat. Educational brochures are available at the visitors center with information on butterfly gardens and native wild flowers. An educational nature trail is available with a brochure to identify plants, trees and vines on the trail. (U-2)

Response: *The comments are noted. The comments discuss the participation of Duke as a steward of the environment. They provide no new information and will not be evaluated further. The appropriate descriptive information regarding the terrestrial ecology of the site will be addressed in Chapters 2 and 4 of the Catawba SEIS.*

A.1.3 Comment Concerning Threatened and Endangered Species Issues

As stated in 10 CFR Part 51, Table B-1, the following is a Category 2 issue:

- Threatened or endangered species

Comment: The second category we evaluated is plants and animals. As part of our study, Duke Energy worked with Dr. L.L. Gaddy, a well-known environmental scientist, to perform a study of threatened and endangered species at the Catawba site. Results of the study indicate there were no state or federally recognized threatened or endangered species identified; in fact, Catawba has a thriving population of quail, beaver, bobcats, Canada geese, osprey, deer and many other wildlife species. Catawba has many ongoing environmental initiatives managed in cooperation with the South Carolina Department of Natural Resources, the South Carolina Wildlife Federation and the Wild Turkey Federation. The Catawba site is in the final stages of becoming WAIT-certified by the South Carolina Wildlife Federation, and wait, W-A-I-T, stands for Wildlife and Industry Together. Catawba hosts a butterfly garden and various other wildlife areas. Based on review of our operating history and a look at our continued operation, we conclude that license renewal will not adversely affect plants and animals. (E-2)(T-2)

Response: *The comment is noted. The appropriate descriptive information provided by Duke regarding the terrestrial ecology of the site will be addressed in Chapters 2 and 4 of the SEIS.*

A.1.4 Comments Concerning Air Quality Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 air quality issues include:

- Air quality effects of transmission lines

Comment: Duke Power has an excellent record of maintenance, and the nuclear generation is the cleanest way, I think, for us to address the major air quality problems which we have in the Charlotte metro area. (A-4)

Comment: The third [environmental] category we evaluated is air quality. Nuclear power provides about 50 percent of Duke Energy's total electric generation in the Piedmont Carolinas. And by design, nuclear power is [a] clean air energy source. Data shows Catawba's operation has not adversely impacted the region's air quality, and there are no plans associated with license renewal that would alter the air quality. (E-3)(T-3)

Comment: I also think that the concept of clean air is an important one to look at. (N-2)

Response: *The comments are noted. Air quality impacts from plant operations were evaluated in the GEIS and found to be minimal. These emissions are regulated through permits issued by the U.S. Environmental Protection Agency and South Carolina. Air quality effects are a Category 1 issue as evaluated in the GEIS and will be discussed in Chapter 2 of the SEIS. The comments provide no new information and, therefore, will not be evaluated further.*

A.1.5 Comments Concerning Human Health Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 human health issues include:

- Radiation exposure to the public during refurbishment
- Occupational radiation exposure during refurbishment
- Microbiological organisms (occupational health)
- Noise
- Radiation exposures to public (license renewal term)
- Occupational radiation exposures (license renewal term)

Comment: There are some real problems with describing nuclear power as clean, safe technology. It may not produce the kinds of pollution that we see from Duke's seven coal plants in North Carolina, and I'm not sure how many in South Carolina, but it does produce ionizing radiation. And this ionizing radiation is legally emitted from the Catawba Plants in day-to-day operations of the Plant. You can't see it, you can't taste it, you can't feel it, but it's there, and legal emissions can cause, I think, excessive cancer deaths. In addition, ionizing radiation causes birth defects, and it causes immune disorders. So the true health impacts of nuclear power can't be looked at in terms of what your ozone levels are. (H-1)

Comment: One of the specifics that we are looking at for the license extension is the number of people that would be projected to die an early death from cancer from the additional nearly two decades, right at two decades, or operation of the Catawba Plants. And at this point, in looking at that date, we believe that that number exceeds what is allowed under Nuclear Regulatory Commission rules. (H-2)

Comment: The EPA–just as an aside, a parenthetical piece here, the EPA, if you live near a chemical plant, requires that that chemical plant kill no more than one person in a million from cancer. The requirements for the Nuclear Regulatory Commission for nuclear power plants are much, much less rigid, so these can be very dangerous plants, and we want to know from the NRC just how many people in this area can be expected to die an early death from the license extension, and we will be presenting that analysis ourselves. (H-3)

Comment: Even the NRC admits that with no accident, no problem, just plain old routine activities, 12 excess deaths will occur from 20 years of reactor operation at any reactor in the United States, which is a ludicrous proposition to suggest that such a thing is totally linear and totally quantifiable. But I'll take the bait. Okay, 12 deaths from extending Catawba's license. Well guess what? There's 100 reactors looking for license extensions. That's 1,200 deaths from license extension, according to NRC. Not me. I'd multiply it by at least ten times. So that takes us back to what I started with: acceptable end risk. NRC knows that [I have] never accepted the same definition as acceptable. I can't get up before you without reminding you that you should be regulating to protect children. (Y-6)

Response: *The comments are noted. Radiation exposure to the public and workers was evaluated in the GEIS and determined to be a Category 1 issue. The NRC's regulatory limits for radiological protection are set to protect workers and the public from the harmful health effects of radiation on humans. The limits were based on the recommendations of standard-setting organizations. Radiation standards reflect extensive scientific study by national and international organizations (International Commission on Radiological Protection [ICRP], National Council on Radiation Protection and Measurements, and National Academy of Sciences) and are conservative to ensure that the public and workers at nuclear power plants* *are protected. The radiation exposure standards are presented in 10 CFR Part 20, "Standards for Protection Against Radiation," and are based on the recommendations in ICRP 26 and 30.*

The comments provide no new information, and do not pertain to the scope of license renewal as set forth in 10 CFR Parts 51 and 54. Therefore, they will not be evaluated further.

A.1.6 Comments Concerning Socioeconomic Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 and 2 socioeconomic issues include:

<u>Category 1</u>

- Public services: public safety, social services, and tourism and recreation
- Public services, education (license renewal term)
- Aesthetic impacts (refurbishment)
- Aesthetic impacts (license renewal)
- Aesthetic impacts of transmission lines (license renewal term)

<u>Category 2</u>

- Housing impacts
- Public services: public utilities
- Public services, education (refurbishment)
- Offsite land use (refurbishment)
- Offsite land use (license renewal term)
- Public services, transportation
- Historic and archaeological resources

Comment: There are many economic advantages, I believe, to us having a reliable and clean source of energy. (A-3)

Comment: The employees of Catawba are an important part of this community. They live and work here, are active in supporting area civic, charitable and business endeavors. They volunteer in the community, they contribute financially to organizations serving Rock Hill, York County and this region. (A-6)

Comment: Duke Energy's been a valued corporate citizen for many years. Its employees are hardworking members of surrounding communities, active in our schools, churches and civic organizations. In addition to the obvious asset of generating safe, reliable energy for our homes and businesses, Duke Energy participates in the activities of our area, annually supporting the efforts of the United Way, the Red Cross, Adopt-a-Highway Programs and other civic activities. (AC-2)

Comment: They have been a good corporate citizen of our community. (B-1)

Comment: Duke Power and Catawba, as Mayor Echols and Mayor Stine have already mentioned, have always been good citizens of York County. They're a very big asset to York County in our view. We are constantly working with Catawba on emergency planning issues, on safety issues. (C-1)

Comment: We are active volunteers in the community. For 11 years, we've hosted Boy Scout encampments where our employees teach classes in electricity, crime prevention, energy, computers, electronics and communications. Over 1,000 boys have attended these events at Catawba Station. Our employees are also part of the Junior Achievement Program, partnering with local schools teaching business skills, providing tutors and mentors. And one thing I'm particularly proud of is each year our employees collect coats and blankets for area shelters and gather school supplies for area schools. They also volunteer hundreds of hours to United Way agencies, and every year our employees donate well over $100,000 to area United Way agencies. Catawba employees also are involved in blood drives and donate annually over 300 units of blood. And we've also hosted Women in the Outdoors and Jake's Events and partnered with local schools to create schoolyard habitats and nature trails. (D-2)(S-2)

Comment: In addition to being safely operated, Catawba has provided many benefits for the community. For example, Duke Energy has contributed millions of dollars in property taxes to York County. We have over 1,100 employees helping maintain a strong economy in this area. Our annual payroll of over $70 million helps support local businesses and industries. And as Gary mentioned earlier, our employees spend hundreds of hours each year volunteering for community, school, civic and church programs and projects. (E-5)(T-5)

Comment: I hope you'll give appropriate positive recognition to the record, because I don't think anything speaks more loudly than the record-the record on participation in all of our community and civic activities. (F-3)

Comment: Certainly, there are obvious benefits to having the Catawba Nuclear Station in York County, primarily the tax benefits. (G-1)

Comment: Without a facility like this and other supporting industries, we would not have some of the highest SAT scores, if not the highest, in the State of South Carolina. Our school systems have the highest percentage of teachers with master's degrees, and then we also have the highest average teacher salary. It's tremendously beneficial to us. And at a ten and a half percent assessment, industries like Duke pay two and a half times the property taxes that our residential development does. (G-2)

Comment: The Catawba Nuclear Power and the millions of dollars of revenue that's been generated from that Station has created an opportunity for York County to provide for the health, safety and welfare of our citizens to a much greater extent than we would have without it. (G-4)

Comment: They [scouts in York County and the Lancaster and Chester areas] have been privileged to be invited to Duke Power property at the Catawba Nuclear Station for the last 11 years and accounting for 1,000 kids during that time to be taught a variety of different merit badge skills. (I-1)

Comment: Duke Power Company, and Catawba Nuclear in particular, have been good community stewards. They have been an outstanding community partner participating with us locally as well as on a regional basis. When I think about the people that I know with Duke Power Company, and in particular Catawba Nuclear Station, I know that they've taught kids first aid, they've managed the Council's web site, which was the first nationally accredited Boy Scouts of America web site in the nation. They have constructed camp shelters at Camp Bob Harden, they've managed major programs, they've provided untold hours of volunteer community service and provided support services to the scouting leaders in the surrounding areas as well. (I-2)

Comment: These are good community stewards, these are good people, these are our neighbors, and these folks live here, they're conscientious community partners. (I-3)

Comment: I think of Duke Energy as being at the top of that list as far as promoting a good quality of life in this area. (L-1)

Comment: Duke, as it was said earlier, has a history of being a good corporate citizen here in York County. The majority of the employees live in the community. Duke employees are not only involved in most of the major community organizations, they are actively encouraged by

Management to become involved in their local communities. And I want to stress this goes beyond financial involvement and includes what I would call human capital or leadership to these organizations. (L-3)

Comment: [On behalf of York County Adult Day Services,] I have been very blessed to find that these people [Catawba employees] repeatedly come back and try and serve the community needs. They started out with building a concrete path for wheelchair vans to unload the clients, they screened in porches at the facilities, they assisted with new renovations, and this was to meet the new DEHAC regulations, and this included safety precautions and guidelines. (O-1)

Comment: I think that Catawba Nuclear for us has been a very good neighbor. They are there with the know-how and the heart to get the job done in this community, and they are quite aware of the community needs, and we're proud of them. (O-2)

Comment: I think that Duke has been, and will hopefully continue to be, a good corporate neighbor. (P-4)

Comment: I think that Catawba itself has proven to not only be an asset to our community by generating power there, but I think they – but also because they are an active neighbor in our area. They're not just there as a corporation, they're there as a neighbor as well. (R-1)

Comment: In conjunction with Catawba Nuclear Station efforts to partner with schools, they have a program underway to supply every elementary and middle school near Catawba Nuclear Site, within a ten-mile radius, with environmental workshop backpacks that will include kits for environmental and wildlife monitoring. In all of these conversation education programs, the Catawba Nuclear Station has developed and sustained partnerships with the South Carolina Department of Natural Resources, the South Carolina Wildlife Federation, the National Wild Turkey Federation, the Stowe Botanical Garden, the Piedmont Council of the Boy Scouts of America and the schools in the area, specifically the ones I mentioned earlier. (U-3)

Comment: their (Duke) employees are good citizens. (AD-2)

Response: *The comments are noted. The comments are supportive of license renewal at Catawba, and are general in nature. The comments provide no new information; therefore, they will not be evaluated further. Socioeconomic issues specific to the plant are Category 2 issues and will be addressed in Chapters 2 and 4 of the SEIS.*

Comment: We are also wanting the NRC to evaluate some liability issues. Thanks to our friend, Mary Olson, from Nuclear Information and Resource Service, we were alerted that Duke recently filed with the Federal Energy Regulatory Commission to set up a limited liability corporation, thereby relieving them from the day-to-day operations liability at their nuclear power stations. We want the socioeconomic impacts of the potential for this new limited liability corporation to be factored into a complete EIS. (W-5)

Comment: In this EIS, you've got to look ahead, and you've got to figure that sometime in the next 20 years we're not going to have a regulated energy market in the Southeast. And you've got to look at Duke Power's behavior in the West, and you've got to ask yourself what's going to happen to the municipalities and the co-ops when Duke is unregulated, and they have to sell at their bond rate? And you've got to look at what kind of a white elephant Catawba's going to be for those communities. (Y-8)

Response: *The comments are noted. The comments relate to corporate liability and energy deregulation. These are NRC policy issues and are outside the scope of license renewal. The comments provide no new information and, therefore, will not be evaluated further.*

A.1.7 Comments Concerning Postulated Accident Issues

As stated in 10 CFR Part 51, Table B-1, Category 1, postulated accidents issues include:

- Design basis accidents
- Severe accidents

The environmental impacts of design basis accidents is a Category 1 issue in the GEIS. Also, the Commission has determined that the probability-weighted environmental consequences from severe accidents (i.e., beyond design basis accidents) are small for all plants but that alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. See 10 CFR 51.53(c)(3)(iii)(L).

Comment: [During a plant tour, we learned that] the Plant was designed to withstand tremendous forces, both natural and unnatural–what we were told, certainly, was that earthquake, hurricane and commercial jetliner crash had all been tested in the laboratory-type testing to be concurrent. (N-5)

Response: *The comment is noted. The comment states an awareness of the types of accidents that the Catawba Nuclear Station was designed to withstand. The comment provides no new information; therefore, it will not be evaluated further.*

A.1.8 Comments Concerning Uranium Fuel Cycle and Waste Management Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 uranium fuel cycle and waste management issues include:

- Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high level waste)
- Offsite radiological impacts (collective effects)
- Offsite radiological impacts (spent fuel and high level waste disposal)
- Nonradiological impacts of the uranium fuel cycle
- Low level waste storage and disposal
- Mixed waste storage and disposal
- On-site spent fuel
- Nonradiological waste
- Transportation

Comment: The longer a reactor operates, the more nuclear waste it generates. The nation still has no workable solution for the disposal of deadly nuclear waste. (AE-3)

Comment: The NRC "believes that there is reasonable assurance that at least one mined geological repository will be available within the first quarter of the twenty-first century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor . . ." (10 CFR 51.23) What if there isn't? Since the commission rendered it's belief, it's become just as reasonable to assume that there may in fact not be a geological repository in the first quarter of this century, or the first half of it, for that matter. What then? (AE-13)

Comment: If the NRC relicenses Catawba, nuclear waste, whether stored in pools or in dry storage, would continue to accumulate over an additional 20 years of an extended license period. What "reasonable," to use the NRC's word, grounds are there for preferring that option to the no-option alternative in the Catawba SEIS? (AE-14)

Comment: The generic EIS, (6.4.6.7) states: "Within the context of a license renewal review and determination, the Commission finds that there is ample basis to conclude that continued storage of existing spent fuel and storage of spent fuel generated during the license renewal period can be accomplished safely and without significant, environmental impacts." Does that finding assume that a permanent repository will be built, or is the NRC stating that waste can be stored safely, without impacts, indefinitely? (AE-15)

Comment: In previous nuclear power plant relicensing documents, the NRC has failed to assign a level of significant impact to collective offsite radiological impacts from the fuel cycle and from high level waste and spent fuel disposal (NUREG 1437, Supplement 5, Chapter 6). If the NRC is tempted to reach a similar conclusion with the Catawba SEIS, it raises the question: How can the NRC claim that relicensing is a preferable alternative to the no-action alternative, when the waste disposal question is so uncertain that the NRC can't even assign it a level of significance? (AE-16)

Response: *Onsite storage and offsite disposal of spent nuclear fuel are Category 1 issues. The safety and environmental effects of long-term storage of spent fuel onsite has been evaluated by the NRC and, as set forth in the Waste Confidence Rule, the NRC generically determined that such storage could 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. At or before the end of that period, the fuel would be moved to a permanent repository. The GEIS is based upon the assumption that storage of the spent fuel onsite is not permanent. The plant-specific supplement to the GEIS regarding license renewal for Catawba will be prepared based on the same assumption. The comment provides no new information; therefore, the comment will not be evaluated further.*

A.1.9 Comments Concerning Alternative Energy Sources

Comment: We're always looking at new alternatives to better serve our customers. During this license renewal application process, we did look at many alternatives for providing-for generating baseload electricity, such as conventional fossil generation, wind, solar and photocells. But when compared to the amount of electricity generated by Catawba, these alternatives were not selected because of environmental impacts, land use requirements, inadequate electricity output and, finally, cost. (D-5)(S-5)

Comment: Any self-respecting environmental impact statement would have alternatives. And alternatives to the licensing extension of the Catawba Plants would be the focus on safer alternative energy, ones that would not be terrorist magnets, like wind farms. (H-9)

Comment: We need to look for other alternative types of things [energy sources] to move into as our need for energy grows. (N-3)

Comment: As far as alternatives go, we heard earlier from Duke Energy that they evaluated other sources of energy. However, what they didn't tell you is that in the Nuclear Regulatory Guide 1437, Volume 1, Section 0.81 [8.1], the NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable. So the alternatives that were not considered as reasonable power, some of which Duke Energy earlier claimed twice today, twice at McGuire that they did analyze and never really did, is [include] wind, photovoltaic cells, solar thermal power, hydroelectric generation, geothermal, wood waste, municipal solid waste, energy crops, delayed retirement of non-nuclear units, imported power, conservation and combination of alternatives. The only thing they did analyze was for replacement power alternatives is your basic centralized plants, such as conventional coal-fired, oil- and gas-fired, gas-fired only, combined cycle, advanced light water nuclear reactor, even though that's not necessarily technically feasible at this time. That remains to be seen. I would wager that the advances that have occurred in wind energy, although this isn't the best part of the world for it. (Q-4)

Comment: We also believe that energy alternatives have not been adequately addressed by the Duke license extension application. And the NRC must do a much better job than Duke did of evaluating realistic alternatives to a 19-year license extension of the Catawba and McGuire reactors. (W-4)

Comment: So what are the alternatives? There are alternatives. Get it straight, guys. There are alternatives, because we're not talking about today's jobs. We're talking about jobs that start, what, 20 years from now? Right. Well, guess what? All of the alternatives have jobs too. And guess what? Duke could provide them. So get it straight. Offshore wind is a great potential. If there's a single order for 500 megawatts of solar, it will be down below natural gas in its kilowatt hour charge. Just make one big order for solar, and it's going to be affordable. (Y-7)

Comment: I'd like to comment here tonight on the lack or the inadequate analysis done by Duke Energy in its submission for the license renewal at Catawba, the inadequate job done in analyzing alternative sources which could be used to generate the power, which is now provided by the Catawba Nuclear Station. (Z-1)

Comment: The State of South Carolina has a huge wind potential located offshore, out of sight of some of the beautiful beaches. (Z-2)

Comment: The National Environmental Policy Act requires that the NRC consider all reasonable alternatives to a proposal, including the no-action alternative. In this case, that would mean not renewing the license for the Catawba units. Public Citizen believes that inasmuch as the expiration dates on the current Catawba licenses are a staggering more-than two decades away, the most prudent and wise course the NRC could take would be to adopt a no-action alternative in the Catawba supplemental environmental impact statement (SEIS). What would be the environmental and socio-economic impacts of the no-action alternative? Given that the licenses at Catawba units 1 and 2 will expire in 2024 and 2026, respectively, it is hard to imagine the no-action alternative could conceivably lead to any additional negative environmental or socio-economic impacts on either the licensee, the community or the region's land, air and water. (AE-6)

Comment: How can the NRC justify the assertion (implicit if the relicensing alternative is preferred) that the impacts from relicensing will be smaller than the impacts from the no-action alternative, when relicensing is an event that as a practical matter doesn't take effect for more than two decades? (AE-9)

Comment: But wait-there's more! Because if you relicense now, the NRC will throw in a bonus analytical conclusion: no alternative energy sources are viable, and none will be–at least not for 40 years! (AE-11)

Comment: The generic EIS "assumes that conservation technologies produce enough energy savings to permit the closing of a nuclear plant." (NUREG-1437, Vol.1, 8.3.14). Is that true with respect to the Catawba plant? (AE-17)

Comment: What is the projected energy conservation from demand-side management in the Catawba service area over the next 20, 30 and 45 years? (AE-18)

Comment: By how much will new federal appliance energy standards, implemented or adopted since the GEIS was written, effect energy conservation in the Catawba service area over the next 20, 30 and 45 years? (AE-19)

Comment: The GEIS tends to dismiss solar and wind power as "baseline" sources of replacement. What is the potential of solar and wind power as replacement if considered as distributive sources, rather than baseline sources, over the next 20, 30 and 45 years? (AE-20)

Comment: What are the environmental and socio-economic impacts of solar and wind power if considered as distributive sources rather than baseline sources, and within that scenario, why would the impacts from the relicensing alternative be preferred. (AE-21)

Comment: Could a combination of alternatives, blending conservation, energy efficiencies, distributive power, including fuel cells, and renewable energy sources constitute a cost-effective replacement for the Catawba capacity? Is the prospect of such combination being cost-effective more, or less, likely in 20, 30 and 45 years? (AE-22)

Comment: In previous nuclear power plant relicensing documents, the NRC has dismissed combination alternatives, such as a mix of conservation and distributive power, as "not considered feasible at this time" (draft NUREG-1437, Supplement 5, 8.3). If the NRC is tempted to reach a similar conclusion with regard to Catawba, it begs the question: why does the NRC care what is feasible "at this time" when the applicant's current licensing is not going to expire for more than two decades? (AE-23)

Comment: If, after rigorous analysis of the questions raised above regarding alternative energy sources, it is determined that those sources may likely constitute a cost-effective alternative to relicensing, then, given the distant expiration dates of the applicant's current licensing, why is relicensing preferable to the no-action alternative? (AE-24)

Response: *The comments are noted. The GEIS included an extensive discussion of alternative energy sources. Environmental impacts associated with various reasonable alternatives to renewal of the operating licenses for Catawba Nuclear Station, Units 1 and 2, will be discussed in Chapter 8 of the SEIS.*

Comment: We have another economic problem, and maybe the EIS surprises me. Analyze it. Because there's a requirement to do cost/benefit analysis and comparison. Surprise me. Put in the alternative energies. (AA-4)

Response: *The comment is noted. A cost-benefit analysis is specifically excluded from the analysis of the impacts of license renewal. However, environmental impacts associated with various reasonable alternatives to renewal of the operating licenses for Catawba will be discussed in Chapter 8 of the SEIS.*

A.1.10 Comments Concerning Safety Issues Within the Scope of License Renewal

Comment: A subsidiary of Duke has been rapidly developing the buffer zone. So the buffer zone's going away. It's not–it's new information that the NRC needs to look at. (H-7)

Comment: I want to briefly mention that our concerns encompass issues like the aging of these reactors, impacts on the Catawba River, impacts on endangered species and microbial impacts. (Y-2)

Comment: There are some things about Catawba and McGuire that are pretty obvious. The containment system, the freeze-thaw cycle from the ice condenser technology, which is used is causing warpage so that doors and valves do not open properly, which creates safety conditions. (AA-1)

Comment: The Catawba Plant is one of the thin-walled, ice condenser designs and is more vulnerable to a catastrophic early containment failure that would release radioactive materials into the environment. (AB-3)(AF-3)

Comment: Whereas, the Catawba and McGuire nuclear plants represent four of only nine U.S. reactors with thin-walled, so called "ice-condenser" concrete containments that the Nuclear Regulatory Commission estimates are significantly more vulnerable to a catastrophic early containment failure that would release radioactive material to the environment. (AF-9)

Comment: Shortly after the Oconee Plant was relicensed, they found these initiation and growth of significant cracks in PWR Alloy 600 weldments, apparently at growth rates that are faster than previously modeled. So this represents what Dave Lockbaum, who's a nuclear scientist, nuclear engineer with the Union of Concerned Scientists, said that the aging failures that have occurred in the last few years indicate beyond a reasonable doubt that the aging management programs in support of relicensing are inadequate because they are not preventing equipment failures, such as the DC Summer hot leg nozzle to pipe weld crack that had some potential generic issues, such as they found that they were due to extensive weld repairs during construction occurred on those areas. It added stress to those. (Q-6)

Comment: Correct assessment of reactor vessel integrity. The reactor is currently limited to 200 refuelings, i.e. cycles of heating and cooling. It is subjected to the stress of internal pressure and to stresses due to the thermal gradients from inside to outside making for a differential in thermal expansion. Fatigue is the term used to characterize the losses of tensile properties due to repeated cycles of stress. Tensile property losses are also caused by irradiation from the reactor fuel. Coupons of the reactor metal are placed inside the reactor to monitor tensile property losses. But they are not subject to stress fatigue. As a result they do not accurately reflect the tensile properties of the fatigue-subjected reactor. (AG-1)

Comment: The reactor stud bolts are exposed to greater stress than the reactor vessel. Are they replaced at refuelings? Are they the same material as the vessel? On what evidence are the tensile properties of the stud bolts based? (AG-2)

Response: *The comments are noted. The NRC's environmental review is confined to environmental matters relevant to the extended period of operation requested by the applicant. To the extent that the comments pertain to safety of equipment and aging within the scope of license renewal, these issues will be addressed during the parallel safety review performed* *under 10 CFR Part 54. Operational safety issues are outside the scope of 10 CFR Part 51 and will not be evaluated further in the SEIS. The comments provide no new information and, therefore, will not be evaluated further in the context of the environmental review. However, the comments will be forwarded to the project manager for the license renewal safety review for consideration.*

Part II - Comments Received on the Draft SEIS

Pursuant to 10 CFR Part 51, the staff transmitted the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Catawba Nuclear Station Units 1 and 2, Draft Report for Comment* (NUREG-1437, Supplement 9, referred to as the draft SEIS) 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 in the NRC's electronic Public Document Room, its license renewal website, and at the York County Library in Rock Hill, South Carolina

- sent copies of the draft SEIS to the applicant, members of the public who requested copies, and certain Federal, State, and local agencies

- published a notice of availability of the draft SEIS in the *Federal Register* on May 21, 2002 (67 FR 35839)

- 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 Rock Hill, South Carolina, on June 27, 2002 to describe the results of the environmental review and answer related questions

- issued public service announcements and 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 four comment letters in addition to the comments received during the public meetings.

The staff has reviewed the public meeting transcripts and the four comment letters that are part of the docket file for the application, all of which are available in the NRC's electronic Public Document Room. Appendix A, Part II, Section A.2, contains a summary of the comments and the staff's responses. Related issues are grouped together. Appendix A, Part II, Section A.3, contains excerpts of the June 27, 2002, public meeting transcripts, the written statements provided at the public meetings, and comment letters.

Each comment identified by the staff was assigned a specific alpha-numeric identifier (marker). That identifier is typed in the margin of the transcript or letter at the beginning of the discussion of the comment. 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-2. The nine speakers at the meetings are listed along with the page of the transcript excerpts in this report on which the comment appears. These comments are identified by the letters A through J followed by a number that identifies each comment in approximate chronological order in which the comments were made. The four written comment letters are identified by the letters K through N. The accession number is provided for the written comments to facilitate access to the document through the Public Electronic Reading Room (ADAMS) http://www.nrc.gov/reading-rm/adams/login.html.

The staff made a determination on each comment that it was one of the following:

(1) A comment that was either related to support or opposition of license renewal in general (or specifically Catawba Nuclear Station Units 1 and 2) or that made a general statement about the license renewal process. It may have made only a general statement regarding Category 1 and/or Category 2 issues. In addition, it provided no new information and does not relate to safety considerations reviewed under 10 CFR Part 54.

(2) A comment regarding environmental issues pertaining to 10 CFR Part 51.

(3) A comment that raised an environmental issue that was not addressed in the GEIS or the DSEIS

(4) A comment regarding severe accident mitigation alternative analysis

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

Comments without a supporting technical basis or without any new information are discussed in this appendix, and not in other sections of this report. Relevant references that address the issues within the regulatory authority of the NRC are provided where appropriate. Many of these references can be obtained from the NRC Electronic Public Document Room.

Within each section of Part II of this appendix (A.2.1 through A.2.13), similar comments are grouped together for ease of reference, and a 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. Revisions to the text in the draft report are designated by vertical lines beside the text.

Table A-2. Comments Received on the Draft SEIS

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A-01	Tony Jenetta	Afternoon Meeting Transcript (6/27/2002) ML022000610	A-60	A.2.13
A-02	Tony Jenetta	Afternoon Meeting Transcript (6/27/2002)	A-61	A.2.13
A-03	Tony Jenetta	Afternoon Meeting Transcript (6/27/2002)	A-62	A.2.13
B-01	Gary Peterson	Afternoon Meeting Transcript (6/27/2002)	A-63	A.2.1
B-02	Gary Peterson	Afternoon Meeting Transcript (6/27/2002)	A-63	A.2.3
C-01	Ed Fitzgerald	Afternoon Meeting Transcript (6/27/2002)	A-64	A.2.13
C-02	Ed Fitzgerald	Afternoon Meeting Transcript (6/27/2002)	A-64	A.2.13
C-03	Ed Fitzgerald	Afternoon Meeting Transcript (6/27/2002)	A-64	A.2.13
C-04	Ed Fitzgerald	Afternoon Meeting Transcript (6/27/2002)	A-64	A.2.13
D-01	Mary Olson	Evening Meeting Transcript (6/27/2002) ML022000611	A-66	A.2.13
D-02	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-66	A.2.13
D-03	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-70	A.2.13
D-04	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-71	A.2.13
D-05	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-72	A.2.1
D-06	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-75	A.2.11
D-07	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-77	A.2.9
D-08	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-79	A.2.10
D-09	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-80	A.2.10
D-10	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-86	A.2.1
D-11	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-86	A.2.1
D-12	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-86	A.2.1
D-13	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-86	A.2.9
D-14	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-86	A.2.9
D-15	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-87	A.2.11
D-16	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-87	A.2.13
D-17	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-87	A.2.13
D-18	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-88	A.2.1
D-19	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-88	A.2.13
D-20	Mary Olson	Evening Meeting Transcript (6/27/2002)	A-88	A.2.10
E-01	Peter Sipp	Evening Meeting Transcript (6/27/2002)	A-67	A.2.13
E-02	Peter Sipp	Evening Meeting Transcript (6/27/2002)	A-89	A.2.13

Table A-2. (contd)

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
E-03	Peter Sipp	Evening Meeting Transcript (6/27/2002)	A-90	A.2.13
E-04	Peter Sipp	Evening Meeting Transcript (6/27/2002)	A-90	A.2.11
E-05	Peter Sipp	Evening Meeting Transcript (6/27/2002)	A-90	A.2.12
E-06	Peter Sipp	Evening Meeting Transcript (6/27/2002)	A-90	A.2.2
F-01	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-68	A.2.13
F-02	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-68	A.2.1
F-03	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-72	A.2.1
F-04	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-74	A.2.12
F-05	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-74	A.2.9
F-06	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-75	A.2.6
F-07	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-81	A.2.10
F-08	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-93	A.2.1
F-09	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-94	A.2.11
F-10	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-94	A.2.2
F-11	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-94	A.2.10
F-12	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-95	A.2.11
F-13	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-95	A.2.11
F-14	Gregg Jocoy	Evening Meeting Transcript (6/27/2002)	A-96	A.2.11
G-01	Tony Jenetta	Evening Meeting Transcript (6/27/2002)	A-79	A.2.9
H–01	Joe Troutman	Evening Meeting Transcript (6/27/2002)	A-83	A.2.9
I-01	Greg Robinson	Evening Meeting Transcript (6/27/2002)	A-85	A.2.3
I-02	Greg Robinson	Evening Meeting Transcript (6/27/2002)	A-85	A.2.3
J-01	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-91	A.2.13
J-02	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-91	A.2.12
J-03	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-91	A.2.2
J-04	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-92	A.2.13
J-05	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-92	A.2.11
J-06	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-92	A.2.13
J-07	Sherry Lorenz	Evening Meeting Transcript (6/27/2002)	A-93	A.2.13
K-01	M.S. Tuckman	Letter (8/9/2002)ML022270455	A-97	A.2.10
K-02	M.S. Tuckman	Letter (8/9/2002)	A-97	A.2.5
K-03	M.S. Tuckman	Letter (8/9/2002)	A-97	A.2.9
K-04	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.6
K-05	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.5
K-06	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.5
K-07	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.5
K-08	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.7
K-09	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.8
K-10	M.S. Tuckman	Letter (8/9/2002)	A-98	A.2.8

Table A-2. (contd)

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
K-11	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.5
K-12	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.5
K-13	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.5
K-14	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.7
K-15	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.7
K-16	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.5
K-17	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.5
K-18	M.S. Tuckman	Letter (8/9/2002)	A-99	A.2.5
K-19	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-20	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-21	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-22	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-23	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-24	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-25	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-26	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-27	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-28	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-29	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-30	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-31	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-32	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-33	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-34	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-35	M.S. Tuckman	Letter (8/9/2002)	A-100	A.2.10
K-36	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-37	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-38	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-39	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-40	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-41	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-42	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-43	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-44	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-45	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-46	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-47	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-48	M.S. Tuckman	Letter (8/9/2002)	A-101	A.2.10
K-49	M.S. Tuckman	Letter (8/9/2002)	A-102	A.2.11
K-50	M.S. Tuckman	Letter (8/9/2002)	A-102	A.2.12

Table A-2. (contd)

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
K-51	M.S. Tuckman	Letter (8/9/2002)	A-102	A.2.12
K-52	M.S. Tuckman	Letter (8/9/2002)	A-102	A.2.5
L-01	Gregory Hogue	Letter (8/13/2002) ML022380016	A-103	A.2.3
M-01	Gary Peterson	Letter (8/8/2002) ML022330373	A-103	A.2.10
M-02	Gary Peterson	Letter (8/8/2002)	A-103	A.2.10
M-03	Gary Peterson	Letter (8/8/2002)	A-104	A.2.10
N-01	Heinz Mueller	Letter (8/23/02) ML022000608	A-104	A.2.9
N-02	Heinz Mueller	Letter (8/23/02)	A-104	A.2.3
N-03	Heinz Mueller	Letter (8/23/02)	A-104	A.2.13
N-04	Heinz Mueller	Letter (8/23/02)	A-105	A.2.13
N-05	Heinz Mueller	Letter (8/23/02)	A-105	A.2.4
N-06	Heinz Mueller	Letter (8/23/02)	A-105	A.2.11
N-07	Heinz Mueller	Letter (8/23/02)	A-105	A.2.8

A.2 Comments and Responses on the Draft SEIS

Comments in this section are grouped in the following categories:

A.2.1 General Comments Concerning License Renewal Process

A.2.2 Comments in Opposition to Catawba Nuclear Station, Units 1 and 2

A.2.3 Comments in Support of Catawba Nuclear Station

A.2.4 Comments Concerning Groundwater Use and Quality

A.2.5 Comments Concerning Aquatic Ecology Issues

A.2.6 Comments Concerning Threatened and Endangered Species Issues

A.2.7 Comments Concerning Historic and Archaeological Resources

A.2.8 Comments Concerning Socioeconomic Issues

A.2.9 Comments Concerning Human Health/Radiological Issues

A.2.10 Comments Concerning Severe Accident Mitigation Alternatives Analysis

A.2.11 Comment Concerning Uranium Fuel Cycle and Waste Management Issues

A.2.12 Comment Concerning Alternatives To License Renewal

A.2.13 Comments Concerning Issues Outside the Scope of Environmental Review for License Renewal: Aging Management; NRC Role and Mission; Safeguards and Security; MOX Fuel; Hearings; Emergency Response and Planning; and Need for Power

A.2.1 General Comments Concerning License Renewal Process

Comment: I saw something in my incoming mail recently about a meeting that wouldn't constitute formal public participation but which I believe will be open to the public when NRC is going to be meeting with Duke in Charlotte. Could you please share with us present about that meeting, if anybody in the room knows about it?

It's at headquarters at Duke in July and it's on renewal. So if you don't know about it, maybe I imagined it. But could somebody get back to me? (D-05)

Response: *The NRC considers public involvement in, and information about, our activities to be a cornerstone of strong, fair regulation of the nuclear industry. We recognize the public's interest in the proper regulation of nuclear activities and provide opportunities for citizens to be heard. We encourage your participation and comments. Without more specifics about the meeting in question, the staff was not able to determine the exact meeting. The schedule for all public meetings can be found at http://www.nrc.gov/public-involve/public-meetings/meeting-schedule.html. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of this comment.*

Comment: I want to mention briefly that NIRS finds that with the passage of the generic environmental impact statement on license renewal that what the Nuclear Regulatory Commission refers to as a stable and reliable – is that the words that were used – process – predictable and reliable process – stable and predictable? I'm mangling this, forgive me. Is largely because of the number of issues that the public is categorically excluded in bringing up in the process. And therefore, we have not prioritized it as an opportunity for our membership to be active. (D-10)

Comment: So I just want to note that the participation that you see in this room this afternoon and this evening is fully due to the Nuclear Regulatory Commission's outreach efforts. (D-11)

Response: *The NRC considers public involvement in, and information about, our activities to be a cornerstone of strong, fair regulation of the nuclear industry. We recognize the public's interest in the proper regulation of nuclear activities and provide opportunities for citizens to be* *heard. We encourage your participation and comments. The comments did not provide significant, new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of these comments.*

Comment: Having said that, I want to step back and say I'm genuinely pleased and surprised by the results of this process in bringing up issues that I hear tonight the Nuclear Regulatory Commission staff is interested in pursuing, whether they are part of license renewal or not. These issues are that of hydrogen in ice condensers, hydrogen ignition, whether they should have backup power and whether the mixing of hydrogen and other gases in the atmosphere by fans and the backup power in the event of station blackout.

So again, I take off my hat to the NRC for finding some issues where they must challenge their own regulations and consider changing them. I already mentioned earlier that the National Academy of Science has come out with a new report that basically says the grid in the United States cannot be safeguarded and so this doubles my appreciation of NRC staff for identifying station blackout issues as primary for ice condenser reactors, Catawba in particular. (D-12)

Comment: The national labs and the NRC have put a lot of hard work into this report and as Rani Franovich pointed out, it's the stable and predictable process that the NRC gave us that allowed us to feel comfortable going into license renewal and really spending our energies to put our materials together and have been able to work in a very predictable fashion questions and answers in a very stable manner with the NRC that has led to the report that you're looking at tonight. (I-01)

Comment: We also would like to recognize the NRC staff for their hard work that they have developed and implemented a very thorough, effective and efficient license renewal process accompanying extensive environmental and technical reviews that you've heard here today. (B-01)

Response*: These comments concern the license renewal process in general. The Commission has established a process, by rule, for the environmental and safety reviews to be conducted to review a license renewal application. While the comments refer to the process, they do not provide significant, new information relevant to this Supplement and, therefore, they will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

Comment: We respect the fact that the Nuclear Regulatory Commission is in the review of security issues, we respect the fact that we probably will never know if any of our contentions were addressed. And yet, at what point does the public have the right to continue to assess these concerns in the context of public decision-making processes? (D-18)

Response: *This comment concerns the license renewal process in general. The Commission has established a process, by rule, for the environmental and safety reviews to be conducted to review a license renewal application. The NRC considers public involvement in, and information about, our activities to be a cornerstone of strong, fair regulation of the nuclear industry. We recognize the public's interest in the proper regulation of nuclear activities and provide opportunities for citizens to be heard. We encourage your participation and comments. Additional information on public participation can be found at http://www.nrc.gov/public-involve.html. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Comment: It takes two years to go from the thought, why don't I believe a gas power plant in my backyard, to having it back there generating electricity. So the fact that there's a 10-year window for the process of building a nuclear power plant does not impact the supply of electricity, because you can go, as I say, from thought to producing electricity in two years. Do you guys have an opportunity to evaluate those kinds of questions in the process of...Today, we've gotten to the point to where that lead time is two years. So the rush to do this before they're even halfway through their current license is no longer valid. If part of what you're concerned about is we're going to need a long lead time for nuclear stuff, there are alternatives to nuclear that can be done in two years, we can have generating capacity right away. (F-02)

Response: *This comment concerns the license renewal process in general. The Commission has established a process, by rule, for the environmental and safety reviews to be conducted to review a license renewal application. Applications for license renewal are submitted years in advance, for several reasons. If a utility decides to replace a nuclear power plant, it could take up to 10 years to design and construct new generating capacity to replace that nuclear power plant. In addition, decisions to replace or recondition major components can involve significant capital investment. As such, these decisions may involve financial planning many years in advance of the extended period of operation. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Comment: Forgive me if it sounds like this is a done deal to me, but it sounds like it's a done deal. You guys have decided this is hunky-dory. Am I misunderstanding? Everything you've just said says we've decided this thing is cool. I'm just saying that you are telling us that as far as the staff of the NRC is concerned, there are no environmental problems with relicensure. I just want to make sure that we were clear that the NRC staff feels that there is no – that the options of not relicensing are worse than the option of relicensing. (F-03)

Response: *This comment concerns the license renewal process in general. The Commission has established a process, by rule, for the environmental and safety reviews to be conducted to* *review a license renewal application. In the draft, it was the NRC staff's preliminary recommendation that the Commission determine that the adverse environmental impacts of license renewal for Catawba Units 1 and 2 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation was 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 received during the scoping process. This recommendation has been adopted in this SEIS. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Comment: And I have to reiterate once again, don't be persuaded by Duke Energy's reputation in the community. Of course, they're well-liked, they employ a lot people, they pay a lot of tax money. That doesn't mean that the technical questions that you folks are supposed to be investigating are any less serious because Duke Energy has the support of the public. You have to get down to the brass tacks and make a decision about whether or not the things that are proposed are safe and sound for us and for our families. (F-08)

Response: *This comment concerns the license renewal process in general. The Commission has established a process, by rule, for the environmental and safety reviews to be conducted to review a license renewal application. The NRC's mission is three-fold: to protect public health and safety; to protect the environment; and to provide for the common defense and security. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

A.2.2 Comments in Opposition to Catawba Nuclear Station, Units 1 and 2

Comment: Why then don't we all stand up to them and say no more, no more deadly chemicals, no more playing with our future? Ladies and gentlemen, I am asking you why are you ready to throw your lives away for profits? Even the profits of a foreign country, a country that is hundreds and hundreds of miles away and doesn't give a rip whether you're dying of cancer or you're blown into 1000 pieces. And by this, I mean France. (J-03)

Comment: So I'm in favor of no new license. Sorry, but that's not good enough, it really isn't. (E-06)

Comment: The contortions evident in this document are a testament to the inability of the Commission and its staff to admit the nuclear power plant impacts are not small. (F-10)

Response: *The comments oppose license renewal at Catawba Nuclear Station, Units 1and 2, and are general in nature. The comments did not provide significant, new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

A.2.3 Comments in Support of Catawba Nuclear Station

Comment: And based on our initial review, Duke Power agrees with the conclusions of the report. (B-02)

Comment: We have taken a look at the draft environmental impact statement, and from our initial review from specialists, we agree with the conclusions of the report. (I-02)
Comment: The Department of the Interior has reviewed the referenced document and we have no comments to provide at this time. (L-01)

Comment: Based on the sufficiency of information, alternatives evaluation, and potential environmental impacts over which EPA has authority, the document received a rating of "EC-1," (Environmental Concerns - Adequate Information). (N-02)

Response: *The comments were in support of the DSEIS's conclusions. The comments did not provide significant, new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

A.2.4 Comments Concerning Groundwater Use and Quality

Comment: Section 4.5 discusses groundwater use and quality. The document (page 4-35) mentions that the facility uses <100 gpm from three existing groundwater wells (page 2-6). We note the statement on page 4-36 "*It is impossible to reliably predict the quantity of future withdrawals and groundwater demands over the renewal term.*" A similar statement on page 4-14 is made regarding surface water withdrawals. Information regarding the anticipated growth rate in the consumer service area and other applicable factors may provide information on future power demands and consequently water needs. (N-05)

Response: *The comment addresses groundwater use and quality. The Supplement has been revised as appropriate.*

A.2.5 Comments Concerning Aquatic Ecology Issues

Comment: Page 1-9, Line 8: From Table 1-1, under Column reading "Permit Expiration or Consultation Date": The permit expiration date is listed as "April 30, 2006". The NPDES permit issue date was April 30, 2001, however the permit was not issued until well into the 5-year cycle. Therefore the expiration date on the permit is not the full 5 years from date of issue. Correct the permit expiration date to be “June 30, 2005”. (K-02)

Comment: Page 2-14, Line 34: “4916 ha (12,139 ac)” should read “4,917 ha (12,149 ac)” (K-05)

Comment: Page 2-14, Line 35: The statement “Full pond was achieved in 1904…” is somewhat misleading. Construction of a much smaller dam was completed in 1904. This dam was completely covered by the current and much larger Wylie dam which resulted in a significantly larger reservoir. Change the statement to read: “The lake was initially impounded in 1904. Present full pond was obtained in 1924 with an increase in the dam height. (K-06)

Comment: Page 2-16, Line 1: “Duke owns the land that underlays the lake…” is not entirely correct. Change the statement to read: “Duke either owns the land under the lake or owns flood rights to the land under the lake”. (K-07)

Comment: Page 2-36, Line 5: “4912 ha (12,139 ac)” should read “4,917 ha (12,149 ac)” (K-11)

Comment: Page 2-38, Line 31: “4912 ha (12,139 ac)” should read “4,917 ha (12,149 ac)” (K-12)

Comment: Page 2-38, Line 34: Duke owns eight (not nine) public recreational access locations on Lake Wylie and one additional access location immediately downstream of the lake. Of these nine access areas, only two (not 3) are leased to other operators. (K-13)

Comment: Page 2-49, Line 22: Line Reads: “This lake was formed by impounding the water of the Catawba River, and full pond was achieved in 1904.” Correct the sentence to read: "This lake was formed by impounding the water of the Catawba River in 1904.” (K-16)

Comment: Page 2-49, Line 24: “4912 ha (12,139 ac)” should read “4,917 ha (12,149 ac)” (K-17)

Comment: Page 4-14, Line 40-41: Statement reads: Based on Catawba-specific experience, a review of available technical literature on thermophilic organisms, and the fact that there is little Heated. This sentence is incomplete. (K-18)

Comment: Page E-2, Line 11: Expiration date of NPDES wastewater permit is 6/30/05 rather than 4/30/06. (K-52)

Response: *The comments concern aquatic resource issues. The Supplement has been revised as appropriate.*

A.2.6 Comments Concerning Threatened and Endangered Species Issues

Comment: What about the spider lily? I understood what you said about one of these endangered species–thank you so much, that's a pretty picture – I think it was the little flower thing, the little plant there, you said is like not in Lake Wiley, it's in tributaries further down, but it could potentially be in Lake Wiley if it were brought in, something like that?

The mussel, that's the one, yeah. Is the same not true for the spider lily. Could it not be brought from Lansford Canal State Park and, you know – since it's in tough straits, is that not a consideration too? (F-06)

Response: *The spider lily is a Federal and State-listed species of concern. Based on field surveys, this species is not known to occur on the Catawba site, the transmission line rights-of-way or at Lake Wylie, though there is potential habitat in these areas. The Carolina heelsplitter is a Federal and State-listed aquatic species with the potential to occur in Lake Wylie or in streams in the transmission line rights-of-way. All known occurrences of this species in the Catawba River system are limited to small tributary streams located downstream of Lake Wylie (FWS 1996). In addition, a survey conducted in the Catawba River downstream of Lake Wylie failed to locate the species (Duke 2002b); thus, it is highly unlikely this species could be found in Lake Wylie as a consequence of downstream movement of spawn. This species has not been observed in Lake Wylie or in streams along the transmission line rights-of-way. Current and future ecological surveys and monitoring programs conducted in these areas have the spider lily and the Carolina heelsplitter on a watch list. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

Comment: Page 2-14, Line 14: The term "conservation easements" should be replaced with "protection of rare species". Duke does not currently have conservation easements with SCDNR for transmission ROWs. (K-04).

Response: *The comment addresses threatened and endangered species issues. The Supplement has been revised as appropriate.*

A.2.7 Comments Concerning Historic and Archaeological Resources

Comment: Page 2-16, Line 9: The fenced cemetery referenced as part of the site is not part of Catawba Nuclear site. The site is owned and operated by the Concord Cemetery Association. (K-08)

Comment: Page 2-48, Line 25: The Concord Cemetery is not located within the Catawba site, but adjacent to it. The cemetery is owned and operated by the Concord Cemetery Association. (K-14)

Comment: Page 2-48, Line 37: The Concord Cemetery is not located within the Catawba site, but adjacent to it. The cemetery is owned and operated by the Concord Cemetery Association. (K-15)

Response: *The comments address historic and archaeological resources issues. The Supplement has been revised as appropriate.*

A.2.8 Comments Concerning Socioeconomic Issues

Comment: Page 2-36 states that noise from the facility is "...noticeable but not obtrusive." Please clarify this decibel level. (N-07)

Response: *The description of noise level from the facility is subjective. Although actual noise surveys were not conducted, by observation, the staff concluded that noise from the facility was noticeable but not obtrusive. The comment did not provide significant, new information relevant to this Supplement and therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

Comment: Page 2-27, Line 24-25: From Table 2-4, under Column reading "Number of Personnel": Currently reads:
Other – NC 95
Other – SC 96
In order to correctly reflect the number counts as given in Table 2-5, change to:
Other - NC 112
Other - SC 79
(K-09)

Comment: Page 2-32, Line 24-25: Lines Read: "There are 24 counties within the 80-km (50 mi) radius of the Catawba site: 13 in South Carolina and 10 in North Carolina. The 23-county area is served by 3 major interstate freeways." Correct the sentences to read: "There are 24 counties within the 80-km (50 mi) radius of the Catawba site: 11 in South Carolina and 13 in North Carolina. The 24-county area is served by 3 major interstate freeways." (K-10)

Response: *The comments address socioeconomic issues. The Supplement has been revised as appropriate.*

A.2.9 Comments Concerning Human Health/Radiological Issues

Comment: I gather from what you said that this monitoring is self-monitoring done by Duke, is that right? In the radiological impact section that you were doing? (F-05)

Comment: In regards to the dosimeter readings of the individual receiving it away from the plant, who in addition would have authority to measure that within the county? Would the York County Emergency Preparedness agency have a role in that? Would there automatically be a procedure to measure this in addition to Duke measuring it on their own perimeter. Would Duke measure it beyond their perimeter or is there another agency that will constantly monitor to dosage for the individual? (G-01)

Response: *Radiological issues are Category 1 issues and are discussed in Section 2.2.7 of this SEIS. Duke has conducted a radiological environmental monitoring program (REMP) around the Catawba site since 1981. The radiological impacts to workers, the public, and the environment have been carefully monitored, documented, and compared to the appropriate standards. The REMP includes monitoring of the air, direct radiation, surface water, drinking water, groundwater, shoreline sediment, milk, fish, broadleaf vegetation, and food products in about a 24-km (15-mi) radius of the station. The South Carolina Department of Health and Environmental Control also performs radiological monitoring in the vicinity of Catawba. The comments did not provide significant, new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments*.

Comment: When it comes to radiological impacts, the Commission chooses to regulate in terms of millirems and I'd like you to tell me how I know how many millirems I got today. So it's fair to say, however, that averages are used and models are used and that we don't really know when it comes to the general public, how much we each get. Is that maximally exposed individual an infant or an adult? (D-07)

Response: *Radiation doses are routinely measured with a dosimeter in the nuclear industry. The average dose equivalent to the U.S. population is 360 millirem/year. This comes from various sources including natural sources such as radon, environmental sources, consumer products and occupational exposure. While current radiation dose limits (NRC 1993) are based on the International Commission on Radiological Protection 1977 guidance (ICRP 1977) as published by the U.S. Environmental Protection Agency (EPA 1987), the evidence gathered since that time has not changed the risk assessment significantly. See, for example, summaries by National Council on Radiation Protection and Measurement (NCRP 2001) and United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR 2001b). These risk assessments, which incorporate the latest scientific research from around the world,* *generally rule out the existence of radiation risks that differ much from the ICRP guidance of 1977. Managing radiation risks using current dose limits and ALARA programs is consistent with safety as defined by the political process in the United States.*

The regulations for protecting the public are intentionally conservative and provide adequate protection for the public, for all ages and radiosensitivity, including fetuses, infants, and children. The average dose to a member of the critical group is represented by the average of the doses for all members of the critical group, which in turn is assumed to represent the most likely exposure situation. For example, when considering whether it is appropriate to "release" a building (allow people to work in the building without restrictions) that has been decontaminated, the critical group would be the group of regular employees that would work in the building. If radiation in the soil is the concern, then the scenario used to represent the maximally exposed individual is that of a resident farmer. The assumptions used for this scenario are "prudently conservative" and tend to overestimate the potential doses. The added sensitivity of certain members of the population, such as pregnant women, infants, and children, are accounted for in the analysis. However, the most sensitive member may not always be the member of the population that receives the highest dose. This is especially true if the most sensitive member (for example, an infant) does not participate in specific activities that may provide the greatest dose or if he/she does not eat specific foods that cause the greatest dose.

Additional information on radiation protection can be found at http://www.nrc.gov/what-we-do/radiation.html. Radiological issues are Category 1 issues and are discussed in Section 4.3 of this SEIS. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.

Comment: Baby teeth reminds me of the strontium-90 that's building up in the teeth of children in this area most likely. The tooth fairy project undertaken by Jay Gould and others has shown that children who live downwind of nuclear reactors in the United States do in fact have more strontium 90 than children who live in other areas, even though atmospheric bomb testing is over.

But we're not allowed to bring that issue to the question of whether Catawba 1 and Catawba 2 should continue to operate in this neighborhood. We're not allowed to bring that issue because it would be challenging current regulations. (D-13)

Response: *The comment implies the strontium-90 (Sr-90) measured in people near nuclear plants must have come from nuclear plants, which is not the case.*

Interpretation of measurements of radioactive materials in people is difficult unless one knows what each individual was exposed to, when the exposures occurred, and by what routes they occurred (ingestion, inhalation, etc). Travel of the individual being studied must be accounted for, since even a couple of days in a high-fallout area could swamp any effect of local exposures if inhalation were suspected to be a primary route. In particular for Sr-90, dietary contributions from foodstuffs produced out of the region must be considered. Finally, migration must be accounted for to interpret measurements, because people may have lived somewhere else for the better part of their lives.

Substances in the human body are dynamic, not static. This includes radioactive and non-radioactive substances. The dynamic processes include intake of material; uptake to systematic circulation from the gastrointestinal tract, respiratory tract, or skin; translocation throughout the body system; retention over time; and elimination via excretion and radioactive decay. Thus, even in deciduous teeth, the time course of exposure leading to intake and all other dynamic processes must be considered to interpret measurements. Very little Sr-90 is released from a nuclear power reactor, and little if any Sr-90 found in the environment can be directly attributed to reactor effluents. Even in the event that any measurable Sr-90 can be found in a person living near Catawba or any other nuclear reactor, the Sr-90 cannot be absolutely attributed to the releases from the reactor. Radiological issues are Category 1 issues and are discussed in Section 4.3 of this SEIS. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.

Comment: But I cannot accept – and I have said before and I will say again – that the NRC's own finding that the 20 years of operation of each of these reactors, when only considering the off-site dose, when considering routine releases, routine operations and no accidents, perfect – Duke delivering perfection – will result in 12 excess cancer deaths per 20 years of operations. That, when you do the math, results in 24 people for two units for 20 additional years, and when you add the fact that each of these units already has 40 years of license, a total of 36 cancer deaths each. So now we come up with a total of 72, since there's two units. And then, because there's one non-fatal cancer for every fatal cancer generated with no accidents, with no problems, we're talking about 144 cancers from these two units in their 60 years of operations. And this doesn't even include handling the high level waste. (D-14)

Response: *There has been much concern and confusion regarding the statements in a Federal Register Notice (66 FR 39277) dated July 30, 2001 regarding potential long term health effects that may occur as a result of radiation doses from an additional 20 years of operation of nuclear power plants as a result of license renewal. According to 10 CFR Part 51, Subpart A, Appendix B, Table B-1, "... the 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about*

14,800 person-rem or 12 cancer fatalities, for each additional 20 year power reactor operating term."

This calculated value of 12 additional deaths from fatal cancer over the 20 years of additional operation of a nuclear power plant is the result of several conservative assumptions. This value is, in fact, a calculated upper bound value. It does not mean that 12 people will die from cancer over the next 20 years of continued power plant operation.

These calculations use the concept of collective dose. Collective dose estimates the effects across a very large population, assuming that a small amount of radiation dose spread out among a large population would yield similar effects of a larger amount of radiation dose to a much smaller population. The Health Physics Society, www.hps.org, published a white paper to explain collective dose. The paper states, "[b]elow the dose of ten rem, estimations of adverse health effect is speculative. Collective dose remains a useful index for quantifying dose in large populations and in comparing the magnitude of exposure from different radiation sources. However, for a population in which all individuals receive lifetime doses of less than 10 rem above background, collective dose is a highly speculative and uncertain measure of risk and should not be quantified for the purposes of estimating population health risks." According to NCRP Report 92, "Public Radiation Exposure from Nuclear Power Generation in the United States," the collective effective dose equivalent to regional populations normalized to a 1 gigawatt power reactor operation is 4.8 person-rem per year. The total contribution from the complete uranium fuel cycle, which includes uranium mining and milling, is 136 person-rem per year.

The cancer risk factors used in this calculation are also quite conservative. They are from the BEIR-V report, "Health Effects of Exposure to Low Levels of Ionizing Radiation." In this report, it is estimated that, "[i]f 100,000 persons of all ages received a whole body dose of 0.1 Gy (10 rad) of gamma radiation in a single brief exposure, about 800 extra cancer deaths would be expected to occur during their remaining lifetimes in addition to the nearly 20,000 cancer deaths that would occur in the absence of radiation. Because the extra cancer deaths would be indistinguishable from those that occurred naturally, even to obtain a measure of how many extra deaths occurred is a difficult statistical estimation problem.

The NRC estimations of risk to arrive at the statistically calculated value of 12 deaths assumes tiny doses summed over large populations. It further assumes the "linear no threshold" theory that some effect will result from some dose, however small the dose, and it assumes that even these tiny doses have some statistically adverse health effect. As stated in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, "In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses." Conversely, it cannot be sure that there will be any cancer fatalities from these low doses. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be *evaluated further. There were no changes made in this Supplement as a result of the comment*.

Comment: I recently had a nuclear stress test done in Rock Hill here at a doctor's office. They injected several radioactive isotopes into my blood while I was exercising and took pictures with special equipment and so forth. But I work at the Catawba station, I don't, as you might understand, deal with radiation, I don't go inside the radioactive areas. However, I was talking to some of the folks that administer the people that do, and just in conversation it came up that I received the number of micro-curies that's really almost equivalent to the number of curies that would be allowed to be released by the Catawba station in a year, they injected it into my body for this test. But my question is would you be surprised to say that that would be accurate, that that number probably was fairly comparable to the limits that the Catawba station operates under? (H-01)

Response: *The doses received by patients during medical diagnostic procedures are in many cases much greater than would be allowed to workers in a year under NRC regulations and almost invariably much greater than doses NRC permits members of the public to receive from nuclear power plant operations. Radiological issues are Category 1 issues and are discussed in Section 4.3 of this SEIS. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

Comment: Page 2-4, Line 38: Line 38 should be revised to state: "….5.0 percent by weight uranium-235." (K-03)

Response: *Section 2 has been revised as suggested by the comment.*

Comment: EPA Region 4's review of this DGSEIS found no issues related to nuclear or environmental radiation which were significant enough to comment on or ask for clarification. However, EPA does not regulate the radioactive component of any waste streams; that is the responsibility of the Nuclear Regulatory Commission (NRC). The NRC regulates the alpha, beta, and gamma radioactivity of all the waste streams at nuclear plants. (N-01)

Response: *The comment concerns a Category 1 issue that is discussed in Section 4.3 of this Supplement. The comment did not provide significant, new information relevant to this Supplement and, therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

A.2.10 Comments Concerning Severe Accident Mitigation Alternatives Analysis

Comment: Regarding postulated accidents and hydrogen explosions during loss of power, the SAMA should be implemented as a part of a license renewal. Section 5 – Environmental Impacts of Postulated Accidents... In the report, the staff concluded that the SAMA that would establish hydrogen control in SBO events by providing backup power to igniters must be cost beneficial. But the staff does verbal double back flip to avoid applying the analysis to license renewal, saying: "However, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of the license renewal pursuant to 10 CFR Part 54." [Page 5-29]. The severe accident mitigation alternative should be implemented as a requirement in the Catawba license renewal process. (F-11)

Response: *The staff concluded that the SAMA that would establish hydrogen control in SBO events by providing back-up power to igniters is cost-beneficial under certain assumptions. However, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54. The need for plant design and procedural changes will be resolved as part of GSI-189 and addressed for Catawba and all other ice-condenser plants as a current operating license issue.*

The comment did not provide significant, new information relevant to this Supplement and, therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of the comment.

Comment: At the same time, when and at what point will these cost/benefit analyses begin to be impacted by new information like the National Academy of Science's report saying that the grid is highly vulnerable to attack and at what point does, you know, something like the dedicated line become cost effective? (D-08)

Comment: And all I can say is that I offered in very good faith to Duke the idea of using hydroelectric generation on the site of the reactor as an ultimate form of insurance, as long as that dam is there, that the reactor could be cooled in the event of station blackout. And I think it's time to take that teeter-totter and put the full weight of the national security issues on the other end of whether it is cost effective to back up Catawba 1 and 2 with its own on-site dedicated line to the electric generation that is also on site. (D-20)

Response: *The Commenter asks that the NRC consider national security issues and the vulnerabilities of the grid when it assesses the cost differences of a dedicated line for electrical supply. However, the staff's position is that NEPA does not require the NRC to evaluate the effects or impacts of a speculative and unquantifiable event. Likewise, consideration of the* *costs associated with these events is also not required. Nevertheless, the methodology employed by Duke in conducting its SAMA analysis for Catawba did consider installation of a dedicated line from the nearby hydroelectric facility and concluded that it was not sufficiently cost-beneficial to merit further consideration.*

The comments did not provide significant new information relevant to this Supplement and, therefore, they will not be evaluated further. There were no changes made to this Supplement as a result of the comments.

Comment: Since this power plant has been in operation for some period of time, how is it that you just now came to the conclusion that hydrogen control and installation of water tight wall being further evaluated as a current operating license issue was something that should be addressed? Didn't this kind of work go on before? Didn't someone throw up a red flag somewhere down the line and say, you know what, there's one of these generators out here that doesn't even have a water-tight wall around it? (F-07)

Response: *In accordance with Generic Letter 88-20, every licensee was required to perform an Individual Plant Examination (IPE) for both internally- and externally-initiated events at their plants. The major objective of these studies was to identify and eliminate any potential vulnerabilities in the design or operation of the plant that could lead to core damage or containment failure. Vulnerabilities identified through the studies were addressed by licensees, generally through hardware or procedure changes. Additional improvements to further reduce risk were also identified and evaluated by the licensee for possible implementation. Enhancement of the hydrogen control system as well as installation of a water tight wall were considered by Duke as part of the IPE and a follow-up design study. However, these improvements were not implemented because neither was found to be cost effective by Duke based on their assessment. As part of license renewal, the NRC staff reevaluated these potential improvements using a cost/benefit methodology and assumptions consistent with NRC guidelines for performing regulatory analyses. Using this methodology, these plant improvements are cost-beneficial as discussed in Chapter 5 of this Supplement. By letter dated August 8, 2002, Duke committed to designing and scheduling the installation of flood protection for the 6900/4160 V transformers.*

The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in the Supplement as a result of the comment.

Comment: But my other question I'd give you is can you reflect on when these cost/benefit analyses are done? You know, you balancing against potential fatalities, well, what's the number? What's the cost of a death? (D-09)

Response: *The cost benefit analysis presented in Chapter 5 was performed in accordance with NRC's guidelines for performing regulatory analysis. These guidelines are described in NUREG/BR-0058, Revision 3, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," and NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook." The regulatory analysis provides a formal, reasoned analysis of a potential plant change, and contains estimates of benefits and costs that are quantified to the extent possible. Within the guidelines, a conversion factor of $2000 per person-rem has been adopted, which represents the product of the dollar value of a statistical life ($3 million) and a risk coefficiant that establishes the probability of stochastic health effects attributable to radiological exposure (approximately 7E-4). The basis for these values is described in NUREG-1530, "Reassessment of NRC's Dollar Per Person-Rem Conversion Factor Policy."*

The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in the Supplement as a result of the comment.

Comment: Page xix, Line 12-14: The staff's conclusion statement contained in these lines contradicts the staff conclusion statement contained in Section 5.2.7, page 5-28, lines 20-21. (K-01)

Response: *The Executive Summary has been revised to reflect the conclusions in Section 5.2.7.*

Comment: Page 5-6, Line 20: 5.8E-05/ry should be 5.8E-05/yr Duke's reported risk estimates are base on a calendar year basis, not a reactor year basis. The capacity factor used in the PRA is 0.9. (K-19)

Comment: Page 5-6, Line 25: (2 cases) "per reactor-year" should be "per year" (K-20)

Comment: Page 5-7, Line 17: Table 5-3 - Heading "Frequency (per reactor-year)" should be Frequency (per year) (K-21)

Comment: Page 5-8, Line 23" "reactor-year" should be "year" (K-22)

Comment: Page 5-8, Line 26: "per reactor-year" should be "per year" (K-23)

Comment: Page 5-9, Line 2: "per reactor-year" should be "per year" (K-24)

Comment: Page 5-9, Line 3: "per reactor-year" should be "per year" (K-25)

Response: *Section 5.2.2.1 has been revised as suggested by the comments.*

Comment: Page 5-11, Line 10: “per reactor-year” should be “per year” (K-26)

Response: *Section 5.2.2.2 has been revised as suggested by the comment.*

Comment: Page 5-12, Line 25: “per reactor-year” should be “per year” (K-27)

Comment: Page 5-12, Line 29: “per reactor-year” should be “per year” (K-28)

Comment: Page 5-14, Table 5-5 Footnote (a): “per reactor-year” should be “per year” (K-29)

Comment: Page 5-14, Table 5-5 Footnote (b): “per reactor-year” should be “per year” (K-30)

Comment: Page 5-15, Line 10, Table 5-6: The cost of enhancement provided by Duke for the back-up power to the igniters ($540,000) is a per unit cost and should not be divided by 2. One of the major cost categories for the candidate modification is in the installation labor, primarily pulling cables. It was judged that finding a location for the diesel that would allow it to serve either unit would dramatically increase the cable pulling cost component. As such, it was judged that having a diesel for each unit would be less expensive (given the low cost of the hardware) than pulling cables to both units from a single location. (K-31)

Comment: Page 5-15, Line 22 Table 5-6: Delete Footnote (c) (K-32)

Response: *Section 5.2.3.1 has been revised as suggested by the comments.*

Comment: Page 5-17, Line 28: “per reactor-year” should be “per year” (K-33)

Comment: Page 5-17, Line 29: “per reactor-year” should be “per year” (K-34)

Comment: Page 5-17, Line 35: “per reactor-year” should be “per year” (K-35)

Response: *Section 5.2.4 has been revised as suggested by the comments.*

Comment: Page 5-19, Line 17: “$205,000 per site” should be “$205,000 per unit” (K-36)

Comment: Page 5-19, Line 24: “$540,000 per site” should be “$540,000 per unit” (K-37)

Comment: Page 5-19, Line 27-29: The sentence, “In order to provide ...” should be deleted as it is not appropriate to divide these costs by 2. (K-38)

Comment: Page 5-19, Line 36-38: The sentence, “Duke further noted that ...” should be modified. The discussion that Duke provided relative to powering the air-return fans was in the context of powering the igniters. The mixing afforded by the fans may or may not be significant to the effectiveness of PARs, but in any case Duke provided no position on the need for fans when using PARs. (K-39)

Response: *Section 5.2.5 has been revised as suggested by these comments. In addition, the sentence addressed by Comment K-39 has been moved to the preceding paragraphs.*

Comment: Page 5-22, Line 34: 3.81E+08 should be 3.1E+08 see page 12 of Attachment H (K-40)

Response: *Section 5.2.6.1 has been revised as suggested by the comment.*

Comment: Page 5-25, Line 14: “30 percent” should be “24 percent”. See Table 5-3 of the SEIS. (K-41)

Comment: Page 5-25, Line 29: “per reactor-year” should be “per year” (K-42)

Comment: Page 5-25, Line 30: “per reactor year” should be “per year” (K-43)

Comment: Page 5-26, Line 3-5: The discussion concerning NUREG/CR-6427 should more accurately characterize the insights from the NUREG. This NUREG provided a simplified level 2 analysis for the purpose of investigating the importance of DCH. The conservative assumptions applied in this analysis with regard to hydrogen generation and the probability of ignition make it useful for understanding the uncertainties associated with early containment failure probabilities. The NUREG should not be interpreted as the latest information with respect to a realistic or best-estimate evaluation of the potential for early containment failure as a result of hydrogen combustion during station blackouts. (K-44)

Comment: Page 5-26, Line 3: “per reactor-year” should be “per year” (K-45)

Comment: Page 5-26, Line 20: (2 cases) “per reactor-year” should be “per year” (K-46)

Comment: Page 5-27, Line 5 and 9 Table 5-7: $270,000 should be $540,000 and $102,5000 should be $205,000. The cost provided by Duke are per unit costs and should not be divided by 2. (K-47)

Comment: Page 5-27, Line 11-13 Table 5-7: Delete Footnote (a) (K-48)

Response: *Section 5.2.6.2 has been revised as suggested by the comments.*

Comment: Section 5.2.7 of Reference 1 identifies two Severe Accident Mitigation Alternatives (SAMAs): one to provide back-up power to the hydrogen igniters for Station Blackout (SBO) events and the other to install flood protection around the 6900/4160 volt transformers. Catawba has reviewed these two SAMA's and concurs with the NRC that these two SAMAs are not within the scope of license renewal and should be addressed separate from any license renewal proceedings. (M-01)

Comment: For the first SAMA, concerning the installation of back-up power to the hydrogen ignition system during a SBO event, Catawba agrees with the NRC staff the depending on the design requirements there may be a cost-beneficial modification that provides sufficient alternative power during a SBO to the hydrogen ignition system. (M-02)

Comment: For the second SAMA, concerning the installation of flood protection around the 6900/4160 volt transformers, Catawba also agrees with the NRC staff conclusion in Reference 1. (M-03)

Response: *The commentor agrees with the staff's conclusions. The comments did not provide new information relevant to this Supplement and, therefore, these comment will not be evaluated further. There were no changes made in this Supplement as a result of the comments*.

A.2.11 Comment Concerning Uranium Fuel Cycle and Waste Management Issues

Comment: And can we talk about that waste, the fact that 20 more years of generation of electricity for two units is effectively a whole new 1000 – or we heard earlier 1129 megawatt – electrical generation reactor? Because, you know, 40 more years, that's like a whole new unit. That's going to be a whole new unit's worth of high level waste either staying here or traveling somewhere. But we can't bring that up. (D-15)

Comment: Nuclear power is a great thing, but the waste, what are we going to do with it? Nobody wants it – oh, well. What are we going to do with it? Nobody wants it. Nevada sure doesn't want it, they don't even have a reactor in that state and oh, we're going to put it out there. We'll get it out of my yard, I don't want it, put it somewhere in Nevada. (E-04)

Response: *Onsite storage and offsite disposal of spent nuclear fuel are Category 1 issues. The safety and environmental effects of a long-term storage of spent fuel onsite has been evaluated by the NRC and, as set forth in the Waste Confidence Rule, the NRC generically determined that such storage could 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. At or before the end of that period, the fuel would be moved to a permanent* *repository. The GEIS is based upon the assumption that storage of the spent fuel onsite is not permanent. The plant-specific Supplement to the GEIS regarding license renewal for Catawba Station, Units 1 and 2 is based on the same assumption.*

The comments did not provide significant, new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.

Comment: Page 6-6, Line 25: This page presents a brief chronology of events that have occurred in the area of high level waste disposal subsequent to the GEIS being published in 1996. The chronology ends at the President's recommendation in February 2002. While it may seem a bit odd for this type of information to be contained in an environmental document, Duke believes that the chronology should remain in the SEIS and should be updated to reflect significant events that have taken place since then. For example: "On April 8, 2002, Governor Guinn of Nevada issued a "Notice of Disapproval" regarding the recommendation of the President. As required by the Nuclear Waste Policy Act, the matter was then referred to the Congress. Subsequently, [insert final decision of Congress and date]." (K-49)

Response: *The comment addresses uranium fuel cycle and waste management issues. The Supplement has been revised as appropriate.*

Comment: Even if we don't have a disaster of any kind, in our lifetime, the waste from nuclear power plants and weapons production will stay with us for hundreds and thousands of years. These deadly chemicals are already causing more cancers and disease, birth effects and death that we shouldn't even be suffering. (J-05)

Comment: Before license renewal proceeds, the Commission must resolve important questions about future impacts of the fuel cycle and high level waste. The draft report states that EPA performance standards "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 1000 premature cancer deaths worldwide for a 100,000 metric ton repository." [Page 6-5] The impacts of license renewal – twenty years of additional operation, a 0-percent increase – will unquestionably increase.

If and when a geological repository is built, these questions may be easier to resolve, but because of the insoluble nature of the problem and the large impacts of high level nuclear waste, the Commission must suspend or eliminate license renewal. (F-14)

Response: *There has been much concern and confusion regarding the statements in a Federal Register Notice (66 FR 39277) dated July 30, 2001 regarding potential long term health effects that may occur as a result of radiation doses from an additional 20 years of operation of* *nuclear power plants as a result of license renewal. According to 10 CFR Part 51, Subpart A, Appendix B, Table B-1, "... the 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about 14,800 person-rem or 12 cancer fatalities, for each additional 20 year power reactor operating term."*

This calculated value of 12 additional deaths from fatal cancer over the 20 years of additional operation of a nuclear power plant is the result of several conservative assumptions. This value is, in fact, a calculated upper bound value. It does not mean that 12 people will die from cancer over the next 20 years of continued power plant operation.

These calculations use the concept of collective dose. Collective dose estimates the effects across a very large population, assuming that a small amount of radiation dose spread out among a large population would yield similar effects of a larger amount of radiation dose to a much smaller population. The Health Physics Society, www.hps.org, published a white paper to explain collective dose. The paper states, "[b]elow the dose of ten rem, estimations of adverse health effect is speculative. Collective dose remains a useful index for quantifying dose in large populations and in comparing the magnitude of exposure from different radiation sources. However, for a population in which all individuals receive lifetime doses of less than 10 rem above background, collective dose is a highly speculative and uncertain measure of risk and should not be quantified for the purposes of estimating population health risks." According to NCRP Report 92, "Public Radiation Exposure from Nuclear Power Generation in the United States," the collective effective dose equivalent to regional populations normalized to a 1 gigawatt power reactor operation is 4.8 person-rem per year. The total contribution from the complete uranium fuel cycle, which includes uranium mining and milling, is 136 person-rem per year.

The cancer risk factors used in this calculation are also quite conservative. They are from the BEIR-V report, "Health Effects of Exposure to Low Levels of Ionizing Radiation." In this report, it is estimated that, "[i]f 100,000 persons of all ages received a whole body dose of 0.1 Gy (10 rad) of gamma radiation in a single brief exposure, about 800 extra cancer deaths would be expected to occur during their remaining lifetimes in addition to the nearly 20,000 cancer deaths that would occur in the absence of radiation. Because the extra cancer deaths would be indistinguishable from those that occurred naturally, even to obtain a measure of how many extra deaths occurred is a difficult statistical estimation problem."

The NRC estimations of risk to arrive at the statistically calculated value of 12 deaths assumes tiny doses summed over large populations. It further assumes the "linear no threshold" theory that some effect will result from some dose, however small the dose, and it assumes that even these tiny doses have some statistically adverse health effect. As stated in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, "In particular, science cannot rule out the possibility *that there will be no cancer fatalities from these tiny doses." Conversely, it cannot be sure that there will be any cancer fatalities from these low doses. The comments did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comments*.

Comment: We appreciate your commitment to reducing waste volume from the facility (page 2-12). (N-06)

Response: *The statement referred to by the comment is that "Catawba has been aggressively reducing volume and minimizing waste for several years and intends to do so in the future". The staff does not view this as a commitment on either the staff's part or the applicant's part to reduce waste volume, rather it is viewed as the applicants intent. The comment did not provide significant, new information relevant to this Supplement and therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

Comment: The document offered for comment strains and ultimately exceeds the limits of comprehension in order to avoid assigning a single significance level of large in its analysis of environmental impacts of high level waste. The efforts of the staff and/or Commission to resist admitting that high-level waste and spent or irradiated fuel have a large impact on the environment and public health must not be permitted to obscure the facts. (F-09)

Comment: Section 6 – Environmental Impacts of the Uranium Fuel Cycle...Supplement 9 reports that the Duke Energy and NRC staff have found no information which is new or significant enough on any issue to alter conclusions found in the general environmental impact statement.

The report makes two more exceptions, one for nuclear fuel and one for high level waste. However, despite the detailed exploration of the uncertainties of such estimates, both of these issues are swept off the Category 2 table, relegating them to Category 1 limbo. "Accordingly, while the Commission has not assigned a single level of significance for the collective effect of the fuel cycle, this issue is considered Category 1." [Page 6-4.] 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. (F-12)

Response: *Environmental Impacts of the uranium fuel cycle are discussed in detail in Section 6.1 of this Supplement. The Commission has determined this is a Category 1 issue. The single significance level was not assigned because at the time that the GEIS was written there were no regulatory limits for offsite releases of radioactive nuclides for the candidate repository site, but enough information was available to assign the designation of "Generic". Since the GEIS was originally issued in 1996, the EPA has published radiation protection* *standards for Yucca Mountain, Nevada. The Commission has subsequently published its regulations at 10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada".*

The comments did not provide significant, new information relevant to this Supplement and, therefore, they will not be evaluated further. There were no changes made in this Supplement as a result of the comments.

Comment: Nowhere in Section 6.1 does the NRC analyze the actual impacts of the fuel cycle and its waste products. Instead of investigating and quantifying the impacts of the fuel cycle and waste, the report merely recapitulates regulatory dose limits. Dose limits are an unreliable means of analysis because they are subject to change and have no meaning in the time frames necessary for the determination of long term radionuclide impacts of geological repositories. Moreover, regulatory limits for some important aspects of waste disposition do not exist. (F-13)

Response: *This comment concerns the license renewal process in general, but did not provide new information. The Commission has determined that this is a Category 1 issue. The Commission has established a process, by rule, for the environmental and safety reviews to be conducted to review a license renewal application*. *The information presented in Chapter 6 of this Supplement and is based on an analysis performed for the GEIS, NUREG-1437 (NRC 1996, 1999). Chapter 6 refers the reader to this analysis*. *The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

Comment: What type of fuel does Catawba use right now, 1 and 2, Catawba 1 and 2? And what is the requirement for a reactor to qualify for Category 1 consideration, particularly in radiological and off-site radiological analysis? There's a qualifying condition in order for Category 1 issues to apply to a nuclear reactor, there's an exclusionary clause in the GEIS. For radiological impacts and off-site radiological impacts particularly, GEIS says that they only apply to light water reactors using low enriched uranium fuel. Categorically. (D-06)

Response: *This comment concerns a Category 1 issue. The fuel used at Catawba is low-enriched (up to 4.73 percent by weight) uranium dioxide in the form of ceramic pellets contained in zirconium alloy fuel rods. The analysis in the GEIS is based on normal operation following license renewal and extends to all nuclear power reactors. Therefore it is generic to light water reactors. If the facility were to operate outside these bounds, then a separate analysis would have to be performed. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment*.

A.2.12 Comment Concerning Alternatives to License Renewal

Comment: What is the baseload capacity of the Catawba reactors? The thermal just gets dumped into the lake, doesn't it? I mean it doesn't do anything for me – it doesn't turn on a light bulb for me or anyone. Okay. The power plant they're proposing for Fort Mills is 980 megawatts. (F-04)

Response: *Each generating unit is designed to operate at core power levels up to 3411 MW(t), which corresponds to a net electrical output of approximately 1129 MW(e). The energy that makes up the difference between the electric power output and thermal power output is, for the most part, released to the atmosphere as heat from the cooling towers.*

The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.

Comment: Wind, solar and hydrogen can and will end our dependency on nuclear power plants and other dangerous polluting plants. Why ignore safe and clean technology if it's good for the good of Man? Why? I don't understand it. Is it because of corporate greed, because of the fact that it is less profitable for big industry? I think I may be right. Isn't this all about money? I think I may be right. Is corporate America truly concerned about our health and even the health of our own families and friends? (J-02)

Response: *Alternative power generation is addressed in Section 8 of this SEIS. Several alternative actions were considered—no action, new generation alternatives, purchased electrical power, alternative technologies (including wind and solar) and the combination of alternatives. Alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories such as ecology and land use, that reach MODERATE or LARGE significance. In comparison, the environmental impacts of the proposed action, renewal of the Catawba OLs, are SMALL for all categories (except collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned).*

The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.

Comment: It says in here that Catawba site receives approximately four to five kilowatt hours of direct normal solar radiation per square yard – thank you very much – per day, of solar radiation. And then at the end it says implementation of solar generation on a large scale, enough to replace Catawba's generating capacity, would likely result in large – and you had to emphasize the word large – environmental impacts. Well, I thank you, but there's no waste with making electric on somebody's roof, there's no waste at all. (E-05)

Response: *Solar power is discussed in Section 8.2.5.3 of this SEIS. Because of the natural resource impacts (land and ecological), the area's relatively low rate of solar radiation, and its high cost, solar power is not deemed a feasible baseload alternative to renewal of the Catawba OLs. There are substantial impacts to natural resources (wildlife habitat, land-use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS (NRC 1996), land requirements are high—14,000 ha (35,000 ac) per 1000 MW(e) for photovoltaic and approximately 6000 ha (14,000 ac) per 1000 MW(e) for solar thermal systems. Neither type of solar-electric system would fit at the Catawba site, and both would have LARGE environmental impacts at a greenfield site. Some onsite generated solar power, e.g., from rooftop photovoltaic applications, may substitute for electric power from the grid. The comment did not provide significant, new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Comment: Page 8-32, Line 23: Reference to SCDNR should be replaced with SCDHEC (K-50)

Comment: Page 8-41, Line 18 Reference to SCDENR should be replaced with SCDHEC (K-51)

Response: *The Supplement has been revised as appropriate.*

A.2.13 Comments Concerning Issues Outside the Scope of Environmental Review for License Renewal: Aging Management, NRC Role and Mission, Safeguards and Security, MOX Fuel, Hearings, Emergency Response & Planning, Need for Power

<u>Aging Management</u>

Comment: In regards to aging of equipment, you say that you're not going to do a measurement aspect of the existing plant as it exists at this point. I'm worried about the containment, the containment walls and the existing plant over the years that it's been in operation. Is there any kind of monitoring devices that measures the existing equipment and future equipment of the containment vessel itself as we go day to day? As we age, we weaken, whether it be a human being or a car. So this plant has been in operation over a period of years and so there's certain fatigue in construction. Has Duke got the capability of monitoring this fatigue over the years that it's been in operation? (A-01)

Comment: And if extended 20 years more, how would this be measured in future development and building? (A-02)

Comment: In regards to the follow up, and evaluating the components and the material and construction as the years go by, there needs to be public mandate in regards to Duke advocating if there's a weakness of the years in certain structures. And NRC should maybe require more monitoring aspect or re-evaluating if there needs to be reconstruction of the Units 1 or 2.That's an ongoing thing as the units continue. Re-evaluation should be an ongoing scope of the– (A-03)

Response: *The NRC's environmental review is confined to environmental matters relevant to the extended period of operation requested by the applicant. Safety matters related to aging are outside the scope of this environmental review. An NRC safety review for the license renewal period is conducted separately. The comments will be forwarded to the project manager for the license renewal safety review for consideration. To the extent that these comments pertain to managing the effects of aging on components and structures specified in 10 CFR 54.21 during the period of extended operation to ensure functionality, they will be addressed in the parallel safety review. The comments did not provide new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

<u>NRC Role and Mission</u>

Comment: So my question is what the precedent or regulatory basis since they are regulators, not promoters, that the Nuclear Regulatory Commission has used in order to make that decision to override the ASLB. The question is whether or not there's any sort of precedent. I mean, to some degree, one could say that rewriting Part 70 should have triggered a programmatic EIS. (D-03)

Response: *The NRC's environmental review is confined to environmental matters relevant to the extended period of operation requested by the applicant. The comment relates to the hearing process. It is beyond the scope of the staff's environmental review.*

The comment did not provide new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.

Comment: So I started to really see that word and when you say right there, "the environment," when the word "the" used, it implies separation, but when we say "our," ah-ha, it means I've got to have it to live, and that's true, we can't live very long without clean air and without clean water. And I wondered if you considered changing or going through the process, I don't know how long it would take, but if you would consider changing that. It takes the same amount of space in the sentence, take the "the" out of there and put "o-u-r" in its place. (E-01)

Response: *The staff appreciates this input on their mission statement. This comment will be forwarded to the appropriate group at NRC Headquarters. It does not, however, relate directly to license renewal. The comment did not provide new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Comment: First of all, when Pete asked you about the mission statement, it's my understanding – and correct me if I'm wrong – that the part of the challenge that the Nuclear Regulatory Commission faces is that you have the responsibility both to regulate and promote nuclear energy. Is that no longer the case? Was it not the case at one time? (F-01)

Response: *The Commission does not have a mission to promote nuclear energy. Today, the NRC's regulatory activities are focused on reactor safety oversight and reactor license renewal of existing plants, materials safety oversight and materials licensing for a variety of purposes, and waste management of both high-level waste and low-level waste. The comment did not provide new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Comment: I want to know from anyone that would know this, how much money does Catawba receive in subsidies. Does anybody know? Does Catawba receive tax dollars to be there? (E-02)

Response: *The comment is beyond the scope of license renewal. The comment did not provide new information relevant to this Supplement and, therefore, this comment will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

<u>MOX Fuel</u>

Comment: But I wanted to reiterate once again our concern that the projected operating life before decommissioning of the plant extends out to 2044. We question that strategy, but with the proposed introduction of MOX fuel, which throws some more questions into the equation about the longevity of the plant, we again are concerned about that issue which lies out in front of us. (C-01)

Comment: Our major concern from the Sierra Club is again the introduction of MOX fuel, which has only been briefly mentioned here this afternoon, which will be – as planned by the operators, at least that's what they've said, to become a major component of the fuel source. It is our belief and the belief of others who have studied that that the introduction of MOX fuel puts additional stresses and corrosive activities in the plant which would again question the likelihood of that plant being an integral part of alternatives process out to an additional 20 years. (C-02)

Comment: The Sierra Club passed a resolution on this issue in October 2001, opposing the shipment in plutonium weapons-grade nuclear material from various places, including Rocky Flats, Colorado into the Savannah River Site for the ultimate conversion into MOX fuel. (C-03)

Comment: We believe that the application for the license under scoping review – this issue today is the same as the scoping issue – that the Catawba Nuclear Station will ultimately use MOX as part of the fuel component, that the South Carolina Sierra Club views this application process today as seriously flawed because the real issue in front of us is really what's going to happen down the road when they discuss introducing MOX. And all the statistics and all the information we heard today relates to conventional fuel, not to MOX. And that the Duke Energy withdraw its application and proceed to request the NRC for the license to use the introduction of MOX and then we'll take the new information and we'll object to that as well. (C-04)

Comment: You succinctly stated it in (b), whether the use of MOX is relevant to the aging issues, which was the bone of our contention. (D-04)

Comment: Where and when will the National Environmental Policy Act be applied to the use of this contractually obligated irradiation of plutonium? The answer is in a process by NRC staff, an environmental assessment, which may or may not ever be opened to a complete public access like this process for people who live in this community, unless they're willing to litigate, unless they're willing to either join up with the likes of me and go into court under the banner of an environmental organization or they're able to hire their own attorney and step in at that point. So I'm basically wanting to put on record a few of the concerns that we have about the impacts that MOX would have, that are not reflected in the current document that we're looking at tonight. Increased health hazards to the worker and public, both from routine and accident conditions; the reworking of that committed off-site dose that is responsible for 144 cancers for Catawba 1 and 2, what's the difference with MOX fuel; the socio-economic impacts of asking those people in this area to pay for this increased hazard with their own tax dollars; the increased rate of aging that may result to the reactor pressure vessel and internals from the use of this different type of fuel; elevated thermal impacts impacting not only operations, but also the environment and also waste storage in handling and disposal including impacts on decommissioning which are not covered by the contract, by the way, and would be borne by who? Increased fission products in all forms of emissions and waste; increased plutonium in all emissions and all types of waste; impacts, as I said, on decommissioning; and finally, impact on security. (D-17)

Comment: And we also can't bring up the fact that Catawba is currently under contract with the Department of Energy that names Catawba 1 and 2 as mission reactors for the irradiation of weapons grade plutonium in MOX fuel. And by the way, I just want to read a very short portion of the contract. It says "The contractor may only propose to replace a mission reactor if (1) the reactor has been shut down for economic reasons or (2) the Nuclear Regulatory Commission or the utility company has required the reactor to be shutdown for safety...and in either case, the shutdown will preclude accomplishment of the plutonium disposition mission schedule."

That's very tight language saying that under only the NRC rejecting the safety of MOX fuel will this reactor not use it, if that fuel is produced. And yet, we are told that this very same time period, the studies that have been done on uranium fuel are all that will be considered. (D-16)

Comment: We don't need plutonium on our roads, whether it's in South Carolina or anywhere else, because in essence, anywhere else is here too. A nuclear disaster has no borders, no boundaries, it will swiftly sicken and eventually exterminate everyone in its path, every human, every animal, every tree and every blade of grass. (J-04)

Comment: However, when we start transporting MOX fuel over our highways and start burning it in our reactors, we may be crossing a point of no return. (J-06)

Comment: Ladies and gentlemen, please nix MOX. (J-07)

Response: *The Commission has determined that MOX fuel issues are outside the scope of license renewal at Catawba. The use of MOX fuel will be addressed in a separate environmental review if an application to use MOX fuel at Catawba is received. The comments did not provide new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

Safeguards and Security

Comment: I am talking about the threat of a nuclear fallout from a reactor, a reactor that has exploded on its own, a terrorist attack, or an attack anywhere in the U.S. Terrorists confiscating plutonium from the sites it is stored or even holding up the trucks that are supposed to be transporting this lethal chemical across the roads of our cities, towns and neighborhoods. (J-01)

Comment: Catawba 1 and 2 are currently sitting there on line. If, heaven forbid, they were attacked while on line, there would be a Chernobyl type event if the core was breached and containment was breached. The International Atomic Energy Agency said that a week at September 11, that that would be the type of consequence. And yet, calculations have been done, have been published in the open press, that if a reactor is turned off for only 30 days, because such a large portion of the radioactivity is transient, is like that medical radioactivity that decays very quickly in seconds, minutes, hours, days, weeks – in 30 days, half of the radiological impact is gone if the same attack occurs – half. Now it does level out, we don't see it go away in a couple of decades, we know that. You still have a big problem on your hands if irradiated fuel is attacked, but to look at the cost/benefit to this region in an era of terrorism is something that people have a right to know, whether those considerations have been made. (D-19)

Comment: I understand that the containment for Catawba is only three-quarters of an inch plate. That's not very much. That's a real easy target for somebody who wants to make a mess in South Carolina. (E-03)

Response: *NRC and other Federal agencies have heightened vigilance and implemented initiatives to evaluate and respond to possible threats posed by terrorists, including the use of aircraft against commercial nuclear power plants and independent spent fuel storage installations (ISFSIs). Malevolent acts remain speculative and beyond the scope of a NEPA review. NRC routinely assesses threats and other information provided to them by other Federal agencies and sources. The NRC also ensures that licensees meet appropriate security levels. The NRC will continue to focus on prevention of terrorist acts for all nuclear facilities and will not focus on site-specific evaluations of speculative environmental impacts. While these are legitimate matters of concern, they should continue to be addressed through the ongoing regulatory process as a current and generic regulatory issue that affects all nuclear facilities and many activities conducted at nuclear facilities. The NRC has taken a number of actions to respond to the events of September 11, and plans to take additional measures. However, the issue of security and risk from malevolent acts at nuclear power plants is not unique to facilities that have requested a renewal to their license and, therefore, is not within the scope of this Supplement. The comments did not provide new information relevant to this Supplement and, therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

<u>Hearings</u>

Comment: How many hearings besides the Duke hearing have been granted across the fleet of license renewals so far? (D-01)

Comment: And I personally am aware of at least six attempts to get hearings. Do you know if there have been any others over that? (D-02)

Response: *These comments relate to the hearing process. They are beyond the scope of the Supplement. The comments did not provide new information relevant to this Supplement and* *therefore, these comments will not be evaluated further. There were no changes made in this Supplement as a result of the comments.*

Emergency Response and Planning

Comment: That is, the review identified environmental impacts which should be avoided, in order to fully protect the environment. Specifically, the possibility of environmental impacts resulting from a release due to a severe accident are a concern. However, we understand that NRC along with DOE, FEMA, and EPA are taking additional steps to ensure that nuclear plants are prepared for such an occurrence. (N-03)

Response: *The staff evaluated impacts under current population conditions. Emergency preparedness is an ongoing process at all plants, including the Catawba Nuclear Station. Each nuclear plant must have an approved emergency plan, as required by 10 CFR Part 50, that is revised periodically and required to be up to date. Emergency planning is part of the current operating license and is outside the scope of the environmental analysis for license renewal. The comment did not provide new information relevant to this Supplement and does not pertain to the scope of license renewal as set in 10 CFR Part 51 and Part 54, therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

Need for Power

Comment: The document does not mention whether power demands on the Catawba facility are expected to change significantly from present levels during the license renewal period (up to 20 years). If consumer power needs in the service area increase significantly, please clarify how this would this (sic) affect operations, particularly with regard to the cooling system, effluent release, and waste quantity. (N-04)

Response: *As specified in 10 CFR 51.95 (c)(2), the issue of need for power is outside the scope of license renewal. 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 comment did not provide new information relevant to this Supplement and it does not pertain to the scope of license renewal as set in 10 CFR Part 51 and Part 54; therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of the comment.*

A.3 Public Meeting Transcript Excerpts and Comment Letters

Transcript of the Afternoon Public Meeting on June 27, 2002 in Rock Hill, South Carolina

[Introduction, Mr. Cameron]
[Presentation, Ms. Franovich]
[Presentation, Mr. Wilson]
[Presentation, Ms. Parkhurst]
[Presentation, Mr. Palla]

MR. JENETTA: My name is Tony Jenetta.

A-01 In regards to aging of equipment, you say that you're not going to do a measurement aspect of the existing plant as it exists at this point. I'm worried about the containment, the containment walls and the existing plant over the years that it's been in operation. Is there any kind of monitoring devices that measures the existing equipment and future equipment of the containment vessel itself as we go day to day?

MR. CAMERON: I think we're going to ask Rani to address that for you. Rani – and Rani, do you understand the question that the gentleman is asking?

MS. FRANOVICH: Well, I'm going to rephrase it to make sure I understand. Are you talking about concrete containment structure or are you talking about what is within containment?

A-01 cont MR. JENETTA: As we age, we weaken, whether it be a human being or a car. So this plant has been in operation over a period of years and so there's certain fatigue in construction. Has Duke got the capability of monitoring this fatigue over the years that it's been in operation?

A-02 And if extended 20 years more, how would this be measured in future development and building?

MS. FRANOVICH: Okay, as far as the future development and building, I'm not sure I understand how that pertains to the renewal of the existing plant. But you can follow up on that when I give you the answer to the previous questions you had.

Duke is proposing aging management of the concrete structure as well as the safety-related equipment inside of containment. And they have different aging management programs for different pieces of equipment and it depends upon what the equipment is composed of, whether it's steel, concrete, electronics, cables, and the environment that the equipment is in. So if you look at Duke's license renewal application, you will see how they designate or identify all of the components and structures that meet the scoping criteria for the rule. They talk about what materials they are constructed of, what environments they're in and what the aging management program will be to manage or monitor their aging. The NRC taff is in the process now of determining whether or not what Duke proposes to do is adequate.

You also mentioned fatigue. Fatigue is one of the time-limited aging analyses that I talked about during my presentation. And it's really an analysis for the original plant life that's revisited and re-approved for an additional 20 or however many years the extended period of operation will be. So that's how they address the fatigue of certain components.

Does that answer your question?

MR. CAMERON: And Rani, I take it that you're – well go back to you in a minute, sir. I take it that what you're saying is that there are various monitoring programs that Duke is proposing and that we're reviewing to deal with aging and fatigue.

MS. FRANOVICH: That's correct. The program that they designate for monitoring or managing the effects of aging of different components really depends on what material it is – what the material of the component is and what the environment is. But the application has all of that information on what they propose to do and the staff is still in the process of evaluating the acceptability of what the applicant proposes.

MR. CAMERON: Do you have a follow up on that, sir?

A-03 MR. JENETTA: In regards to the follow up, and evaluating the components and the material and construction as the years go by, there needs to be public mandate in regards to Duke advocating if there's a weakness of the years in certain structures. And NRC should maybe require more monitoring aspect or re-evaluating if there needs to be reconstruction of the Units 1 or 2.

MS. FRANOVICH: Okay.

A-03 cont MR. JENETTA: That's an ongoing thing as the units continue. Re-evaluation should be an ongoing scope of the –

MS. FRANOVICH: The staff agrees with you – the staff agrees with you and, in fact, what we've built into the guidance documents that we've written for how applicants prepare their applications, involves an element called corrective action and that gets to exactly what you're talking about. If there is an identified deficiency, degradation, aging, failure, then Duke is required to address it, take corrective action and make it safe again. So you're absolutely right and our guidance documents address that and so does the application that Duke gave us.

They talk about their corrective action element for each and every aging management program that they propose for monitoring and managing aging. So we agree with you.

MR. CAMERON: Okay, thank you for that comment, sir, and thank you, Rani.

MS. FRANOVICH: Sure.

MR. CAMERON: Other questions on either severe accident mitigation alternatives or other issues at this point?

(No response.)

MR. CAMERON: Okay. Thank you, Bob.

[Presentation, Mr. Wilson]

MR. CAMERON: Okay, thank you very much, Jim.

This is the part of the meeting where we ask members of the public to give us comments. And before we go to those comments, I'd like to ask Gary Peterson from Duke Energy – he's the vice president at Catawba Nuclear Station, to just give us a little bit of background on the rationale for the license renewal application and whatever else that you'd like to share with us. Gary Peterson.

MR. PETERSON: Thank you, Chip.

I'd like to thank all the members of the public and the community who have taken the time out of their busy schedule today to come to this hearing.

On behalf of Duke Power and the co-owners of Catawba Nuclear Station, I'd like to thank our employees and the license renewal team for their continuous dedication and steadfast commitment to making Catawba successful over the past 17 years of operation. They have truly made this station worthy of license renewal.

We also would like to recognize the NRC staff for their hard work that they have developed and
B-01 implemented a very thorough, effective and efficient license renewal process accompanying extensive environmental and technical reviews that you've heard here today.

B-02 After reviewing the Catawba draft environmental impact statement, the completeness of their efforts is very evident. And based on our initial review, Duke Power agrees with the conclusions of the report.. Our technical staff is reviewing the report in detail and we will provide any written comments by the August 9 deadline.

Finally, and most important, we want to thank our community for its support of our operations. We work extremely hard to be a good neighbor and a responsible corporate citizen. The confidence our neighbors have demonstrated in our ability as nuclear professionals is well-founded.

I can assure you that the safe operation of Catawba Nuclear Station is and always will be our top priority here in the community. We appreciate the opportunity to work through this license renewal process as it continues. We are extremely proud of our facility, our employees, our station and our operations. We look forward to the possibility of serving the community and our customers for the many years to come.

Thank you.

MR. CAMERON: Thank you very much, Gary.

Next we're going to go to Mr. Ed Fitzgerald from the Sierra Club. Ed, would you like to share your thoughts with us? Thank you.

MR. FITZGERALD: My name is Ed Fitzgerald and I'm the Chair of the South Carolina Sierra Club, and Chip, thank you for the opportunity to speak to the group again.

C-01 I spoke at the October 23 scoping process and most of our thoughts are part of the public record. But I wanted to reiterate once again our concern that the projected operating life before decommissioning of the plant extends out to 2044. We question that strategy, but with the proposed introduction of MOX fuel, which throws some more questions into the equation about the longevity of the plant, we again are concerned about that issue which lies out in front of us.

C-02 Our major concern from the Sierra Club is again the introduction of MOX fuel, which has only been briefly mentioned here this afternoon, which will be – as planned by the operators, at least that's what they've said, to become a major component of the fuel source. It is our belief and the belief of others who have studied that that the introduction of MOX fuel puts additional stresses and corrosive activities in the plant which would again question the likelihood of that plant being an integral part of alternatives process out to an additional 20 years.

C-03 The Sierra Club passed a resolution on this issue in October 2001, opposing the shipment in plutonium weapons-grade nuclear material from various places, including Rocky Flats, Colorado into the Savannah River Site for the ultimate conversion into MOX fuel. If you watch the press and watch the national coverage of this, our Governor Hodges opposed that. He was unsuccessful at this point blocking the shipments by the Department of Energy. It's going to going to go into court but it's doubtful at this point whether the Governor is going to be able to contain the shipments to Savannah River, which should start shortly.

We have actively supported to Governor in his stance on barring nuclear plutonium into South Carolina without a clear exit strategy, but at this point, we believe that issue is over with.

C-04 Our position remains unchanged, I don't want to bore you with all the information that's already in the record, but once again, we believe that the application for the license under scoping review – this issue today is the same as the scoping issue – that the Catawba Nuclear Station will ultimately use MOX as part of the fuel component, that the South Carolina Sierra Club views this application process today as seriously flawed because the real issue in front of us is really what's going to happen down the road when they discuss introducing MOX. And all the statistics and all the information we heard today relates to conventional fuel, not to MOX. And that the Duke Energy withdraw its application and proceed to request the NRC for the license to use the introduction of MOX and then we'll take the new information and we'll object to that as well.

So once again, thank you very much, Chip.

MR. CAMERON: Thank you for giving us the views of South Carolina Sierra Club on that issue – on these issues.

Is there anybody else who desires to make a comment to us this afternoon?

(No response.)

MR. CAMERON: Okay, we are going to be back for a 7:00 meeting tonight and a 6:00 open house for informal discussion. And in that vein, I would just ask the NRC staff, some of our expert consultants, to just make sure that they informally talk with any of the people here today who might have further questions, either on safety issues, on MOX implications, whatever. Make sure that we get the information that they might want out to them.

And with that, I would just thank you for being here this afternoon and we're adjourned until open house at 6:00. Thank you.

(Whereupon, the afternoon session was concluded at 2:41 p.m.)

Transcript of the Evening Public Meeting on June 27, 2002, Rock Hill, South Carolina

[Introduction, Mr. Cameron]
[Presentation, Ms. Franovich]

MS. OLSON: May Olson, Nuclear Information and Resource Service. I haven't had a chance to stay up on things and so this is an honest question on my part.

D-01 How many hearings besides the Duke hearing have been granted across the fleet of license renewals so far?

MS. FRANOVICH: I'm going to answer that question and let somebody correct me if I'm wrong, but I believe that Duke is the first license renewal application for which petitions have been granted a hearing.

D-02 MS. OLSON: And I personally am aware of at least six attempts to get hearings. Do you know if there have been any others over that number?

MS. FRANOVICH: I do not, but I'm not sure if I'm prepared to answer that – I don't have a means of really knowing, off the top of my head.

MR. CAMERON: Jared, do you have any information on this? This is Jared Heck from our Office of General Counsel.

MR. HECK: I can't answer to night how many have been filed and I'm not familiar with how many have been granted or denied to this point, but if you would like afterwards, you know, you can give me your information and I can get those numbers for you.

MS. OLSON: Thank you.

MS. FRANOVICH: Do you want us to get back to you on that, Mary?

MS. OLSON: Yes.

MS. FRANOVICH: Okay.

MR. CAMERON: I think we know informally that there was a petition on Calvert Cliffs, on Oconee, on Turkey Point, and on McGuire – is that right?

MS. FRANOVICH: That's the same project.

MR. CAMERON: So it's considered the same –

MS. FRANOVICH: Same application.

MR. CAMERON: Okay. But anyway, we'll get together and clarify that for you.

Any other questions? We know that some of this information you know very well, but in terms of updates or whatever. Peter, just give us your full name.

MR. SIPP: My full name is Peter, my middle name is Fox and my last name is Sipp, S-i-p-p.

Ms. Franovich, I want to ask you, would you read the beginning of the statement about – when you first started off, you talked about the statement from – I'm not remembering exactly, but at the beginning when you read the statement about what the NRC is about.

MS. FRANOVICH: Our mission?

MR. SIPP: Yeah.

MS. FRANOVICH: You want me to re-read that?

MR. SIPP: Yeah, if you would. And when you get to a certain point, I want to ask you to stop – that's why I'm asking you to read it.

MS. FRANOVICH: Okay. The mission is three-fold – to ensure adequate protection of public health and safety, to protect the environment –

MR. SIPP: That's the point I want to mention to you. I didn't really get this word until I left home and started doing my laundry and I read the box and it said this doesn't contain
E-01 phosphorus, so it won't spoil our lakes and streams. Ah-ha. So I started to really see that word and when you say right there, "the environment," when the word "the" used, it implies separation, but when we say "our," ah-ha, it means I've got to have it to live, and that's true, we can't live very long without clean air and without clean water. And I wondered if you considered changing or going through the process, I don't know how long it would take, but if you would consider changing that. It takes the same amount of space in the sentence, take the "the" out of there and put "o-u-r" in its place.

MS. FRANOVICH: Sure.

MR. SIPP: Okay, thank you.

MR. CAMERON: Thank you, Peter.

Gregg, did you have a question?

MR. JOCOY: I'm Gregg Jocoy, that's G-r-e-g-g J-o-c-o-y.

I am about as ignorant about most of these matters as one can possibly be. I hear Mary say I'm not quite sure about something and I'm like, I'm totally not sure about most things. But you did mention a couple of things that I wanted to ask you about.

F-01 First of all, when Pete asked you about the mission statement, it's my understanding – and correct me if I'm wrong – that the part of the challenge that the Nuclear Regulatory Commission faces is that you have the responsibility both to regulate and promote nuclear energy. Is that no longer the case?

MS. FRANOVICH: No, it is not.

F-01 cont MR. JOCOY: Was it not the case at one time?

MS. FRANOVICH: At one time – P.T. can correct me if I'm wrong – but the Department of Energy had a role to promote and regulate and I think the NRC was established to separate those functions. So the NRC's sole role is to regulate the industry and make sure that nuclear materials are used safely.

MR. CAMERON: And we can't emphasize that enough. We only have regulatory responsibilities by statute. We do not have any promotional – and I just want to make sure everybody understands that.

MR. JOCOY: And I didn't. I'm glad you cleared that up.

The other thing that I wanted to mention was you indicate that Duke has been – has come forward with this application now, even though they're not even halfway through their current 40-year license, because they need ample opportunity to prepare for an application if they're going to put a new nuclear power plant on line to replace one that's decommissioned after the year 2024 or 2026.

F-02 That 10-year window is really irrelevant at this point. It takes two years to go from the thought, why don't I believe a gas power plant in my backyard, to having it back there generating electricity. So the fact that there's a 10-year window for the process of building a nuclear power plant does not impact the supply of electricity, because you can go, as I say, from thought to producing electricity in two years. Do you guys have an opportunity to evaluate those kinds of questions in the process of –

MS. FRANOVICH: The kinds of questions about how quickly would it take to build replacement generating capacity?

F-02 cont MR. JOCOY: Alternative sources, right – not nuclear sources.

MS. FRANOVICH: Jim, is that part of the environmental review?

MR. CAMERON: Yes, Jim is –

MS. FRANOVICH: I think he's going to talk about that in his–- don't steal Jim's thunder.

(Laughter.)

MR. WILSON: I think in the environmental review, we look at alternatives to replacing the baseload generating capacity. I don't think we look at time scales or how long it takes to implement them or how much time is required to plan. We just evaluate what alternatives could be used on the same economic scale. I think there are technologies that are not mature yet and we discount them.

But if you look in Section 8 of our draft environmental impact statement, you can see the alternatives that we did consider for this license renewal application.

MR. CAMERON: Let's go back and revisit that when Mary Ann Parkhurst talks to us, because we do that. But I want to clear up one perhaps misimpression that Rani's statement about the time needed to plan for replacement power wasn't the time needed to provide replacement power necessarily by a nuclear energy source, but for any energy source. In other words, if a license isn't renewed, then there needs to be a long lead time to figure out how are you going to deal with that energy need by whatever way you do it.

MS. FRANOVICH: Exactly.

F-02 cont MR. JOCOY: Which is exactly my point, Chip. Today, we've gotten to the point to where that lead time is two years. So the rush to do this before they're even halfway through their current license is no longer valid. If part of what you're concerned about is we're going to need a long lead time for nuclear stuff, there are alternatives to nuclear that can be done in two years, we can have generating capacity right away.

MR. CAMERON: Okay. And I just want to emphasize that even though we're doing questions now, comments that flow from those questions are fine and we will consider those as comments. In other words, it's not just during that second part of the meeting. So we heard that comment.

And Gregg, did you have another part?

MR. JOCOY: No.

MR. CAMERON: Sherry, did you have anything that you wanted to ask?

MS. LORENZ: I'll have later comments, yes.

MR. CAMERON: Later, all right.

And let's go to Mary for another question to Rani. Mary.

MS. OLSON: This is one of those areas where I understand we're speaking about your employer, but I still have a question about it.

As you mentioned, the Atomic Safety and Licensing Board admitted a contention for consideration on the mixed oxide fuel issue and, forgive me that I was a little bit distracted and I don't remember whether you stated that Duke appealed that decision by the Atomic Safety and Licensing Board and the Commission upheld the Duke appeal and that that's no longer a current contention before the hearing process.

D-03 So my question is what the precedent or regulatory basis since they are regulators, not promoters, that the Nuclear Regulatory Commission has used in order to make that decision to override the ASLB.

MS. FRANOVICH: And I'm going to defer to my legal counsel to answer that question, but I believe it's in Part II. Jared, if you can field that one.

MR. CAMERON: Yeah, Jared, are you ready for that one?

MR. HECK: Yes.

MR. CAMERON: All right.

MR. HECK: There are provisions in Part II for appealing decisions of the Licensing Board to the Commission, any party may do that under certain circumstances. And that's the process that Duke used for their appeal.

The Commission's decision, as I recall, was based on standards in Part 54 which limit consideration of issues in license renewal to issues related to aging of certain components and structures. The Commission determined that MOX fuel use was outside the scope of license renewal.

And if you would like, afterwards, I can refer you to the Commission's decision and we can get together and I can give you a copy – point you to a copy of that.

D-03 cont MS. OLSON: The question is whether or not there's any sort of precedent. I mean, to some degree, one could say that rewriting Part 70 should have triggered a programmatic EIS.

MR. CAMERON: But when you say precedent, I think that Jared needs to understand whether you mean precedent for the procedural mechanism that allowed the Commission to consider that, or whether you're talking about precedent in terms of ruling on whether the use of MOX was relevant to the license renewal proceeding. Which one are you talking about?

D-04 MS. OLSON: You succinctly stated it in (b), whether the use of MOX is relevant to the aging issues, which was the bone of our contention.

MR. CAMERON: Okay, Jared.

MR. HECK: To my knowledge, this is the first time that question has been squarely addressed by the Commission, so there's no prior decision where that was addressed.

The authority for the decision drawn upon by the Commission comes from a rule in Part 54.

MR. CAMERON: Thank you, Jared. Jared obviously is with our Office of General Counsel, if we didn't say that before.

Are we ready to go to the environmental process?

(No response.)

[Presentation, Mr. Wilson]

MR. CAMERON: Okay, and while I'm going over to Mary... Jim, the requests for additional information, you did mention it but I take it that those were requests to the license renewal applicant, is that correct?

MR. WILSON: Yes, they were requests from the staff to Duke to get information on the docket that we would need to include in our environmental impact statement that had not been provided in their initial application. We issued an RAI on SAMA and we issued an RAI on the rest of the environmental review.

MR. CAMERON: Okay, thanks. Mary.

MS. OLSON: This is a process question really. Again, I'm behind, I admit it. Capacity issues are catching up with us.

D-05 I saw something in my incoming mail recently about a meeting that wouldn't constitute formal public participation but which I believe will be open to the public when NRC is going to be meeting with Duke in Charlotte. Could you please share with us present about that meeting, if anybody in the room knows about it?

MR. WILSON: I'm not resonating to your reference. Can you give me –

MR. CAMERON: Let's fine out if this is on the safety – it may be on the safety side rather than the environmental side. Rani.

MS. FRANOVICH: There is to be an NRC inspection at the Catawba plant, at the McGuire plant.

D-05 cont MS. OLSON: It's at headquarters at Duke in July and it's on renewal. So if you don't know about it, maybe I imagined it. But could somebody get back to me?

MS. FRANOVICH: Well, I'll tell you what, if you want to give me a call Monday, if you can find what you may have seen, we'll figure it out.

MS. OLSON: I'll find it in the next few minutes, I take it's in my backpack.

MS. FRANOVICH: Okay, yeah, let me know.

MR. CAMERON: All right. Other questions for Jim, environmental review process, before we go to the draft EIS itself?

(No response.)

MR. CAMERON: Okay, thanks, Jim.

And we basically have two followup items here. One is the item on the – sort of the history of adjudicatory activity on license renewal applications and the second is what this meeting may have been in regard to license renewal. Okay?

MS. OLSON: I know it's not formal public participation, it's an opportunity, however, for the public to attend.

MR. CAMERON: Sure, sure, we understand that and we'll find out.

Mary Ann, would you like to come up and tell us about the draft environmental impact statement? Then we'll go back out to you for questions.

[Presentation, Ms. Parkhurst]

MR. CAMERON: Okay, let's go to Gregg, and Gregg, you had a question related to this last part before, but go ahead.

F-03 MR. JOCOY: Forgive me if it sounds like this is a done deal to me, but it sounds like it's a done deal. You guys have decided this is hunky-dory.

Am I misunderstanding? Everything you've just said says we've decided this thing is cool.

MS. PARKHURST: We made a very serious evaluation of the issues and we did not –

F-03 cont MR. JOCOY: Oh, I'm not questioning that, I'm just saying that you are telling us that as far as the staff of the NRC is concerned, there are no environmental problems with relicensure.

MS. PARKHURST: That there is not sufficient – Jim, what is the exact quote on that?

MR. WILSON: You're right, we concluded that the impacts of license renewal at Catawba were acceptable from an environmental standpoint.

MR. CAMERON: But I guess let me just make sure everybody understands that this is a draft environmental impact statement. Secondly, there is another piece, safety review, that has to be done. The third piece, inspection findings, and finally, don't under-estimate the fact that there is an adjudicatory hearing going on where people have raised contentions. So I don't think you could say it's a done deal, but I mean everybody can have their own opinion on that, of course.

F-03 cont MR. JOCOY: Well, actually, I want to thank you, Chip, because I don't mean to imply undue criticism in saying that. I just want to make sure that we were clear that the NRC staff feels that there is no – that the options of not relicensing are worse than the option of relicensing. You guys have made that basic decision, is the way I understand what you're saying.

F-04 I wanted to ask three real quicky questions. What is the baseload capacity of the Catawba reactors?

MS. PARKHURST: Megawatts thermal or electric?

MR. JOCOY: Electric.

MS. PARKHURST: Electric?

MR. JOCOY: How much electricity do they produce?

MS. PARKHURST: I think it's 1129 megawatts electric and 3411 megawatts thermal.

F-04 cont MR. JOCOY: Well, the thermal just gets dumped into the lake, doesn't it?

MS. PARKHURST: There's a cooling tower.

F-04 cont MR. JOCOY: Well, I mean it doesn't do anything for me – it doesn't turn on a light bulb for me or anyone.

MS. PARKHURST: 1121 megawatts electric.

F-04 cont MR. JOCOY: Okay. The power plant they're proposing for Fort Mill is 980 megawatts.

F-05 Anyway, I gather from what you said that this monitoring is self-monitoring done by Duke, is that right? In the radiological impact section that you were doing?

MS. PARKHURST: There's quite a process on what they have to supply and so on, and there are state measurements made as well. It's not just Duke, but Duke does its own self-monitoring and there are outside sources that also monitor this.

MR. JOCOY: Okay, do they do that under contract to Duke?

MS. PARKHURST: No.

MR. JOCOY: Do they do that under contract to the NRC?

MS. PARKHURST: No, the state regulators.

MR. JOCOY: Oh, oh, oh, like DHEC in South Carolina.

MS. PARKHURST: Yes.

F-06 MR. JOCOY: All right, last question. what about the spider lily? I understood what you said about one of these endangered species – thank you so much, that's a pretty picture – I think it was the little flower thing, the little plant there, you said is like not in Lake Wiley, it's in tributaries further down, but it could potentially be in Lake Wiley if it were brought in, something like that?

The mussel, that's the one, yeah. Is the same not true for the spider lily? Could it not be brought from Lansford Canal State Park and, you know – since it's in tough straits, is that not a consideration too?

MR. CAMERON: Let's see if Tina wants to explain the differentiation between that. Tina, give your full name and all that.

MS. CARLSON: Hi, I'm Tina Carlson, I'm an ecologist with Lawrence Livermore National Laboratory. I worked with the terrestrial ecologist, Ted Doerr, from Los Alamos, who did this analysis. Now the spider lily does not occur, you know, on the transmission lines or at Lake Wiley, but they were identified as some potential habitat that could. The spider lily is a species of concern, it's not a listed species. But it hasn't been identified at the site. But with their ongoing monitoring programs and their work with the transmission lines, it's on their list to watch for.

So genetic material does move around with plants and so it is something you do have to keep in mind, but at least at this point, it hasn't been identified there.

MR. CAMERON: Okay, thank you, Tina. Any other questions on this part? Let's go over to Mary.

MS. OLSON: Mary Olson, Nuclear Information and Resource Service.

I'd like to ask you a series of simple questions. They're not intended to be trick questions, but I really want this on our transcript.

D-06 What type of fuel does Catawba use right now, 1 and 2, Catawba 1 and 2?

MS. PARKHURST: You mean uranium?

D-06 cont MS. OLSON: Uranium – fuel, thank you. And what is the requirement for a reactor to qualify for Category 1 consideration, particularly in radiological and off-site radiological analysis?

MS. PARKHURST: What was the first part of that analysis?

D-06 cont MS. OLSON: There's a qualifying condition in order for Category 1 issues to apply to a nuclear reactor, there's an exclusionary clause in the GEIS.

MS. PARKHURST: I'm sure I have been through it. Right off the top of my head, I'm not sure I remember, but is there somebody else that can –

MR. CAMERON: Let me borrow that back from you, Mary. I think Mary is talking about what's the standard for opening up a Category 1 issue to apply to a specific plant. You're talking about the new and significant information standard?

MS. PARKHURST: Actually in the document, there's a number of times we go through what causes, what allows something to be considered Category 1 or Category 2. I would have to refer to it and read it out here, but let's see – we've got small significance –

MR. CAMERON: We're hoping we're answering the right question.

MS. OLSON: I'll be quite patient and –

MS. PARKHURST: Like I say, I know it's in here several times and I think that I've got it right here but –

MS. OLSON: I'll tell you what it is and then maybe you could tell me that I'm right or you could get back to me somehow.

MS. PARKHURST: Sure.

D-06 cont MS. OLSON: For radiological impacts and off-site radiological impacts particularly, GEIS says that they only apply to light water reactors using low enriched uranium fuel.

MS. PARKHURST: Right, okay.

D-06 cont MS. OLSON: Categorically.

MS. PARKHURST: That's what we're dealing with.

MS. OLSON: So you don't disagree with me on that point. So I'll reserve the rest of what I have to say about that for my comments because I don't want to ask you to make comments in an area that's been put off the table by the Commission.

D-07 But finally, I do want to ask you, when it comes to radiological impacts, the Commission chooses to regulate in terms of millirems and I'd like you to tell me how I know how many millirems I got today.

MR. CAMERON: Health physicist question. Mary Ann?

MS. PARKHURST: How much you got today, if you had a device on you – if you were working in a nuclear facility and were expected to be receiving some radiation as a result of that–- exposure as a result of that work, then you would be wearing a dosimeter which can detect the radiation there.

As far as what you receive in a day as a person in the public, you're receiving radiation from cosmic and solar radiation, you're receiving it from the radon from uranium in the soils that are naturally here, from the bricks in your home if you have them, granite and so on –

MS. OLSON: Beyond that.

MS. PARKHURST: Okay, beyond that. There's – I suppose if a person wanted to know how much they got in a day, they could pay one of the manufacturers – one of the services that makes thermo-luminescent dosimeters and you could probably find a way to purchase and wear this as know actually how much you're getting. As far as the facilities like in a nuclear plant, we know how much it is at the boundaries. These things are measured, so we know how much would be at that point, but I don't know that that's your question.

VOICE: You may want to talk about how we estimate also.

MR. KUGLER: I would just going to say the licensees are also required to estimate the dose to the maximally exposed individual based on releases from the plant, and any member of the public would be expected to receive less than that because they make some very conservative assumptions when they do that calculation.

So we may not be able to tell you exactly what you got, but we can tell you that it's no more than that amount. And that's in their annual reports and we talk about it in the environmental impact statement, I think in 2-27?

MS. PARKHURST: 2-27 and -41...

MR. KUGLER: So there is information on that in the environmental impact statement. Is that what you were asking?

MR. CAMERON: Okay.

D-07 cont MS. OLSON: So it's fair to say, however, that averages are used and models are used and that we don't really know when it comes to the general public, how much we each get.

And finally, is that maximally exposed individual an infant or an adult?

MR. CAMERON: I take it's important that we answer this question so that people clearly understand what the situation is, and I don't know who wants to do it. Why don't you start and Mary Ann might complete.

MR. KUGLER: I'm Andy Kugler, for the record, NRC.

The reason we use the term "maximally exposed individual" is it's a person – using some very conservative assumptions, it would be the maximum dose that somebody could get. It's not an average. And that's what I'm saying, that the actual dose to any individual would be lower than that. And what they try and do is they assume, you know, somebody stays in the worse place they could possibly stay, all the time, and therefore, they get a maximum exposure. And realistically, nobody would do that or could do that.

So it's a conservative number that, you know, estimates the dose higher than what any individual would actually receive, and therefore it's basically a bounding sort of calculation.

So the actual dose that any person will have received from the plant will be some number lower than that. So, you know, once you look at that number, you know, you're somewhere below that. How far below that is hard to say.

MS. OLSON: Adult?

MR. KUGLER: That I'm not entirely sure about. Do you know?

MS. PARKHURST: They do a lot of modeling of adult and infant because certainly the infants are more critical. However, what they're looking at is what is the exposure level here and then they convert it to dose. And so they understand again what the maximum could be to anybody at the fence line of the facility.

As far as annual doses, people in the U.S. get something along the lines of an average of 300 millirem a year. This is through, again, the solar, the cosmic, the indoor radon. Actually radon is a pretty strong component of that, but we have a pretty good feel for what the variation is. And from nuclear plants, the numbers that you're looking at on these lines, it's so low – and you look at Page 2-26 in the document, it kind of goes through what's from the gaseous, the liquid and critical organ doses and so on from the releases from the plants as a result of that. So that might be a place to look at it. But again, it's about 300 millirem is considered average in this country.

MR. CAMERON: Okay, let's go to this gentleman back here. Hi. Just tell us again who you are.

G-01 MR. JENETTA: Tony Jenetta. In regards to the dosimeter readings of the individual receiving it away from the plant, who in addition would have authority to measure that within the county? Would the York County Emergency Preparedness agency have a role in that?

MS. PARKHURST: Have authority or be able to help you get access to dosimetry?

G-01 cont MR. JENETTA: Would there automatically be a procedure to measure this in addition to Duke measuring it on their own perimeter. Would Duke measure it beyond their perimeter or is there another agency that will constantly monitor to dosage for the individual citizen?

MS. PARKHURST: Again, there are state agencies that – Ms. Mr. Gandy – okay, unfortunately – we had probably just the person to respond to that one, who is the state radiation protection officer from that organization, but yes, they do their own monitoring and they require Duke to do monitoring of the facility as well. So there's a cross check of some of these off-site, in particular, types of facilities. And the state will look into like the milk – well, dairy products and fish and so on. So these things are again monitored by the state as well.

MR. CAMERON: Okay, let's go to the severe accidents, which I think there'll be some interest in. But thank you very much, Mary Ann.

Bob Palla, are you ready?

[Presentation, Mr. Palla]

MR. CAMERON: Questions for Bob on severe accidents. Mary.

MS. OLSON: First, I take my hat off to NRC staff for getting out a fine comb on this.

My question though is there's a recent release – I haven't actually read the report yet, but from the National Academy of Sciences on the issue of the vulnerability of the electric grid to terrorist attack. And I know we're getting into safeguard issues here, so let me talk for a moment into a question that might or might not be answerable.

D-08 We were really worried about Y2K and we were really thrilled that the National Electric Reliability Council was right and the grid did not go down. And we certainly don't want to see the grid go down now. At the same time, when and at what point will these cost/benefit analyses begin to be impacted by new information like the National Academy of Science's report saying that the grid is highly vulnerable to attack and at what point does, you know, something like the dedicated line become cost effective?

MR. PALLA: Well, okay, this study was done today without any consideration of these potential events. The numbers that we generate for purposes of the cost/benefit comparison obviously don't include that. I'm not sure if you – you know, just how much the data would change as a result of that.

But this is, I think, a fair consideration when one looks at the merits of making these kinds of improvements for these kinds of containments.

So I don't have a good answer to your question about to what level would this change –

MS. OLSON: No one has a good answer to questions about what ifs, but I'm putting it on the table because I take it's real important and I also think that – I mean it's not very often I go out of my way to try and help a nuclear utility, okay? But my other question I'd give you is can you reflect on when these cost/benefit analyses are done? You know, you balancing against potential fatalities, well, what's the number? What's the cost of a death?

MR. PALLA: That's a different question, but if you wanted to know how close are we to making
D-09 a decision whether or not to do something, as documented in the environmental impact supplement for Catawba, this improvement appears to be cost beneficial just taking the case where igniters alone need to be supplied. That looks to be cost beneficial. And it also looks very close to being cost beneficial to supply both the igniters and the air return fans. This is separate from even considering these additional events that you're referring to. So you may not even have to go further than we've done already, to justify doing the improvement.

MS. OLSON: Glad to hear it.

MR. CAMERON: Not to belabor this, but I think that Mary's question, the heart of it goes to what's the equation that we use – it may not be in loss of life or cancers or whatever. What equation do we use under the regulatory analysis guidelines?

MR. PALLA: We use the regulatory analysis guidelines. Now within the guidelines, values are assigned to person-rem, and certain numbers of person-rem are needed to result in a loss of life. And values for a loss of life are assigned within the methodology. So there is a conversion. It's all implicit within the formula, so –

MR. CAMERON: Could we give Mary – I don't know if you need a citation or anybody needs a citation to the regulatory analysis guidelines.

MR. PALLA: The regulatory analysis guidelines is NUREG/ BR-0184.

MR. CAMERON: NUREG/BR-0184.

MS. OLSON: Thank you.

MR. CAMERON: Great. Any other questions before we go to Jim and the overall conclusion, again, draft environmental impact statement overall conclusion.

Yes, Gregg.

MR. JOCOY: Yeah, thank you very much.

F-07 Tell me something – you folks went in, if I understand the process you went through correctly, you went in and said let's screw up here, and if it's something that we can screw up that we can identify, how much would it cost to keep it from screwing up and then is it worth paying that cost?

MR. PALLA: Yeah, that's basically it.

F-07 cont MR. JOCOY: That being the case, since this power plant has been in operation for some period of time, how is it that you just now came to the conclusion that hydrogen control and installation of water tight wall being further evaluated as a current operating license issue was something that should be addressed? Didn't this kind of work go on before? Didn't someone throw up a red flag somewhere down the line and say, you know what, there's one of these generators out here that doesn't even have a water-tight wall around it? I mean, can you see how that creates some skepticism?

MR. PALLA: Yeah, well, my explanation of that would be that the type of information that we used to reach these kinds of conclusions may have been there before. For example, Duke had identified previously that a water-tight wall could reduce the impacts of some of these internal flooding events. But they did not put this through a systematic cost/benefit analysis and even if they did, some of the basic assumptions that we make in the regulatory analysis guidelines are not the same assumptions that a licensee or utility might make.

So we basically ran this through the NRC set of assumptions, which give additional – it considers additional factors that a utility may not tend to look at because they may only look at certain economic factors and we bring in some additional factors, like replacement power costs, for example. When you put some of these other factors in, this frequently makes the difference between the improvement being cost beneficial or not beneficial. But the example of a water-tight wall, this was actually something that Duke had looked at before and didn't make that decision to install it.

MR. CAMERON: Bob, maybe we've left the impression too that this SAMA evaluation is only something that occurs in license renewal. But don't we have a program outside of license renewal?

MR. PALLA: Okay, well, there's another – well, historically, looking back, there was a program where every plant was required to do an individual plant examination, which is essentially a PRA, Level 1 and 2 PRA. It doesn't go to calculating off-site consequences, but it looks at basically ways that you could lead – accidents could lead to core damage and ways that releases could occur from containments. These are typically called Level 1 and Level 2 PRA. We call this the IPE. The IPE was done I guess in the late '80s, early 1990s. Many improvements were identified and implemented as a result of that, and this was separate from renewal.

And our assessment here basically started from that point and took – we took insights from some of these IPEs and subjected them – you know, a licensee when they looked at potential improvements, put some of the potential improvements identified in the IPE into this process here. so it's not like this is the first time we've seen these, but it is really the first time that we've systematically crunched them through this regulatory analysis process, these guidelines.

Okay, let's have a final word from Rani on this and then let's go to Jim. Rani.

MS. FRANOVICH: I just think it might be important to clarify that even without these improvements to risk, they're meeting all of the current requirements to operate even now. And what we've done is we've gone from a deterministic mode of regulating these plants to a risk-informed process. And that's a fairly new – within the last four years or so – new way of regulating. So this is another way of improving safety at the plants by looking not so much at what they're doing to meet the regulations, but what else can they do to make it even safer than it already is, by meeting current existing regulations.

So I just wanted to clarify that a little bit too.

[Presentation, Mr. Wilson]

MR. CAMERON: Before we go to questions, I don't know if there are any, but Rani, can you tell us – Jim's told us when the environmental review piece is going to be done. When is the safety review piece going to be done, so people know what to anticipate about when there might be a decision?

MS. FRANOVICH: Right. Right now, we're involved in some hearings. If the hearings progress through and go to fruition, we're looking at a decision in December of '03, December of next year.

So if the hearings do not proceed, then it'll be sometime before, I'd say probably June next year.

MR. CAMERON: Thank you. Do we have questions on this last part before we go out to listen to some more from everyone here?

(No response.)

MR. CAMERON: Okay. Just give us your name, please.

MR. TROUTMAN: My name is Joe Troutman, I represent several of the owners at the Catawba Nuclear Station. I believe this would be for Mary Ann, and I probably should have asked it earlier but I didn't really think about it.

H-01 I recently had a nuclear stress test done in Rock Hill here at a doctor's office. They injected several radioactive isotopes into my blood while I was exercising and took pictures with special equipment and so forth. But I work at the Catawba station, I don't, as you might understand, deal with radiation, I don't go inside the radioactive areas. However, I was talking to some of the folks that administer the people that do, and just in conversation it came up that I received the number of micro-curies that's really almost equivalent to the number of curies that would be allowed to be released by the Catawba station in a year, they injected it into my body for this test.

I was quite radioactive after this. I had to go by a monitor that they use at the plant for monitoring radioactivity, and I kind of thought it was going to jump off the wall and chase me down.

H-01 cont But my question is would you be surprised to say that that would be accurate, that that number probably was fairly comparable to the limits that the Catawba station operates under?

MR. CAMERON: Okay, thanks, Joe. Mary Ann, can you talk to that for us?

MS. PARKHURST: I'm going to have to plead ignorance on that particular procedure. However, one of the things about it is that it was a very short term exposure, the way they administer it, so that it's not like it's hanging around for a long time.

But a lot of the exposures are much – the radiotherapies or radiodiagnostics, I didn't mention as far as the average a person gets in a year. If you've got some of those medical treatments or therapies, the numbers can get very large.

MR. CAMERON: And Rich, do you want to say anything more on that in terms of comparative aspects of a – obviously we don't know what treatment Joe got, but in terms of –

MR. TROUTMAN: It wasn't really treatment, it was a test.

MR. CAMERON: A test, I'm sorry.

MR. EMCH: Hi, I'm Rich Emch, I'm environmental project manager with the Nuclear Regulatory Commission.

Most of my experience and knowledge is with reactors similar to what Mary Ann was saying, but I mean, I guess basically what you've said highlights the fact that the amount of radioactive material that's released from Catawba in a year is a very small number, okay? and they do monitor what's released in the liquid and gaseous pathways, and it is very small and it does provide to the maximum individual we were talking about earlier, a very small dose. And we're happy that you're still with us and I'm glad the test went well, or at least I hope it did.

MR. CAMERON: And we hope that the meeting doesn't add to your stress levels.

We're going to start off public comment, more formal comment, by asking Duke Energy Corporation to just provide us with a little bit of information, their perspective on license renewal, and we have Greg Robison with us, who is the project manager for license renewal for Catawba. Is that correct, Greg? Please come up and talk to us and then we're going to go to the rest of the people.

MR. ROBISON: Thank you, Chip. I'm Greg Robison, I am the project manager for license renewal for Catawba.

What I'd like to do is just take a few minutes to thank some people and to recognize some people for some hard work. This evening, I'm speaking on behalf of both Duke and our co-owners at Catawba.

I'd like to start by recognizing and thanking the foundation of the folks that really made this possible, and that's our employees at Catawba. For over 17 years they've stayed focused and dedicated and I'm absolutely certain they'll remain that way for the entire time we will be in license renewal. It is because of their foundation, because of their work, that we're allowed to pursue renewal. And I'm happy to be associated with them.

I in particular want to thank our environmental staff, who put together the environmental information that we did provide to the NRC and that the NRC has used to prepare their environmental impact statement. And also thank our staff for the support that they've given the staff and also the national labs in your site visits.

I-01 The second group I'd like to recognize is the NRC themselves. The national labs and the NRC have put a lot of hard work into this report and as Rani Franovich pointed out, it's the stable and predictable process that the NRC gave us that allowed us to feel comfortable going into license renewal and really spending our energies to put our materials together and have been able to work in a very predictable fashion questions and answers in a very stable manner with the NRC that has led to the report that you're looking at tonight.

I-02 And speaking of the report, we have taken a look at the draft environmental impact statement, and from our initial review from or specialists, we agree with the conclusions of the report. As Bob Palla had pointed out, there were some detailed discussions that we did have with the NRC staff and we are in the process now of doing detailed comments and we will provide those to the staff by August 9.

The last group that I'd like to thank and recognize are our community and our neighbors. They have provided ongoing support for us and demonstrated their confidence in our ability as nuclear professionals. We interact with our neighbors often daily, we have our communications staff here with me tonight, who have continued to let me know of the number of times that they've worked with our neighbors and the strong support our neighbors have given us.

As license renewal shows you, we will continue to stay focused on nuclear safety as our number one priority, and that's because we want to continue to be a good neighbor here in the Rock Hill area and in the York County area.

And with that, I thank you for your time.

MR. CAMERON: Okay, thank you very much, Greg.

We're going to next go to Mary Olson, Nuclear Information and Resource Service and then we're going to go to Peter Sipp after Mary. Mary.

MS. OLSON: Do we have a time limit tonight? I won't be real long, but – I'm just trying to stay honest, Chip.

MR. CAMERON: No, I know. Five to seven minutes, but, you know, take seven.

MS. OLSON: My name is Mary Olson, I'm the Director of the Southeast Office of Nuclear Information and Resource Service. We're a national organization based in Washington, D.C. and we represent approximately 1000 local grassroots activist groups across the country, that are primarily concerned with commercial nuclear power and its radioactive waste.

D-10 I want to mention briefly that NIRS finds that with the passage of the generic environmental
impact statement on license renewal that what the Nuclear Regulatory Commission refers to as
a stable and reliable – is that the words that were used – process – predictable and reliable
process – stable and predictable? I'm mangling this, forgive me. Is largely because of the
number of issues that the public is categorically excluded in bringing up in the process. And
D-11 therefore, we have not prioritized it as an opportunity for our membership to be active. So I just
want to note that the participation that you see in this room this afternoon and this evening is
fully due to the Nuclear Regulatory Commission's outreach efforts.

Having said that, I want to step back and say I'm genuinely pleased and surprised by the results
D-12 of this process in bringing up issues that I hear tonight the Nuclear Regulatory Commission
staff is interested in pursuing, whether they are part of license renewal or not. That gives me,
as a career professional in this field, some confidence and some renewed respect for the
Nuclear Regulatory Commission. These issues are that of hydrogen in ice condensers,
D-12 cont hydrogen ignition, whether they should have backup power and whether the mixing of hydrogen
and other gases in the atmosphere by fans and the backup power in the event of station
blackout.

I am putting this down because the history is that well intentioned NRC staff are not always backed by their organization. And I sincerely hope that that the will not be the case and that we will see new regulatory basis for increasing the security and safety and health of the people of this area, because I believe they are at elevated risk due to the potential for ice condenser failure because of hydrogen.

Now, having said that, I want to say a few other things. When I look in the mirror, my necklace
D-13 reminds me of baby teeth – it's not, I have no children, but they're freshwater pearls. And you
know, baby teeth reminds me of the strontium 90 that's building up in the teeth of children in
this area most likely. The tooth fairy project undertaken by Jay Gould and others has shown
that children who live down wind of nuclear reactors in the United States do in fact have more
strontium 90 than children who live in other areas, even though atmospheric bomb testing is
over.

D-13 contd
D-12 cont
But we're not allowed to bring that issue to the question of whether Catawba 1 and Catawba 2 should continue to operate in this neighborhood. We're not allowed to bring that issue because it would be challenging current regulations. So again, I take off my hat to the NRC for finding some issues where they must challenge their own regulations and consider changing them.

D-14 But I cannot accept – and I have said before and I will say again – that the NRC's own finding that the 20 years of operation of each of these reactors, when only considering the off-site does, when considering routine releases, routine operations and no accidents, perfect – Duke delivering perfection – will result in 12 excess cancer deaths per 20 years of operations. That, when you do the math, results in 24 people for two units for 20 additional years, and when you add the fact that each of these units already has 40 years of license, a total of 36 cancer deaths each. So now we come up with a total of 72, since there's two units. And then, because there's one non-fatal cancer for every fatal cancer generated with no accidents, with no problems, we're talking about 144 cancers from these two units in their 60 years of operations. And this doesn't even include handling the high level waste.

D-15 And can we talk about that waste, the fact that 20 more years of generation of electricity for two units is effectively a whole new 1000 – or we heard earlier 1129 megawatt – electrical generation reactor? Because, you know, 40 more years, that's like a whole new unit. That's going to be a whole new unit's worth of high level waste either staying here or traveling somewhere. But we can't bring that up.

D-16 And we also can't bring up the fact that Catawba is currently under contract with the Department of Energy – and I'm going to hand this over to our transcript in a moment, because I'd like it to go in the record, excerpts from the contract signed by Duke-Cogema-Stone & Webster, that names Catawba 1 and 2 as mission reactors for the irradiation of weapons grade plutonium in MOX fuel. And by the way, I just want to read a very short portion of the contract. It says "The contractor may only propose to replace a mission reactor if (1) the reactor has been shut down for economic reasons or (2) the Nuclear Regulatory Commission or the utility company has required the reactor to be shutdown for safety...and in either case, the shutdown will preclude accomplishment of the plutonium disposition mission schedule."

That's very tight language saying that under only the NRC rejecting the safety of MOX fuel will this reactor not use it, if that fuel is produced. And yet, we are told that this very same time period, the studies that have been done on uranium fuel are all that will be considered.

D-17 Where and when will the National Environmental Policy Act be applied to the use of this contractually obligated irradiation of plutonium? The answer is in a process by NRC staff, an environmental assessment, which may or may not ever be opened to a complete public access like this process for people who live in this community, unless they're willing to litigate, unless they're willing to either join up with the likes of me and go into court under the banner of an environmental organization or they're able to hire their own attorney and step in at that point.

So I'm basically wanting to put on record a few of the concerns that we have about the impacts that MOX would have, that are not reflected in the current document that we're looking at tonight.

Increased health hazards to the worker and public, both from routine and accident conditions; the reworking of that committed off-site dose that is responsible for 144 cancers for Catawba 1 and 2, what's the difference with MOX fuel; the socio-economic impacts of asking those people in this area to pay for this increased hazard with their own tax dollars; the increased rate of aging that may result to the reactor pressure vessel and internals from the use of this different type of fuel; elevated thermal impacts impacting not only operations, but also the environment and also waste storage in handling and disposal including impacts on decommissioning which are not covered by the contract, by the way, and would be borne by who? Increased fission products in all forms of emissions and waste; increased plutonium in all emissions and all types of waste; impacts, as I said, on decommissioning; and finally, impact on security.

And my final comments, I do want to make on security tonight. Nuclear Information and
D-18 Resource Service intervened on the license renewal issues. Our petition to intervene was due on September 14. Needless to say, our application was deeply impacted by the events of September 11. We respect the fact that the Nuclear Regulatory Commission is in the review of security issues, we respect the fact that we probably will never know if any of our contentions were addressed. And yet, at what point does the public have the right to continue to assess these concerns in the context of public decision-making processes?

D-19 Catawba 1 and 2 are currently sitting there on line. If, heaven forbid, they were attacked while on line, there would be a Chernobyl type event if the core was breached and containment was breached. The International Atomic Energy Agency said that a week at September 11, that would be the type of consequence. And yet, calculations have been done, have been published in the open press, that if a reactor is turned off for only 30 days, because such a large portion of the radioactivity is transient, is like that medical radioactivity that decays very quickly in seconds, minutes, hours, days, weeks – in 30 days, half of the radiological impact is gone if the same attack occurs – half.

Now it does level out, we don't see it go away in a couple of decades, we know that. You still have a big problem on your hands if irradiated fuel is attacked, but to look at the cost/benefit to this region in an era of terrorism is something that people have a right to know, whether those considerations have been made.

D-12 cont I already mentioned earlier that the National Academy of Science has come out with a new report that basically says the grid in the United States cannot be safeguarded and so this doubles my appreciation of NRC staff for identifying station blackout issues as primary for ice condenser reactors, Catawba in particular.

D-20 And all I can say is that I offered in very good faith to Duke the idea of using hydroelectric generation on the site of the reactor as an ultimate form of insurance, as long as that dam is there, that the reactor could be cooled in the event of station blackout. And I think it's time to take that teeter-totter and put the full weight of the national security issues on the other end of whether it is cost effective to back up Catawba 1 and 2 with its own on-site dedicated line to the electric generation that is also on site.

So having said that, we are still in litigation on some of these issues, we'll see how it all comes out. I wish Duke the very best with the Fourth of July coming up, we're all deeply concerned about the kinds of things we're reading in a paper, and we encourage both the NRC and Duke Energy to do the utmost to secure and ensure public health and safety.

Thank you.

MR. CAMERON: Thank you, Mary. We're going to go to Peter Sipp next. Okay?

MR. SIPP: Thank you, Chip.

E-02 I want to know from anyone that would know this, how much money does Catawba receive in subsidies. Does anybody know?

MR. CAMERON: That's a pretty broad question here.

E-02 cont MR. SIPP: Okay, but does Catawba receive tax dollars to be there?

MR. CAMERON: I don't know. Why don't you proceed with –

MR. SIPP: Is Greg Robison still here? Do you know that, Greg?

MR. ROBISON: I don't know.

MR. SIPP: Okay, when I was in the sixth grade in 1959, something we had to do in our class was to bring an article once a week, and I think I talked to you about it in Savannah, but it's appropriate that I mention it now because there's others that didn't hear it. But my particular article that one day was about the NS at Savannah, and the NS stands for nuclear ship, and it was commissioned in 1959. I found out from an article in the Sandia National Lab that it was decommissioned in 1972 and it was decommissioned because it could not compete with the oil burners. And that's a well kept secret by the nuclear industry and I ain't keeping it a secret. It can't compete, it couldn't compete, that's why there's only one nuclear commercial ship ever built, it wasn't getting this tax dollars, it's parked in Charleston.

So you folks that are trying to push nuclear power, it's dead. You smile at me, Joe, but it's dead, buddy – it's dead.

E-03 I understand that the containment for Catawba is only three-quarters of an inch plate. That's not very much. That's a real easy target for somebody who wants to make a mess in South Carolina. I wouldn't be bragging on that I worked there.

E-04 Nuclear power is a great thing, but the waste, what are we going to do with it? Nobody wants it – oh, well. What are we going to do with it? Nobody wants it. Nevada sure doesn't want it, they don't even have a reactor in that state and oh, we're going to put it out there. We'll get it out of my yard, I don't want it, put it somewhere in Nevada. No, it's a dead horse, sorry.

We are just the right distance from the sun. If you think about Mercury, the closest planet to the sun, it's very hot, and then go to the other extreme, Pluto, very cold. We're the right distance. That was in my fourth grade child's science book, it reminded me of that – very basic.

I appreciate all you're doing to keep it from having a meltdown and all this stuff in your generic environmental impact statement book on Page 8-47. So much depends on how we look at
E-05 things. It says in here that Catawba site receives approximately four to five kilowatt hours of direct normal solar radiation per square yard – thank you very much – per day, of solar radiation. And then at the end it says implementation of solar generation on a large scale, enough to replace Catawba's generating capacity, would likely result in large – and you had to emphasize the word large – environmental impacts. Well, I thank you, but there's no waste with making electric on somebody's roof, there's no waste at all. Thank you very much.

When you say that you're not pro-nuclear, but when you say – you just don't look at it right.

E-06 So I'm in favor of no new license. Sorry, but that's not good enough, it really isn't.

MR. CAMERON: Okay, thank you, Peter. Let's go to Sherry Lorenz, Sierra Club, right now and then we'll go to Gregg Jocoy. Sherry.

MS. LORENZ: Good evening, ladies and gentlemen. My name is Sherry Lorenz, and I live in Fort Mill.

Tonight I'm standing before you, not as an expert, but as a common citizen who deeply cares about family, friends, neighbors, animals, nature and the general wellbeing and future of this planet.

I have all the scientific information on weapons grade plutonium, but I left it at home. I plan to talk to you as a friend and as a concerned citizen.

Ladies and gentlemen, I am pained that I have to stand up here and talk and convince you of something that shouldn't even be an issue, something that everyone should know is wrong, disastrous, outright insane and may very well one day spell the end of this entire planet as we know it. Why? Why would you or you or you or you want to endanger your children, your wife, your husband, your mother, your father, your sisters and brothers, your grandparents, your friends and neighbors, with a threat that will and can wipe everyone out? But worse yet, will cause immense pain and suffering first before death finally sets in.

J-01 Ladies and gentlemen, I am talking about the threat of a nuclear fallout from a reactor, a reactor that has exploded on its own, a terrorist attack, or an attack anywhere in the U.S. Terrorists confiscating plutonium from the sites it is stored or even holding up the trucks that are supposed to be transporting this lethal chemical across the roads of our cities, towns and neighborhoods. You know as well as I know that for terrorists, nothing is an obstacle. Their motto is we will kill, no matter how, what, where, or when. They have proven it and they will prove it again. It's just a matter of time.

We may one day fry from our own invention, from the plutonium and uranium, we have so proudly created ourselves. Wouldn't this be the ultimate reward for our smarts, our state of the art power generation and advanced technology? It just may be that one day, we will all have to swallow our own medicine – a very deadly one in this case.

Ladies and gentlemen, I don't want to see my children and grandchildren suffer. I don't want to see my friends and neighbors suffer. I don't want to see the world suffer. I don't want to suffer and die myself. Everybody, everybody deserves a decent life on this earth. We are here for just a very short time and we deserve to have a good time, good quality time during our limited stay here on this planet. Ladies and gentlemen, people are suffering as it is, the world is already awash in pain and suffering. Why add to the misery, why make it worse? Why not be intelligent and utilize better ways to produce power, to create safe and clean industry, industry that would really verify our intelligence and technology that is good and safe for us and our world.

Ladies and gentlemen, the knowledge is already available, it's all here to be grabbed, to be utilized, to be taken advantage of. I'll be glad to obtain any type of information for you on clean and safe energy, including the latest copy of the Sierra Club magazine called Sierra.

J-02 Ladies and gentlemen, wind, solar and hydrogen can and will end our dependency on nuclear power plants and other dangerous polluting plants. Why ignore safe and clean technology if it's good for the good of Man? Why? I don't understand it. Is it because of corporate greed, because of the fact that it is less profitable for big industry? I think I may be right. Isn't this all about money? I think I may be right. Is corporate America truly concerned about our health and even the health of our own families and friends? Maybe not. I think I may be right as well.

Why then don't we all stand up to them and say no more, no more deadly chemicals, no more
J-03 playing with our future? Ladies and gentlemen, I am asking you why are you ready to throw your lives away for profits? Even the profits of a foreign country, a country that is hundreds and hundreds of miles away and doesn't give a rip whether you're dying of cancer or you're blown into 1000 pieces. And by this, I mean France.

J-04 Ladies and gentlemen, we don't need plutonium on our roads, whether it's in South Carolina or anywhere else, because in essence, anywhere else is here too. A nuclear disaster has no borders, no boundaries, it will swiftly sicken and eventually exterminate everyone in its path, every human, every animal, every tree and every blade of grass.

The accidents at Chernobyl and Three Mile Island have proven the worst fears and nightmares about nuclear fallout. Thousands have died, many thousands more are suffering right now as we speak. Children are stricken with rare cancers, leukemias, lymphomas, tumors and other hellish diseases that are so terrible, it's almost better to die than to suffer in total agony without hope of recovery.

Ladies and gentlemen, even if we don't have a disaster of any kind, in our lifetime, the waste
J-05 from nuclear power plants and weapons production will stay with us for hundreds and thousands of years. These deadly chemicals are already causing more cancers and disease, birth effects and death that we shouldn't even be suffering.

Where is the end of this? When will we wake up and stop the insanity? I thought that we considered ourselves to be civilized people. I'm sorry, I'm sorry to say that this is not the case. In my opinion – how could we call ourselves civilized if we self-destruct? Nuclear power, plutonium, uranium and other deadly chemicals cannot be considered progress or intelligent inventions. If something doesn't promote health, happiness and a safe world, it is neither intelligent, nor progress.

Ladies and gentlemen, let's see the light, let's stop before it's too late, let's do the right thing.
J-06 We may still have a chance now. However, when we start transporting MOX fuel over our highways and start burning it in our reactors, we may be crossing a point of no return. Let's do the right thing now, let's save our species from extinction. We already have enough plutonium

and uranium to blow this planet to pieces many times over. Let's start disposing of these hellish chemicals, let's start making plans for a safe and good future.

We should be meeting here today to discuss how to undo our mistakes, not make more of them. Let's meet somewhere soon and discuss what's really good for all of humanity. This shouldn't be us versus you, this should be us working together to make this world a better place. Ladies and gentlemen, let's rise to the occasion. You say it's not that easy? Well, I have news for you. There is power in numbers and where there's a will, there's a way. If we all stand up and demand the same thing, to have a safe world, then the others will follow, because even the greedy, the rich and the mighty, can't do it alone, after all. If they become the minority, they too will have to follow suit. They will have to do the right thing as well. They will have no choice.

Ladies and gentlemen, I ask that you look deep into your soul. I know that you know the right answer to all of this.

Ladies and gentlemen, let's stop the insanity now, let's stop it today. And let's meet real soon to discuss a beautiful and safe future for us and our children.

J-07 Ladies and gentlemen, please nix MOX.

Thank you.

(Applause.)

MR. CAMERON: Thank you very much, Sherry. Could we attach that to transcript?

MS. LORENZ: Pardon?

MR. CAMERON: Could we attach that to the transcript?

MS. LORENZ: Yes.

MR. CAMERON: Great. If you have an extra copy or we can get a copy. Okay, thank you very much.

We're going to go to Gregg Jocoy at this point. Gregg is with the Blue Ridge Environmental Defense League.

MR. JOCOY: Good evening, folks. Boy, that was great, Sherry. I heard a fellow on the radio today, who trains people in public speaking and so on like that, and he said if you don't have butterflies in your stomach when you stand up to speak, you're probably in trouble. So apparently I'm not in trouble because I've got the butterflies.

I'm here today representing the Board of Directors of the Blue Ridge Environmental Defense League and I'm simply going to read the statement. I want all of you folks who are on the NRC staff to understand once again I have to reiterate, this is my own personal opinion here, okay? This is not BREDL, this is Gregg's opinion.

F-08 And I have to reiterate once again, don't be persuaded by Duke Energy's reputation in the community. Of course, they're well-liked, they employ a lot people, they pay a lot of tax money. That doesn't mean that the technical questions that you folks are supposed to be investigating are any less serious because Duke Energy has the support of the public. You have to get down to the brass tacks and make a decision about whether or not the things that are proposed are safe and sound for us and for our families. I know that you all take that responsibility very seriously, but I want you to understand too that the folks from Duke Energy have literally hundreds of people who are on staff, paid whatever wages they're paid, and I sell nuts and bolts for a living, Sherry sells something for a living, I'm not really quite sure that I understand what it is. You know, Mary and Pete, these are just average people who are really concerned that Duke Energy plans to screw up our lives.

You know, take the resources that Duke has available to it, take the resources that the opposition has available to it, and use that as you weigh things. Sit there and say okay, Duke has given me 10,000 pages of why this is safe and over here from NIRS, I've got two pages that says there's a problem. Maybe instead of spending my time going through those 10,000 pages, I need to spend some of my time doing those two pages that NIRS has offered and find out if there's something there, because if they've identified a potential problem, maybe it's real and Duke has simply made an effort to hide those real concerns from you folks.

Now on behalf of the Blue Ridge Environmental Defense League, I submit these comments on NUREG-1437, Supplement 9 for Catawba Nuclear Station.

F-09 The document offered for comment strains and ultimately exceeds the limits of comprehension
in order to avoid assigning a single significance level of large in its analysis of environmental
impacts of high level waste. The efforts of the staff and/or Commission to resist admitting that
high-level waste and spent or irradiated fuel have a large impact on the environment and public
F-10 health must not be permitted to obscure the facts. The contortions evident in this document are
a testament to the inability of the Commission and its staff to admit the nuclear power plant
F-11 impacts are not small. Regarding postulated accidents and hydrogen explosions during loss of
power, the SAMA should be implemented as a part of a license renewal.

Section 5 – Environmental Impacts of Postulated Accidents...

In the report, the staff concluded that the SAMA that would establish hydrogen control in SBO events by providing backup power to igniters must be cost beneficial. But the staff does verbal double back flip to avoid applying the analysis to license renewal, saying:

> "However, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of the license renewal pursuant to 10 CFR Part 54." [Page 5-29].

The invocation of GSI-189 in the report notwithstanding, the logic here is akin to "However, the SAMA, the seatbelt alternative for mitigating auto accidents, does not relate to adequately managing the effects of tire and battery replacement. Therefore, it need not be implemented as part of the driver's license renewal." So no seatbelt is required?

F-11 cont The severe accident mitigation alternative should be implemented as a requirement in the Catawba license renewal process.

F-12 Section 6 – Environmental Impacts of the Uranium Fuel Cycle...

Supplement 9 reports that the Duke Energy and NRC staff have found no information which is new or significant enough on any issue to alter conclusions found in the general environmental impact statement. The report states the following:

> "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 from spent fuel, which were not assigned a single significance level). [Emphasis was added.] That's from abstract page iii.

Later in Chapter 6, the report again makes exceptions for assigning single significance levels for collective off-site radiological impacts from the fuel cycle and from high level waste on pages 6-1 and 6-3.

> "For all those issues, the staff concluded in the GEIS that the impacts are small except for collective off-site radiological impacts from the fuel cycle and from HLW and spent fuel disposal, as discussed below." [Again, emphasis added][pg 6-3].

> The report makes two more exceptions, one for nuclear fuel and one for high level waste. However, despite the detailed exploration of the uncertainties of such estimates, both of these issues are swept off the Category 2 table, relegating them to Category 1 limbo.

> "Accordingly, while the Commission has not assigned a single level of significance for the collective effect of the fuel cycle, this issue is considered Category 1." [Page 6-4.]

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."

F-13 Nowhere in Section 6.1 does the NRC analyze the actual impacts of the fuel cycle and its waste products. Instead of investigating and quantifying the impacts of the fuel cycle and waste, the report merely recapitulates regulatory dose limits. Dose limits are an unreliable means of analysis because they are subject to change and have no meaning in the time frames necessary for the determination of long term radionuclide impacts of geological repositories. Moreover, regulatory limits for some important aspects of waste disposition do not exist.

F-14 Before license renewal proceeds, the Commission must resolve important questions about future impacts of the fuel cycle and high level waste. The draft report states that EPA performance standards "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 1000 premature cancer deaths worldwide for a 100,000 metric ton repository." [Page 6-5] "The impacts of license renewal – twenty years of additional operation, a 50-percent increase – will unquestionably increase these estimates.

If and when a geological repository is built, these questions may be easier to resolve, but because of the insoluble nature of the problem and the large impacts of high level nuclear waste, the Commission must suspend or eliminate license renewal.

MR. CAMERON: Thank you very much, Gregg, and we'll put that on to the end of the transcript.

That's the final speaker for tonight and we would just thank all of you for being here tonight, first of all. Thank you for our questions about various aspects of the process and thank you for your heartfelt comments tonight that we heard, and suggestions.

And with that, I think we're probably adjourned. The staff is available, our experts are available if you have time to talk about various issues. Thank you.

(Whereupon, the public hearing was adjourned at 9:21 p.m.)

COMMENT LETTERS

Letter K, page 1

Duke Power.
A Duke Energy Company

M. S. Tuckman
Executive Vice President
Nuclear Generation

Duke Power
526 South Church St. EC07H
Charlotte, NC 28202
P. O. Box 1006 EC07H
Charlotte, NC 28201-1006
(704) 382-2200 OFFICE
(704) 382-4360 FAX

August 9, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Comments on draft plant-specific Supplement 9 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants" Catawba Nuclear Station, Docket Nos. 50-413 and 50-414

By letter dated June 13, 2001, Duke Energy Corporation (Duke) submitted an Application to Renew the Facility Operating Licenses of McGuire Nuclear Station and Catawba Nuclear Station (Application). The staff has reviewed the information provided in the Environmental Report contained in the Application as well as the information provided in Duke letters dated February 1 and 8, 2002. By letter dated May 14, 2002, the staff forwarded a copy of the draft plant-specific Supplement 9 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants" for McGuire and provided Duke the opportunity to submit comments. Accordingly, please find Duke comments on draft Supplement 9 to NUREG-1437.

In addition to providing comments on the draft Supplement 9, Duke is also in the process of reviewing the conclusions contained in Section 5.2.7 of the draft Supplement 9. In this section, the staff concluded that two of the severe accident mitigation alternatives (SAMAs): one related to hydrogen control in SBO sequences is cost beneficial under certain assumptions, which are being examined in connection with the resolution of GSI-189, "Susceptibility of Ice-Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident" and a second SAMA related to the installation of flood protection around the 6900/4160 volt transformers. Duke is in the process of reviewing both of these SAMA and has provided its position in a separate letter dated August 8, 2002.

If there are any questions, please contact either Bill Miller at (704) 373-7900 or Bob Gill at (704) 382-3339.

Very truly yours,

M. S. Tuckman
M. S. Tuckman

Attachment

A085

Letter K, page 2

U.S. Nuclear Regulatory Commission
Document Control Desk
August 9, 2002
Page 2

Affidavit

M. S. Tuckman, being duly sworn, states that he is Executive Vice President, Nuclear Generation Department, Duke Energy Corporation; that he is authorized on the part of said Corporation to sign and file with the U. S. Nuclear Regulatory Commission the attached comments on draft plant-specific Supplement 8 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants," and that all the statements and matters set forth herein are true and correct to the best of his knowledge and belief. To the extent that these statements are not based on his personal knowledge, they are based on information provided by Duke employees and/or consultants. Such information has been reviewed in accordance with Duke Energy Corporation practice and is believed to be reliable.

M. S. Tuckman
M. S. Tuckman, Executive Vice President
Duke Energy Corporation

Subscribed and sworn to before me this 9TH day of August 2002.

Mary P. Nelms
Notary Public

My Commission Expires:
JAN 22, 2006

Letter K, page 3

Attachment 1

Comments on Draft Plant-Specific Supplement 9 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants"

Catawba Nuclear Station, Units 1 and 2

Letter K, page 4

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter Executive Summary
Section Not Applicable

	Comment Number	Page	Line	Comment
K-01	1	xix	12-14	The staff's conclusion statement contained in these lines contradicts the staff conclusion statement contained in Section 5.2.7, page 5-28, lines 20-21.

Chapter 1.0 Introduction
Section 1.5 Compliance and Consultations

	Comment Number	Page	Line	Comment
K-02	2	1-9	8	From Table 1-1, under Column reading "Permit Expiration or Consultation Date": The permit expiration date is listed as "April 30, 2006". The NPDES permit issue date was April 30, 2001, however the permit was not issued until well into the 5-year cycle. Therefore the expiration date on the permit is not the full 5 years from date of issue. Correct the permit expiration date to be "June 30, 2005".

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.1.2 Reactor Systems

	Comment Number	Page	Line	Comment
K-03	3	2-4	38	Line 38 should be revised to state: "….5.0 percent by weight uranium-235."

Attachment 1, Page 1

Letter K, page 5

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.1.7 Power Transmission Systems

	Comment Number	Page	Line	Comment
K-04	4	2-14	14	The term "conservation easements" should be replaced with "protection of rare species". Duke does not currently have conservation easements with SCDNR for transmission ROWs.

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.1 Land Use

	Comment Number	Page	Line	Comment
K-05	5	2-14	34	"4916 ha (12,139 ac)" should read "4,917 ha (12,149 ac)"
K-06	6	2-14	35	The statement "Full pond was achieved in 1904…" is somewhat misleading. Construction of a much smaller dam was completed in 1904. This dam was completely covered by the current and much larger Wylie dam which resulted in a significantly larger reservoir. Change the statement to read: "The lake was initially impounded in 1904. Present full pond was obtained in 1924 with an increase in the dam height.
K-07	7	2-16	1	"Duke owns the land that underlays the lake…" is not entirely correct. Change the statement to read: "Duke either owns the land under the lake or owns flood rights to the land under the lake".
K-08	8	2-16	9	The fenced cemetery referenced as part of the site is not part of Catawba Nuclear site. The site is owned and operated by the Concord Cemetery Association.

Attachment 1, Page 2

Letter K, page 6

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.8.1 Housing

	Comment Number	Page	Line	Comment
K-09	9	2-27	24-25	From Table 2-4, under Column reading "Number of Personnel": Currently reads: Other – NC 95 Other – SC 96 In order to correctly reflect the number counts as given in Table 2-5, change to: Other - NC 112 Other - SC 79

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.8.2 Public Services

	Comment Number	Page	Line	Comment
K-10	10	2-32	24-25	Lines Read: "There are 24 counties within the 80-km (50 mi) radius of the Catawba site: 13 in South Carolina and 10 in North Carolina. The 23-county area is served by 3 major interstate freeways." Correct the sentences to read: "There are 24 counties within the 80-km (50 mi) radius of the Catawba site: 11 in South Carolina and 13 in North Carolina. The 24-county area is served by 3 major interstate freeways."

Attachment 1, Page 3

Letter K, page 7

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.8.4 Visual Aesthetics and Noise

	Comment Number	Page	Line	Comment
K-11	11	2-36	5	"4912 ha (12,139 ac)" should read "4,917 ha (12,149 ac)"

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.8.5 Demography

	Comment Number	Page	Line	Comment
K-12	12	2-38	31	"4912 ha (12,139 ac)" should read "4,917 ha (12,149 ac)"
K-13	13	2-38	34	Duke owns eight (not nine) public recreational access locations on Lake Wylie and one additional access location immediately downstream of the lake. Of these nine access areas, only two (not 3) are leased to other operators.

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.9.2 Historic and Archaeological Resources at Catawba

	Comment Number	Page	Line	Comment
K-14	14	2-48	25	The Concord Cemetery is not located within the Catawba site, but adjacent to it. The cemetery is owned and operated by the Concord Cemetery Association.
K-15	15	2-48	37	The Concord Cemetery is not located within the Catawba site, but adjacent to it. The cemetery is owned and operated by the Concord Cemetery Association.

Attachment 1, Page 4

Letter K, page 8

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.10 Related Federal Project Activities and Consultations

	Comment Number	Page	Line	Comment
K-16	16	2-49	22	Line Reads: "This lake was formed by impounding the water of the Catawba River, and full pond was achieved in 1904." Correct the sentence to read: "This lake was formed by impounding the water of the Catawba River in 1904."
K-17	17	2-49	24	"4912 ha (12,139 ac)" should read "4,917 ha (12,149 ac)"

Chapter 4.0 Environmental Impacts of Operation
Section 4.1.2 Microbiological Organisms (Public Health)

	Comment Number	Page	Line	Comment
K-18	18	4-14	40-41	Statement reads: Based on Catawba-specific experience, a review of available technical literature on thermophilic organisms, and the fact that there is little heated This sentence is incomplete.

Attachment 1, Page 5

Letter K, page 9

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.2.1 Duke's Risk Estimates

	Comment Number	Page	Line	Comment
K-19	19	5-6	20	5.8E-05/ry should be 5.8E-05/yr Duke's reported risk estimates are base on a calendar year basis, not a reactor year basis. The capacity factor used in the PRA is 0.9.
K-20	20	5-6	25 2 cases	"per reactor-year" should be "per year"
K-21	21	5-7	17	Table 5-3 - Heading "Frequency (per reactor-year)" should be Frequency (per year)
K-22	22	5-8	23	"reactor-year" should be "year"
K-23	23	5-8	26	"per reactor-year" should be "per year"
K-24	24	5-9	2	"per reactor-year" should be "per year"
K-25	25	5-9	3	"per reactor-year" should be "per year"

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.2.2 Review of Duke's Risk Estimates

	Comment Number	Page	Line	Comment
K-26	26	5-11	10	"per reactor-year" should be "per year"

Letter K, page 10

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.3.1 Process for Identifying Potential Design Improvements

	Comment Number	Page	Line	Comment
K-27	27	5-12	25	"per reactor-year" should be "per year"
K-28	28	5-12	29	"per reactor-year" should be "per year"
K-29	29	5-14		Table 5-5 Footnote (a) "per reactor-year" should be "per year"
K-30	30	5-14		Table 5-5 Footnote (b) "per reactor-year" should be "per year"
K-31	31	5-15	10	Table 5-6 - The cost of enhancement provided by Duke for the back-up power to the igniters ($540,000) is a per unit cost and should not be divided by 2. One of the major cost categories for the candidate modification is in the installation labor, primarily pulling cables. It was judged that finding a location for the diesel that would allow it to serve either unit would dramatically increase the cable pulling cost component. As such, it was judged that having a diesel for each unit would be less expensive (given the low cost of the hardware) than pulling cables to both units from a single location.
K-32	32	5-15	22	Table 5-6 – Delete Footnote (c)

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.4 Risk Reduction Potential of Design Improvements

	Comment Number	Page	Line	Comment
K-33	33	5-17	28	"per reactor-year" should be "per year"
K-34	34	5-17	29	"per reactor-year" should be "per year"
K-35	35	5-17	35	"per reactor-year" should be "per year"

Letter K, page 11

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.5 Cost Impacts of Candidate Design Improvements

	Comment Number	Page	Line	Comment
K-36	36	5-19	17	"$205,000 per site" should be "$205,000 per unit" see comment 28
K-37	37	5-19	24	"$540,000 per site" should be "$540,000 per unit see comment 28
K-38	38	5-19	27-29	The sentence, "In order to provide ..." should be deleted as it is not appropriate to divide these costs by 2.
K-39	39	5-19	36-38	The sentence, "Duke further noted that ..." should be modified. The discussion that Duke provided relative to powering the air-return fans was in the context of powering the igniters. The mixing afforded by the fans may or may not be significant to the effectiveness of PARs, but in any case Duke provided no position on the need for fans when using PARs.

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.6.1 Duke Evaluation

	Comment Number	Page	Line	Comment
K-40	40	5-22	34	3.81E+08 should be 3.1E+08 see page 12 of Attachment H

Attachment 1, Page 8

Letter K, page 12

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.6.2 Staff Evaluation

	Comment Number	Page	Line	Comment
K-41	41	5-25	14	"30 percent" should be "24 percent" See Table 5-3 of the SEIS
K-42	42	5-25	29	"per reactor-year" should be "per year"
K-43	43	5-25	30	"per reactor year" should be "per year"
K-44	44	5-26	3-5	The discussion concerning NUREG/CR-6427 should more accurately characterize the insights from the NUREG. This NUREG provided a simplified level 2 analysis for the purpose of investigating the importance of DCH. The conservative assumptions applied in this analysis with regard to hydrogen generation and the probability of ignition make it useful for understanding the uncertainties associated with early containment failure probabilities. The NUREG should not be interpreted as the latest information with respect to a realistic or best-estimate evaluation of the potential for early containment failure as a result of hydrogen combustion during station blackouts.
K-45	45	5-26	3	"per reactor-year" should be "per year"
K-46	46	5-26	20 2 cases	"per reactor-year" should be "per year"
K-47	47	5-27	5 & 9	Table 5-7 - $270,000 should be $540,000 and $102,5000 should be $205,000 The cost provided by Duke are per unit costs and should not be divided by 2
K-48	48	5-27	11-13	Table 5-7 - Delete Footnote (a)

Attachment 1, Page 9

Letter K, page 13

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter 6.0 Environmental Impacts of the Uranium Fuel Cycle and Solid Waste Management
Section 6.1 The Uranium Fuel Cycle

K-49

Comment Number	Page	Line	Comment
49	6-6	25	This page presents a brief chronology of events that have occurred in the area of high level waste disposal subsequent to the GEIS being published in 1996. The chronology ends at the President's recommendation in February 2002. While it may seem a bit odd for this type of information to be contained in an environmental document, Duke believes that the chronology should remain in the SEIS and should be updated to reflect significant events that have taken place since then. For example: "On April 8, 2002, Governor Guinn of Nevada issued a "Notice of Disapproval" regarding the recommendation of the President. As required by the Nuclear Waste Policy Act, the matter was then referred to the Congress. Subsequently, [insert final decision of Congress and date]."

Chapter Chapter 8.0 Environmental Impacts of Alternatives to Operating License Renewal
Section Section 8.2.2.1 Oil and Natural-Gas-Fired (Combined Cycle) Closed-Cycle Cooling System

K-50

Comment Number	Page	Line	Comment
50	8-32	23	Reference to SCDNR should be replaced with SCDHEC

Letter K, page 14

Attachment 1
Comments on Draft NUREG-1437, Supplement 9
Catawba Nuclear Station, Units 1 and 2

Chapter Chapter 8.0 Environmental Impacts of Alternatives to Operating License Renewal
Section Section 8.2.3.1 Nuclear Power Generation - Closed-Cycle Cooling System

K-51

Comment Number	Page	Line	Comment
51	8-41	18	Reference to SCDENR should be replaced with SCDHEC

Chapter Appendix E
Section Table E-1

K-52

Comment Number	Page	Line	Comment
52	E-2	11	Expiration date of NPDES wastewater permit is 6/30/05 rather than 4/30/06.

Letter L, page 1

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

ER 02/438

August 13, 2002

5/21/02
67 FR 35839
1

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555

RECEIVED
2002 AUG 20 PM 2:44
Rules and Directives Branch

RE: Draft Generic EIS for License Renewal of Nuclear Plants, Supplement 9, Catawba Nuclear Station, Units 1 and 2 (NUREG-1437)

Dear Sirs:

L-01 The Department of the Interior has reviewed the referenced document and we have no comments to provide at this time. If you should have any questions, I can be reached at 404-331-4524.

Sincerely,

Gregory Hogue
Regional Environmental Officer

cc:
FWS, R4
OEPC, WASO

Template = ADM - 013

E-RIDS = ADM-03
Add = James H. Wilson (JHW1)
A. Beranek (AFB)

Letter M, page 1

Duke Power®
A Duke Energy Company

GARY R. PETERSON
Vice President
Catawba Nuclear Station

Duke Power
CN01VP / 4800 Concord Rd
York, SC 29745

803 831 4251
803 831 3221 fax
grpeters@duke-energy.com

August 8, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Duke Energy Corporation
Catawba Nuclear Station, Units 1 and 2
Docket Numbers 50-413 and 50-414
Severe Accident Mitigation Alternatives

REFERENCE: 1) Letter, USNRC to Duke Energy Corporation Dated May 14, 2002, SUBJECT: Request for Comments on the Draft Plant-Specific Supplement 9 to the Generic Draft Environmental Impact Statement Regarding Catawba Nuclear Station, Units 1 and 2.

Gentlemen:

M-01 Section 5.2.7 of Reference 1 identifies two Severe Accident Mitigation Alternatives (SAMAs): one to provide back-up power to the hydrogen igniters for Station Blackout (SBO) events and the other to install flood protection around the 6900/4160 volt transformers. The NRC staff states that since these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. The staff intends to pursue these two SAMAs as current

M-01 contd operating license issues. Catawba has reviewed these two SAMAs and concurs with the NRC that these two SAMAs are not within the scope of license renewal and should be addressed separate from any license renewal proceedings. This letter provides the Catawba Nuclear Station position on these two SAMAs.

M-02 For the first SAMA, concerning the installation of back-up power to the hydrogen ignition system during a SBO event, Catawba agrees with the NRC staff that depending on the design requirements there may be a cost-beneficial modification that provides sufficient alternative power during a SBO to the hydrogen ignition system. The NRC staff has determined that this issue is sufficiently important for PWRs with ice-condenser containment and BWR Mark III containments that the NRC has made the issue a Generic Safety Issue (GSI), GSI-189 - Susceptibility of Ice-Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident. As part of the resolution of GSI-189, the NRC is evaluating potential

www.duke-energy.com

Letter M, page 2

U.S. Nuclear Regulatory Commission
Page 2
August 8, 2002

improvements to hydrogen control provisions in ice-condenser plants to reduce their vulnerability to hydrogen-related containment failures during a SBO. This will include an assessment of the costs and benefits of various options. Catawba will evaluate various possible plant design and procedural changes to address this issue. However, since this issue is being pursued by the NRC as a generic issue for ice-condenser and BWR Mark III containments, Catawba will monitor the NRC resolution of GSI-189 as a current operating license issue.

M-03 For the second SAMA, concerning the installation of flood protection around the 6900/4160 volt transformers, Catawba also agrees with the NRC staff conclusion in Reference 1. Catawba is currently in the process of designing and scheduling the installation of flood protection for the 6900/4160 volt transformers for Units 1 and 2. The current schedule is to have this modification completed by March 31, 2005. Catawba will keep the NRC Staff informed on the progress of this modification and any changes to the schedule. This is the only regulatory commitment contained in this letter.

Duke Energy and Catawba have been actively involved since before 1988 in the development of plant-specific probabilistic risk assessments (PRA), individual plant examinations (IPE/IPEEE), and component/system reliability studies to evaluate severe accidents at Catawba. Risk insights from various Catawba risk assessments have been identified and implemented to improve both the design and operation of the plant. These changes to the plant have been prioritized based on risk significance and implemented accordingly. The implementation of such improvements has reduced the risk associated with major contributors identified by the Catawba PRA and has enhanced overall plant safety. Consideration of the two issues identified in Reference 1 continues the activities previously taken by Duke Energy to use risk insights to continuously improve the safety of Catawba Nuclear Station.

If you have any questions regarding this submittal, please contact Randall D. Hart at 803-831-3622.

Sincerely,

Gary R. Peterson

RDH/s

Letter N, page 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

RECEIVED
2002 AUG 29 PM 2: 51
Rules and Directives Branch

August 23, 2002

5/21/02
67FR35839
(2)

4EAD

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

SUBJECT: **Generic Draft Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 9 Catawba Nuclear Station, Units 1 & 2 CEQ No. 020204**

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) reviewed the document entitled, "Draft Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding the Catawba Nuclear Station, Units 1 & 2, Supplement 9," NUREG-1437 (DGSEIS). We appreciate your compliance with the disclosure and public access aspects of the NEPA process. The purpose of this letter is to provide you with the results of our review of the DGSEIS.

N-01 Rad waste, which is usually considered a "low volume waste stream," is any waste stream (i.e., ion exchange regenerate, etc.), that has a radioactive component. EPA Region 4's review of this DGSEIS found no issues related to nuclear or environmental radiation which were significant enough to comment on or to ask for clarification. However, EPA does not regulate the radioactive component of any waste streams; that is the responsibility of the Nuclear Regulatory Commission (NRC). The NRC regulates the alpha, beta, and gamma radioactivity of all the waste streams at nuclear plants.

N-02 Based on the sufficiency of information, alternatives evaluation, and potential environmental impacts over which EPA has authority, the document received a rating of "EC-1," (Environmental Concerns - Adequate Information). That is, the review identified environmental
N-03 impacts which should be avoided, in order to fully protect the environment. Specifically, the possibility of environmental impacts resulting from a release due to a severe accident are a concern. However, we understand that NRC along with DOE, FEMA, and EPA are taking additional steps to ensure that nuclear plants are prepared for such an occurrence. In addition, while the DGSEIS provides reasonable analysis of the proposed action and alternatives, we look forward to the inclusion of clarifying information in the Final GSEIS. Our comments are attached.

Template = ADM-013 E-RIDS = ADM-03
Add = H. Berrick (HFB) add = James H. Wilson (JHW1)

Letter N, page 2

Thank you for the opportunity to provide our comments regarding this project. If you have any questions, you may contact Ramona McConney of my staff at (404) 562-9615.

Sincerely,

Heinz J. Mueller, Chief
Office of Environmental Assessment

Attachment

Letter N, page 3

EPA Comments on
Generic Draft Environmental Impact Statement for
License Renewal of Nuclear Plants, Supplement 8
McGuire Nuclear Station, Units 1 & 2
CEQ No. 020204

N-04 **General:** The document does not mention whether power demands on the Catawba facility are expected to change significantly from present levels during the license renewal period (up to 20 years). If consumer power needs in the service area increase significantly, please clarify how this would this affect operations, particularly with regard to the cooling system, effluent release, and waste quantity.

N-05 **Water:** Section 4.5 discusses groundwater use and quality. The document (page 4-35) mentions that the facility uses <100 gpm from three existing groundwater wells (page 2-6). We note the statement on page 4-36 that *"It is impossible to reliably predict the quantity of future withdrawals and groundwater demands over the renewal term."* A similar statement on page 4-14 is made regarding surface water withdrawals. Information regarding the anticipated growth rate in the consumer service area and other applicable factors may provide information on future power demands and consequently water needs.

N-06 **Waste Minimization:** We appreciate your commitment to reducing waste volume from the facility (page 2-12).

N-07 **Noise:** Page 2-36 states that noise from the facility is *"...noticeable but not obtrusive."* Please clarify the decibel level.

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, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Argonne National Laboratory.

Name	Affiliation	Function or Expertise
	NUCLEAR REGULATORY COMMISSION	
John Tappert	Nuclear Reactor Regulation	Section Chief
James Wilson	Nuclear Reactor Regulation	Project Manager
Barry Zalcman	Nuclear Reactor Regulation	Technical Monitor
Gregory Suber	Nuclear Reactor Regulation	Environmental Engineer
Duke Wheeler	Nuclear Reactor Regulation	Project Management
Robert Schaaf	Nuclear Reactor Regulation	Project Management
Stacey Fox	Nuclear Reactor Regulation	Environmental Engineer
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Richard Emch	Nuclear Reactor Regulation	Radiological Safety
Jack Cushing	Nuclear Reactor Regulation	Project Management
	PACIFIC NORTHWEST NATIONAL LABORATORY[(a)]	
Mary Ann Parkhurst/Rebekah Harty		Task Leaders
Dan Tano/Amanda Stegen		Deputy Task Leader
Bill Sandusky		Air Quality
Mary Ann Parkhurst		Radiation Protection
John Jaksch		Socioeconomics
Paul Nickens		Cultural Resources
Lance Vail		Water Use, Hydrology
Cary Counts		Technical Editor
Debora Schulz, Jean Cheyney, Lisa Smith		Document Design
	Lawrence Livermore National Laboratory[(b)]	
Tina Carlsen		Aquatic Ecology
	Los Alamos National Laboratory[(c)]	
Ted Doerr		Terrestrial Ecology
	Argonne National Laboratory[(d)]	
Bill Metz		Land Use

Energy Research, Inc.	
Mohsen Khatib-Rahbar	Severe Accident Mitigation Alternatives
Michael Zavisca	Severe Accident Mitigation Alternatives
Information Systems Laboratory	
Kim Green	Severe Accident Mitigation Alternatives
Jim Meyer	Severe Accident Mitigation Alternatives

(a) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy (DOE) by Battelle Memorial Institute.
(b) Lawrence Livermore National Laboratory is operated for DOE by the University of California.
(c) Los Alamos National Laboratory is operated for DOE by the University of California.
(d) Argonne National Laboratory is operated for the DOE by the University of Chicago.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Duke Energy Corporation's Application for License Renewal of Catawba Nuclear Station, Units 1 and 2

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Duke Energy Corporation's Application for License Renewal of Catawba Nuclear Station, Units 1 and 2

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 of the Catawba Nuclear Station, Units 1 and 2 operation licenses. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 15555 Rockville Pike, Rockville, Maryland, and are available electronically from the Public Electronic Reading Room found on the Internet at the following net address: http://www.nrc.gov/NRC/Adams/index.html. From this site, the public can gain access to the NRC's Agency wide Document Access and Management Systems (ADAMS), which provides text and image files of NRC's public documents in the Publicly Available Records component of ADAMS. The ADAMS accession numbers for each document are included below.

June 12, 2001	Letter from NRC to Mr. David Lyon, York County Library System, regarding Maintenance of Documents at the Former Catawba Local Public Document Room Related to Application by Duke Energy for License Renewal of Catawba Nuclear Station, Units 1 and 2, for an Additional 20 Years. (Accession No. ML011660168)
June 13, 2001	Letter from Duke to NRC forwarding application to renew the operating licenses of McGuire Nuclear Station, Units 1 and 2 and Catawba Nuclear Station, Units 1 and 2. (Accession No. ML011660138)
August 15, 2001	Letter from NRC to Duke forwarding Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding an Application from Duke Energy Corporation for Renewal of the Operating Licenses for McGuire, Units 1 and 2 and Catawba, Units 1 and 2 (Accession No. ML012270107)
September 14, 2001	Letter from NRC to Duke forwarding Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for Catawba. (Accession No. ML012570124)

September 22, 2001	Letter from NRC to Catawba Indian Nation inviting participation in scoping process for Catawba license renewal. (Accession No. ML012690051)
September 22, 2001	Letter from NRC to Eastern Band of Cherokee inviting participation in scoping process for Catawba license renewal. (Accession No. ML012690057)
September 22, 2001	Letter from NRC to Metrolina Native American Association inviting participation in scoping process for Catawba license renewal. (Accession No. ML012690059)
October 3, 2001	Notice of public meeting to discuss environmental scoping process for the Catawba Units 1 and 2 license renewal application. (Accession No. ML012760475)
November 13, 2001	Summary of site audit to support the review of license renewal application for Catawba. (Accession No. ML013170360)
November 29, 2001	Summary of public meeting held in support of the environmental review for the Catawba Units 1 and 2 license renewal application. (Accession No. ML013330257)
December 10, 2001	Request for additional information related to the staff's review of the severe accident mitigation alternatives analysis for license renewal at Catawba Nuclear Station, Units 1 and 2. (Accession No. ML013460491)
December 12, 2001	Request for additional information related to the staff's review of the license renewal environmental report for Catawba Nuclear Station, Units 1 and 2. (Accession No. ML013470594)
December 20, 2001	Letter from NRC to U.S. Fish and Wildlife Service requesting list of protected species within the area under evaluation for the Catawba Nuclear Station license renewal. (Accession No. ML013540336)
February 1, 2001	Letter from Duke Energy Corporation to NRC transmitting Duke's response to NRC staff's request for additional information dated December 10, 2001, related to the staff's review of severe accident mitigation alternatives for license renewal at Catawba Nuclear Station, Units 1 and 2. (Accession No. ML020450479)

February 8, 2002	Duke Energy Corporation's response to request for additional information dated December 12, 2001, related to the staff's review of the environmental report for license renewal at Catawba Nuclear Station, Units 1 and 2. (Accession No. ML020450547)
March 14, 2002	Note to File: Information Provided by Duke Energy Corporation related to Severe Accident Mitigation Alternatives in its License Renewal Application for the Catawba Nuclear Station, Units 1 and 2. (Accession No. ML020740179)
March 27, 2002	Scoping Summary Report for supplemental environmental impact statement for Catawba license renewal. (Accession No. ML020870376)
May 13, 2002	Letter from NRC to Duke, transmitting Notice of Availability of the Draft Plant-Specific Supplement to the Generic Environmental Impact Statement regarding Catawba Nuclear Station, Units 1 and 2. (Accession No. ML021340817)
May 13, 2002	Letter from NRC to U.S. Environmental Protection Agency, filing draft Supplement 9 to the Generic Environmental Impact Statement regarding Catawba Nuclear Station, Units 1 and 2. (Accession No. ML021350068)
May 14, 2002	Letter from NRC to Duke, requesting comments on the draft plant-specific Supplement 9 to the Generic Environmental Impact Statement regarding Catawba Nuclear Station, Units 1 and 2. (Accession No. ML021350023)
June 4, 2002	Notice of public meeting to discuss the draft supplemental environmental impact statement (DSEIS) for license renewal at Catawba Nuclear Station, Units 1 and 2. (Accession No. ML021570597)
July 17, 2002	Summary of public meetings held on June 27, 2002, to receive comments on draft Supplement 9 to the EEIS for license renewal at Catawba Nuclear Station Units 1 and 2. (Accession No. ML022000608)
August 8, 2002	Letter from Duke to NRC, transmitting Duke's position on the staff's SAMA evaluation contained in Supplement 9 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants for Catawba Nuclear Station, Units 1 and 2. (Accession No. ML022330373)

August 9, 2002	Letter from Duke to NRC, transmitting comments on draft plant-specific Supplement 9 to NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants for Catawba Nuclear Station. (Accession No. ML022270455)
August 13, 2002	Letter from U.S. Department of the Interior to NRC, transmitting comments on Draft Generic EIS for License Renewal of Nuclear Plants, Supplement 9, Catawba Nuclear Station, Units 1 and 2 (NUREG-1437). (Accession No. ML022380016)
August 23, 2002	Letter from the U.S. Environmental Protection Agency regarding the Draft Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 9, Catawba Nuclear Station, Units 1 and 2. (Accession No. ML022480009).

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:

Catawba Cultural Preservation Project, Rock Hill, South Carolina

Catawba Indian Nation Cultural Preservation Project, Rock Hill, South Carolina

Catawba Regional Planning Council, Rock Hill, South Carolina

Centralina Council of Governments, Charlotte, South Carolina

County Administrator, York, South Carolina

County Auditor, York, South Carolina

Historical Center of York County, York, South Carolina

Lake Wylie Chamber of Commerce, Lake Wylie, South Carolina

Museum of York County, Rock Hill, South Carolina

Salvation Army, Rock Hill, South Carolina

South Carolina Department of Archives and History, Columbia, South Carolina

South Carolina Department of Natural Resources, Rock Hill, South Carolina

South Carolina Institute of Archaeology and Anthropology, Columbia, South Carolina

South Carolina State Archaeologist, Columbia, South Carolina

South Carolina State Historic Preservation Officer, Columbia, South Carolina

Tuttle Real Estate, Rock Hill, South Carolina

U.S. Fish and Wildlife Service, Charleston, South Carolina

U.S. Fish and Wildlife Service, Asheville, North Carolina

York Chamber of Commerce, Rock Hill, South Carolina

York County Economic Development, Fort Mill, South Carolina

York County Extension Agents, York, South Carolina

York County Historical Commission, York, South Carolina

York County Planning Department, Rock Hill South Carolina

Appendix E

Catawba Compliance Status and Consultation Correspondence

Appendix E

Catawba Compliance Status and Consultation Correspondence

The list of licenses, permits, consultations, and other approvals obtained form Federal, State, regional, and local authorities for Catawba Nuclear Station, Units 1 and 2 (Catawba) are shown in Table E-1. Following Table E-1 is a reproduction of correspondence received during the evaluation process of the application for renewal of the operating licenses for Catawba.

Table E-1. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Catawba, Units 1 and 2

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	10 CFR Part 50	Operating license, Catawba Unit 1	NPF-35	01/17/85	01/17/25	Authorizes operation of Unit 1
NRC	10 CFR Part 50	Operating license, Catawba Unit 2	NPF-52	05/15/86	05/15/26	Authorizes operation of Unit 2
FWS	Endangered Species Act	Consultation				FWS letter included in Appendix (pp E-4 to E-7).
FWS	Migratory Bird Treaty Act (16 U.S.C. 703-712)	Permit	DPRD 757484	Annual	Annual	Depredation permit. Renewed annually. In Compliance.
SHPO	Section 106 of the National Historic Preservation Act (16 U.S.C. 470f)	Consultation	Letter from Nancy Brock, Coordinator, Review and Compliance Programs, South Carolina Department of Archives and History 05/30/00	05/30/00	None	The National Historic Preservation Act requires Federal agencies to take into account the effect of any undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. The South Carolina State Department of Archives & History determined that the renewal of the Catawba OLs should not have an effect on National Register eligible or listed properties.
SCDHEC	Clean Water Act, Section 402	NPDES stormwater permit	SCR003773	06/01/01	01/31/03	In compliance.
SCDHEC	Clean Water Act, Section 402	NPDES wastewater permit	SC0004278	04/30/01	06/30/05	In compliance.
SCDHEC	RCRA, Section 3010	EPA identification number for generation and storage of hazardous waste	SCD070619796	01/17/85	Annual	EPA ID issues at the opening of the facility and remains with site for life of station. Annual operating fee submitted to SCDHEC. In compliance.
SCDHEC	RCRA Subtitle IX	Underground storage tank permit	R-46-NN-09244	Annual	Annual	Renewed annually. In compliance.

Table E-1. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
SCDHEC	RCRA Subtitle D	Landfill permit	463303-1601	Prior to 1989	Under Revision	Issued prior to 1989. The permit is currently under revision with SCDHEC. In compliance.
SCDHEC	40 CFR Part 61, Subpart M	Asbestos non-scheduled removal permit	8044	Annual	Annual	The non-scheduled asbestos permits are annual permits - 1/1 through 12/31. In compliance.
SCDHEC	Clean Air Act	Air emissions and operating permits	2440-0070	01/3/01	12/31/05	In compliance.

CFR = Code of Federal Regulations
EPA = U.S. Environmental Protection Agency
FWS = U.S. Fish and Wildlife Service
SCDHEC = South Carolina Department of Health and Environmental Control
NPDES = National Pollution Discharge Elimination System
NRC = U.S. Nuclear Regulatory Commission.
RCRA = Resource Conservation and Recovery Act
SHPO = South Carolina State Historic Preservation Office
U.S.C. = United States Code

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

February 12, 2002

Ms. Cynthia A. Carpenter, Chief
Risk Informed Initiatives, Environmental
Decommissioning, and Rulemaking Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Request for List of Protected Species within the Area Under Evaluation for the Catawba Nuclear Station License Renewal
FWS Log No. 4-6-02-122

Dear Ms. Carpenter:

We have reviewed the information received December 26, 2001 concerning the above-referenced project. The following comments are provided in accordance with section 7 of the Endangered Species Act, as amended (16 U.S.C. 1531-1543).

Per your request, we are providing a list of the federally endangered (E) and threatened (T) and candidate (C) species which potentially occur in Cherokee, Chester, Lancaster, and York counties, South Carolina and Gaston and Mecklenburg counties, North Carolina to aid you in determining the impacts your project may have on protected species. The list also includes species of concern under review by the Service. Species of concern (SC) are not legally protected under the Endangered Species Act, and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as endangered/threatened. We are including these species in our response for the purpose of giving you advance notification. These species may be listed in the future, at which time they will be protected under the Endangered Species Act. Therefore, it would be prudent for you to consider these species early in project planning to avoid any adverse effects.

In-house surveys should be conducted by comparing the habitat requirements for the attached listed species with available habitat types at the project site. Field surveys for the species should be performed if habitat requirements overlap with that available at the project site. Surveys for protected plant species must be conducted by a qualified biologist during the flowering or fruiting period(s) of the species. Surveys for the red-cockaded woodpecker should be conducted in accordance with the "Guidelines for preparation of biological assessments and evaluations for the red-cockaded woodpecker" by Gary Henry. A copy of these guidelines is available from this office. Please notify this office with the results of any surveys for the attached list of species and an analysis of the "effects of the action," as defined by 50 CFR 402.02 on any listed species including consideration of direct, indirect, and cumulative effects.

Please keep this office appraised of the progress on this project. If you have any questions please contact Ms. Lori Duncan of my staff at (843) 727-4707 ext. 21. In future correspondence concerning the project, please reference FWS Log No. 4-6-02-122.

Sincerely yours,

Roger L. Banks
Field Supervisor

RLB/LWD

South Carolina Distribution Records of
Endangered, Threatened, Candidate and Species of Concern
February 7, 2002

E	Federally endangered
T	Federally threatened
P	Proposed in the Federal Register
CH	Critical Habitat
C	The U.S. Fish and Wildlife Service or the National Marine Fisheries Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
S/A	Federally protected due to similarity of appearance to a listed species
SC	Federal Species of concern. These species are rare or limited in distribution but are not currently legally protected under the Endangered Species Act.

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated continually and may be different from the following.

County	Common Name	Scientific Name	Status
Cherokee			
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T
	Georgia aster	*Aster georgianus*	C
	Southeastern myotis	*Myotis austroriparius*	SC
Chester			
	Bald eagle	*Haliaeetus leucocephalus*	T
	Red-cockaded woodpecker	*Picoides borealis*	E
	Georgia aster	*Aster georgianus*	C
	Shoals spider-lily	*Hymenocallis coronaria*	SC
Lancaster			
	Carolina heelsplitter	*Lasmigona decorata*	E
	Little amphianthus	*Amphianthus pusillus*	T
	Smooth coneflower	*Echinacea laevigata*	E
	Schweinitz's sunflower	*Helianthus schweinitzii*	E
	Black-spored quillwort	*Isoetes melanospora*	E
	Brook floater	*Alasmidonta varicosa*	SC
	Shoals spider-lily	*Hymenocallis coronaria*	SC
York			
	Bald eagle	*Haliaeetus leucocephalus*	T
	Little amphianthus	*Amphianthus pusillus*	T
	Schweinitz' sunflower	*Helianthus schweinitzii*	E
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T
	Georgia aster	*Aster georgianus*	C
	Carolina darter	*Etheostoma collis*	SC
	Shoals spider-lily	*Hymenocallis coronaria*	SC
	Sun-facing coneflower	*Rudbeckia heliopsidis*	SC

Gaston			
	Bog turtle	*Clemmys muhlenbergii*	T(S/A)
	Bald eagle	*Haliaeetus leucocephalus*	T
	Georgia aster	*Aster georgianus*	C
	Schweinitz's sunflower	*Helianthus schweinitzii*	E
Mecklenburg			
	Bald eagle	*Haliaeetus leucocephalus*	T
	Carolina heelsplitter	*Lasmigona decorata*	E
	Smooth coneflower	*Echinacea laevigata*	E
	Schweinitz's sunflower	*Helianthus schweinitzii*	E
	Michaux's sumac	*Rhus michauxii*	E
	Georgia aster	*Aster georgianus*	C
	Carolina darter	*Etheostoma collis collis*	SC
	Tall larkspur	*Delphinium exaltatum*	SC
	Virginia quillwort	*Isoetes virginica*	SC
	Heller's trefoil	*Lotus helleri*	SC

Appendix F

GEIS Environmental Issues Not Applicable to Catawba Nuclear Station, Units 1 and 2

Appendix F

GEIS Environmental Issues Not Applicable to Catawba Nuclear Station, Units 1 and 2

Table F-1 lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996; 1999)[a] and 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are not applicable to Catawba Nuclear Station Units 1 and 2, (Catawba) because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to Catawba

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	Catawba discharges into fresh water, not into an estuary.
Water-use conflicts (plants with once-through cooling systems)	1	4.2.1.3	Catawba uses cooling towers rather than once-through cooling.
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	2	4.3.3	Catawba uses cooling towers rather than once-through cooling.
Impingement of fish and shellfish	2	4.3.3	Catawba uses cooling towers rather than once-through cooling.
Heat Shock	2	4.3.3	Catawba uses cooling towers rather than once-through cooling.

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

Table F-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
GROUNDWATER USE AND QUALITY			
Groundwater-use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	2	4.8.1.1 4.8.1.2	Groundwater consumption at Catawba is <100 gpm
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	Catawba does not use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	Catawba does not use Ranney wells.
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	Not applicable due to the location of Catawba.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	Not applicable due to the location of Catawba.
Groundwater quality degradation (cooling ponds at inland sites)	2	4.8.3	Catawba does not use a cooling pond heat dissipation system.
TERRESTRIAL RESOURCES			
Cooling pond impacts on terrestrial resources	1	4.4.4	Catawba does not use cooling ponds.

F.1 References

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

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

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