NUREG-1437
Supplement 8

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 8

Regarding
McGuire Nuclear Station, Units 1 and 2

Final Report

Manuscript Completed: November 2002
Date 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. The GEIS (and its Addendum 1) identifies 92 environmental issues and reaches generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 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 McGuire Nuclear Station, Units 1 and 2 (McGuire) up to an additional 20 years under 10 CFR Part 54. This SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

Regarding the 69 issues for which the GEIS reached generic conclusions, neither Duke nor the staff has identified information that is both new and significant for any of these issues that apply to McGuire. In addition, the staff determined that information provided during the environmental review did not call into question the conclusions in the GEIS. Therefore, the staff concludes that the impacts of renewing the McGuire 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 high-level waste and spent fuel, which were not assigned single significance levels).

Regarding the remaining 23 issues, those that apply to McGuire are addressed in this SEIS. For each applicable issue, the staff concludes that the significance of the potential environmental impacts 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 environmental review 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 McGuire are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental

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

Abstract

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

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 McGuire Nuclear Station, Units 1 and 2 (McGuire) 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 June 12, 2021, for Unit 1, and March 3, 2023, 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. Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(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 McGuire site in September 2001 and held public scoping meetings on September 25, 2001, in Huntersville, North Carolina. In preparing this Supplemental Environmental Impact Statement (SEIS) for McGuire, the staff reviewed the McGuire 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, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, and considered the public comments received during the scoping process. The public comments received during the scoping process that were considered to be within 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 Huntersville, North Carolina, on June 12, 2002, to describe the preliminary results of the NRC environmental review, to answer questions, and to provide members of the public with information to assist them in formulating comments on the draft SEIS. All of the comments received on the draft SEIS were considered by the staff in developing the final SEIS. These comments are addressed in Appendix A, Part II, of this SEIS.

(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.

This SEIS includes the 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 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 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) ["Temporary storage of spent fuel after cessation of reactor operations–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. In the GEIS, the staff evaluated 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 resources.
>
> 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 led to 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 likely not to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the 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 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 McGuire, Units 1 and 2) and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's Energy Information Administration, gas- and coal-fired generation appear to be the most likely power-generation alternatives if the power from Units 1 and 2 is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the McGuire site or some other unspecified location.

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.

If the McGuire OLs are not renewed and the units cease operation on or before the expiration of their current OLs, then the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of McGuire. 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 McGuire 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

°	degree
μm	micrometer
μCi	microcurie
AADT	Annual Average Daily Traffic
ac	acre
ac.	Alternating current
ACC	averted cleanup and decontamination costs
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
AOC	averted offsite property damage costs
AOE	averted occupational exposure
AOSC	averted onsite cleanup costs
APE	averted public exposure
APRC	averted power replacement cost
ATWS	anticipated transient without scram
Bq	becquerel
Btu	British thermal unit
Btu/kWh	British thermal units per kilowatt hour
Btu/lb	British thermal units per pound
BWR	boiling water reactor
°C	Celsius
C	candidate for Federal or State listing
CAA	Clean Air Act
CDC	Center for Disease Control and Prevention
CDF	core damage frequency
CEQ	Council on Environmental Quality
CET	containment event tree
CFR	Code of Federal Regulations
Ci	curie
CMUD	Charlotte-Mecklenburg Utilities District
COE	Cost of enhancement
CWA	Clean Water Act
DBA	design-basis accident
DCH	direct containment heating
DG	diesel generator
DOE	U.S. Department of Energy

DSM	demand-side management
Duke	Duke Energy Corporation
E	endangered
ECCS	emergency core cooling system
EIA	Energy Information Agency
EIS	Environmental Impact Statement
ELF	extremely low frequency
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
EPZ	Emergency Planning Zone
ER	Environmental Report
ESA	Endangered Species Act
ESRP	Environmental Standard Review Plan
EX	extirpated
°F	Fahrenheit
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FES	Final Environmental Statement
FR	Federal Register
FSAR	Final Safety Analysis Report
FSC	Federal species of concern
ft	feet
ft/s	feet per second
ft^3	cubic feet
F-V	Fussell-Vesely
FWPCA	Federal Water Pollution Control Act
FWS	U. S. Fish and Wildlife Service
FWST	refueling water storage tank
gal	gallon
GEIS	Generic Environmental Impact Statement
gpd	gallons per day
gpm	gallons per minute
GSI	Generic Safety Issue
ha	hectare
HEPA	high-efficiency particulate air (filter)
HLW	high-level waste

hr	hour(s)
Hz	hertz
I&C	instrumentation and control
IBA	Important Bird Area
IEEE	Institution of Electrical and Electronic Engineers
IPE	individual plant examination
IPEEE	individual plant examination for external events
ISFSI	Independent Spent Fuel Storage Installation
ISLOCA	interfacing loss of coolant accident
J	joule
km	kilometer
km^2	square kilometers
kV	kilovolt
kWh	kilowatt-hour
L	liter
L/s	liters per second
LNG	liquefied natural gas
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LOS	level of service
LWR	light-water reactor
m	meter
M	million
m/s	meter per second
m^3	cubic meters
m^3/d	cubic meters per day
MAAP	Modular Accident Analysis Program
MACCS2	MELCOR Accident Consequence Code System 2
McGuire	McGuire Nuclear Station
mgd	million gallons per day
mGy	milligray
mi	mile
mi^2	square miles
MJ/kg	million joules per kilogram
mL	milliliter
mph	miles per hour

mrad	millirad
mrem	millirem
mSv	millisievert
MT	metric ton
MTHM	metric tonnes of heavy metal (uranium, etc.)
MUMPO	Mecklenburg-Union Metropolitan Planning Organization
MW	megawatt
MW(e)	megawatts electric
MW(t)	megawatts thermal
MWd/MTU	megawatt days per metric ton uranium
MWh	megawatt hour
NA	not applicable
NAS	National Academy of Sciences
NC	North Carolina
NCDCR	North Carolina Department of Cultural Resources
NCDENR	North Carolina Department of Environmental and Natural Resources
NCDHHS	North Carolina Department of Health and Human Services
NCDNRCD	North Carolina Department of Natural Resources and Community Development
NCDOT	North Carolina Department of Transportation
NCWRC	North Carolina Wildlife Resource Commission
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
ng/J	nanograms per joule
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NWPPC	Northwest Power Planning Council
ODCM	Offsite Dose Calculation Manual
OL	operating license
PAME	primary ameobic meningoencephalitis
PAR	passive autocatalytic recombiner
PDS	plant damage state
PM	particulate matter

$PM_{2.5}$	particulate matter having aerodynamic diameter less than or equal to 2.5 μm
PM_{10}	particulate matter having aerodynamic diameter less than or equal to 10μm
PRA	Probabilistic Risk Assessment
PSD	prevention of significant deterioration
PW	present worth
PWR	pressurized water reactor
PU_{RP}	present value replacement power cost
RAI	request for additional information
RCRA	Resource Conservation and Recovery Act
REMP	radiological environmental monitoring program
RN	service water
RPV	reactor pressure vessel
RV	reactor vessel
RV	containment ventilation cooling water system
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternatives
SBO	station blackout
SAR	Safety Analysis Report
SC	State species of concern
SEIS	Supplemental Environmental Impact Statement
SER	Safety Evaluation Report
SHPO	State Historical Preservation Officer
SR	significantly rare
SR	state route
SGTR	steam generator tube rupture
SS	safe shutdown
SSF	standby shutdown facility
Sv	sieverts
T	threatened
TBq	terabecquerel
UFSAR	Updated Final Safety Analysis Report
U_{RP}	long term replacement power cost
U.S.	United States
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. Use of the GEIS guides the preparation of complete plant-specific information in support of the OL renewal process.

Duke Energy Corporation (Duke)[(b)] operates McGuire Nuclear Station, Units 1 and 2 (McGuire) in southwestern North Carolina under OLs NPF-9 and NPF-17, which were issued by the NRC. These OLs will expire in June 2021 for Unit 1 and in March 2023 for Unit 2. On June 13, 2001, Duke submitted an application to the NRC to renew the McGuire OLs up to an additional 20 years under 10 CFR Part 54 (Duke 2001b). The application also included renewal for Catawba Nuclear Station in Rock Hill, South Carolina. A separate environmental evaluation is being conducted for Catawba Nuclear Station. 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 2001a) 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 McGuire license renewal application. This SEIS is a supplement to the GEIS because it relies, in part, on the findings of the GEIS. The staff has also prepared 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 license for McGuire 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 McGuire; (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 those 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 McGuire.

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 the 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 population or resource that is affected, (3) assessed the nature and magnitude of the impact on the affected population or resource, (4) characterized the significance of the effect for both beneficial and adverse effects, (5) determined whether the results of the analysis apply 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 to not be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in the 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 2 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 McGuire 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 McGuire 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 McGuire 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 McGuire. 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 the 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 the assessment of the relevant new and significant information; the scope of the assessment does not include other facets of the issue that are not affected by the new information.

Chapters 3 through 7 discuss the environmental issues considered in the GEIS that are applicable to McGuire. 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 with the environmental impacts of alternatives. The 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 on August 15, 2001 (NRC 2001a). On August 23, 2001, the staff published a notice of intent to prepare an EIS and conduct scoping cited as 66 FR 44386 (NRC 2001b). Two public scoping meetings were held on September 25, 2001, in Huntersville, North Carolina. Comments received during the scoping periods were summarized in the *Environmental Impact Statement*

Scoping Process: Summary Report – McGuire Units 1 and 2, Huntersville, North Carolina (NRC 2002a). Comments 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, in the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff and its contractors retained to assist the staff visited the McGuire site on September 24, 2001, to gather 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 of this SEIS. Other documents related to McGuire were reviewed and are referenced.

On May 10, 2002, the NRC published the Notice of Availability of the draft SEIS in 67 FR 31846 (NRC 2002b). A 75-day comment period began on the date of publication of the U.S. Environmental Protection Agency (EPA) Notice of Filing of the draft SEIS, to allow members of the public to comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings were held in Huntersville, North Carolina, on June 12, 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 McGuire draft SEIS ended August 2, 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 of this SEIS. The NRC responses to those comments are also provided.

This SEIS presents the staff's analysis that considers and weighs the environmental effects of the proposed renewal of the OLs for McGuire, 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 McGuire, Units 1 and 2. McGuire is located in southwestern North Carolina, in northwestern Mecklenburg County on the shore of Lake Norman, approximately 27 km (17 mi) north-northwest of Charlotte and 10 km (6 mi) west of Huntersville. The current OL for Unit 1 expires on June 12, 2021, and the current OL for Unit

2 on March 3, 2023. By letter dated June 13, 2001, Duke submitted an application to the NRC (Duke 2001b) 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 approximately 1129 megawatts electric (MW[e]). Water for the plant's once-through cooling system is drawn from and discharged back into Lake Norman. McGuire produces 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 (NRC 1996, 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 the McGuire 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 McGuire. 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-9 (Unit 1) NPF-17 (Unit 2)	June 12, 2021 (Unit 1) March 3, 2023 (Unit 2)	Operation of McGuire Units 1 and 2
FWS	Endangered Species Act, Section 7	Consultation	NA	Consultation initiated October 10, 2001	Operation during renewal term
NCDENR	Clean Water Act, Section 402	NPDES wastewater permit	NCOO24392	February 28, 2005	Permit for discharge of wastewater and once-through cooling water to discharge canal that empties into Lake Norman
NCDENR	Clean Water Act, Section 402	NPDES stormwater permit	NCS000020	Pending NCDENR approval	Collection, treatment, and discharge of stormwater
Mecklenburg County Department of Environmental Protection	Clean Air Act, Section 112	Air emissions permit	00-019-269	Renewed annually	Emissions from diesel emergency generators, miscellaneous diesel engines, and other miscellaneous units
NCDCR	National Historic Preservation Act, Section 106	Consultation	NA	Consultation initiated January 31, 2000	Impact on sites listed or eligible for listing in the National Register of Historic Places

FWS - U.S. Fish and Wildlife Service.
NCDCR - North Carolina Department of Cultural Resources.
NCDENR - North Carolina Department of Environment and Natural Resources.
NPDES - National Pollutant Discharge Elimination System.
NA - Not applicable.

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 McGuire ER states that Duke is in compliance with applicable environmental standards and requirements for McGuire. 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. *Applicant's Environmental Report – Operating License Renewal Stage — McGuire Nuclear Station*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. *Application to Renew the Operating Licenses of McGuire Nuclear Station, Units 1 and 2 and the Catawba Nuclear Station, Units 1 and 2.* Charlotte, North Carolina.

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

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

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

National Historic Preservation Act of 1966 (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, McGuire Nuclear Station, Units 1 and 2; Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." 66 FR 44386. August 23, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2002a. *Environmental Impact Statement Scoping Process: Summary Report — McGuire Nuclear Station Units 1 & 2, Huntersville, North Carolina*. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2002b. "Duke Energy Corporation; McGuire Nuclear Station, Units 1 and 2; Notice of Availability of the Draft Supplement 8 to the Generic Environmental Impact Statement and Public Meetings for the License Renewal of McGuire Units 1 and 2." 67 FR 31846. May 10, 2002.

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

The Duke Energy Corporation's (Duke's) McGuire Nuclear Station, Units 1 and 2 (McGuire) is located on the shore of Lake Norman in North Carolina's Mecklenburg County approximately 27 km (17 mi) north-northwest of Charlotte, North Carolina. The plant consists of two units (Units 1 and 2) that are the subject of this action. Each unit is a pressurized light-water reactor (LWR) with four steam generators producing steam that turns turbines to generate electricity. Lake Norman is used as the sources of cooling and process water for McGuire. The plant and its environs are described in Section 2.1, and the plant's interaction with the environment is presented in Section 2.2.

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

McGuire is located on 234 ha (577 ac) of Duke-owned land in southwestern North Carolina. Figures 2-1 and 2-2 show the site location and features within 80 km and 10 km (50 mi and 6 mi), respectively. The site is surrounded by an exclusion area whose radius measures 0.76 km (0.47 mi) and covers 182.4 ha (450.5 ac) (Duke 2001a).

The McGuire site is bounded to the west by the Catawba River and to the north by Lake Norman. Lake Norman is a 13,156-ha (32,510-ac) lake that was formed by the impoundment of the Catawba River by the Cowan's Ford Dam hydroelectric station (owned and operated by Duke Power). Lake Norman achieved full pond level in 1964. Cowan's Ford Dam is immediately west of the site and on the Catawba River channel.

The region surrounding McGuire is considered to have a high population density based on the definitions applied to case study sites in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999b).[(a)] The area around McGuire is experiencing a rapid change from a rural to a suburban environment (Duke 2001a). Huntersville (population 25,000), North Carolina, is the nearest town (Duke 2001a). The town center is located approximately 10 km (6 mi) east of the plant.

(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.

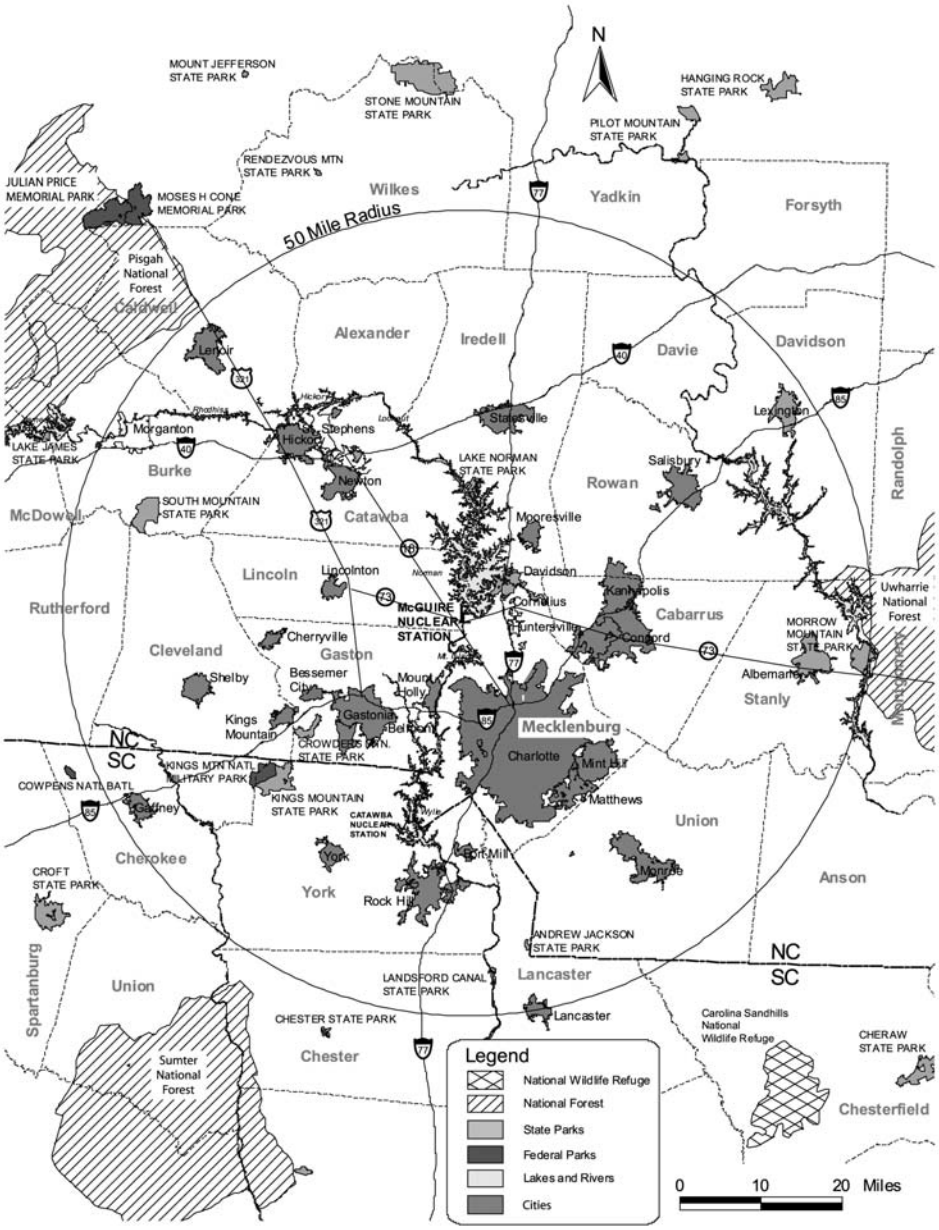

Figure 2-1. Location of McGuire Nuclear Station, Units 1 and 2, 80-km (50-mi) Region

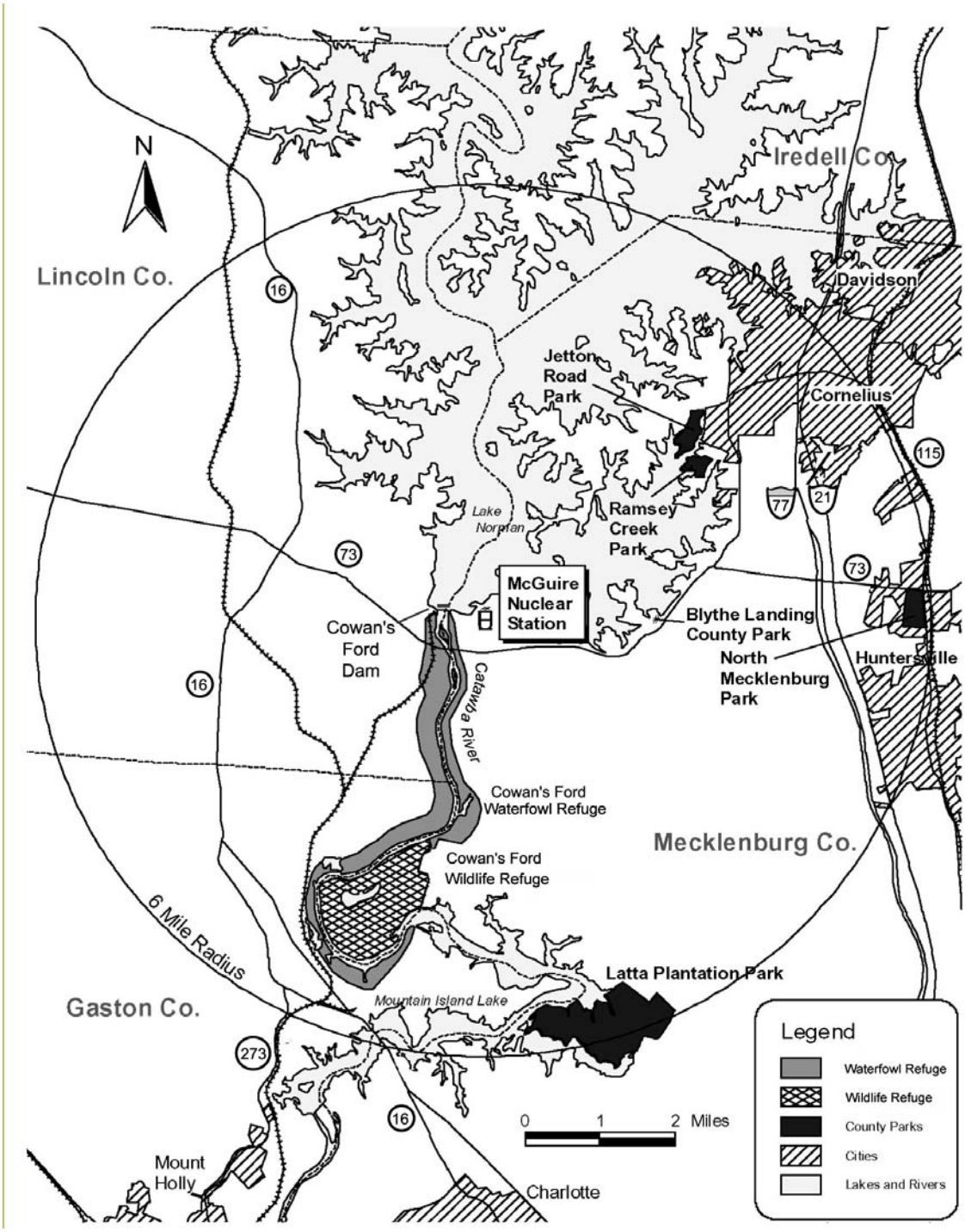

Figure 2-2. Location of McGuire Nuclear Station, Units 1 and 2, 10-km (6-mi) Region

The McGuire site has approximately 1345 full-time workers employed by Duke and site contractors during normal plant operations. Duke refuels each reactor unit at McGuire on an 18- to 24-month schedule, when site employment increases by as many as 1015 workers for temporary duty (30 to 40 days).

The elevation of the McGuire exclusion area varies from 198 m to 244 m (650 to 800 ft) (Duke 2001a), and its topography is rolling (NRC 1996). The exclusion area is dominated by Cecil sandy loam and harbors typical piedmont plant communities and cover types, predominantly hardwood-pine forests and marshes and wetlands (Duke 2001a). The majority of land in the area immediately around McGuire is forested, pasture, cropland, or residential developments, each contributing significant proportions to the total land use. The shoreline of Lake Norman is developed with vacation and permanent residences, campgrounds, boat launches, marinas, and golf courses. The 270-ha (668-ac) Cowan's Ford Wildlife Refuge (owned and operated by Mecklenburg County Parks and Recreation Department) and the Cowan's Ford Waterfowl Refuge (managed by the North Carolina Wildlife Resources Commission) are located just south of the McGuire exclusion area along the shores of Mountain Island Lake. These areas, as well as adjacent lands, have been officially designated as Important Bird Areas (IBAs) by the National Audubon Society because of their rich avian diversity (Duke 2001a).

Five parks (Blythe Landing County Park, Jetton Road Park, Latta Plantation Park, North Mecklenburg Park, and Ramsey Park), located in and owned by Mecklenburg County, are within a 10-km (6-mi) radius of the McGuire plant. Five state parks (Andrew Jackson State Park, Crowders Mountain State Park, Lake Norman State Park, Morrow Mountain State Park, and South Mountain State Park), Kings Mountain National Military Park, and the Catawba Indian Reservation are located within 80 km (50 mi) of the McGuire plant (Duke 2001a).

2.1.1 External Appearance and Setting

Because of the large amount of timber adjacent to the site, the nuclear plant is visible from only a few locations on the land. It is readily visible from many locations along the lake shore. The most obvious structures are the transmission towers and lines that are visible from North Carolina Highway 73 (NC-73), which runs along the southern edge of the site.

McGuire Units 1 and 2 each have a separate reactor building, turbine building, and switchyard. The following buildings and features are common to both units: service building, auxiliary building, intake structures (upper level and lower level), discharge structure and discharge canal, standby nuclear service water pond, and independent spent fuel storage installation (ISFSI; Duke 2001a).

An ISFSI was added at McGuire to expand the storage capacity for spent fuel. The initial loading of spent fuel into the dry storage facility took place in 2001. The storage of spent fuel in the ISFSI is conducted under a general permit issued in accordance with 10 CFR 72.210. The ISFSI is outside the scope of this review.

The McGuire site lies near the center of the Piedmont physiographic province. The Piedmont is characterized by rolling hills and numerous small streams and rivers. It is a northeast-trending zone from Georgia through Virginia that varies in width from about 130 to 190 km (80 to 120 mi) (Duke 2001a). The Fall Line, which divides the Piedmont from the Coastal Plain physiographic province to the southeast, lies 100 km (65 mi) downstream from the site.

The Piedmont province is underlain by five narrow northeast-trending belts of metamorphosed sedimentary rock. The McGuire site is within the Charlotte Belt. These rocks, originally formed during the lower Paleozoic, are now in the form of mica schist and gabbro. Although there are numerous faults in the Piedmont region, there are no identifiable faults or other geological structures that could be expected to localize earthquakes in the immediate vicinity of the McGuire site (NRC 1976).

2.1.2 Reactor Systems

The McGuire site is shown in Figure 2-3. Each unit is a pressurized LWR with four steam generators that produce steam that turns turbines to generate electricity. Each unit, designed and fabricated by the Westinghouse Electric Corporation, 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]) (Duke 2001a).

The nuclear steam supply system for each unit 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. The containment 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.

McGuire is licensed for fuel that is slightly enriched uranium dioxide, up to 4.75 percent by weight uranium-235 (Duke 2001a). McGuire has several different fuel designs that are used 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 licensed fuel pin

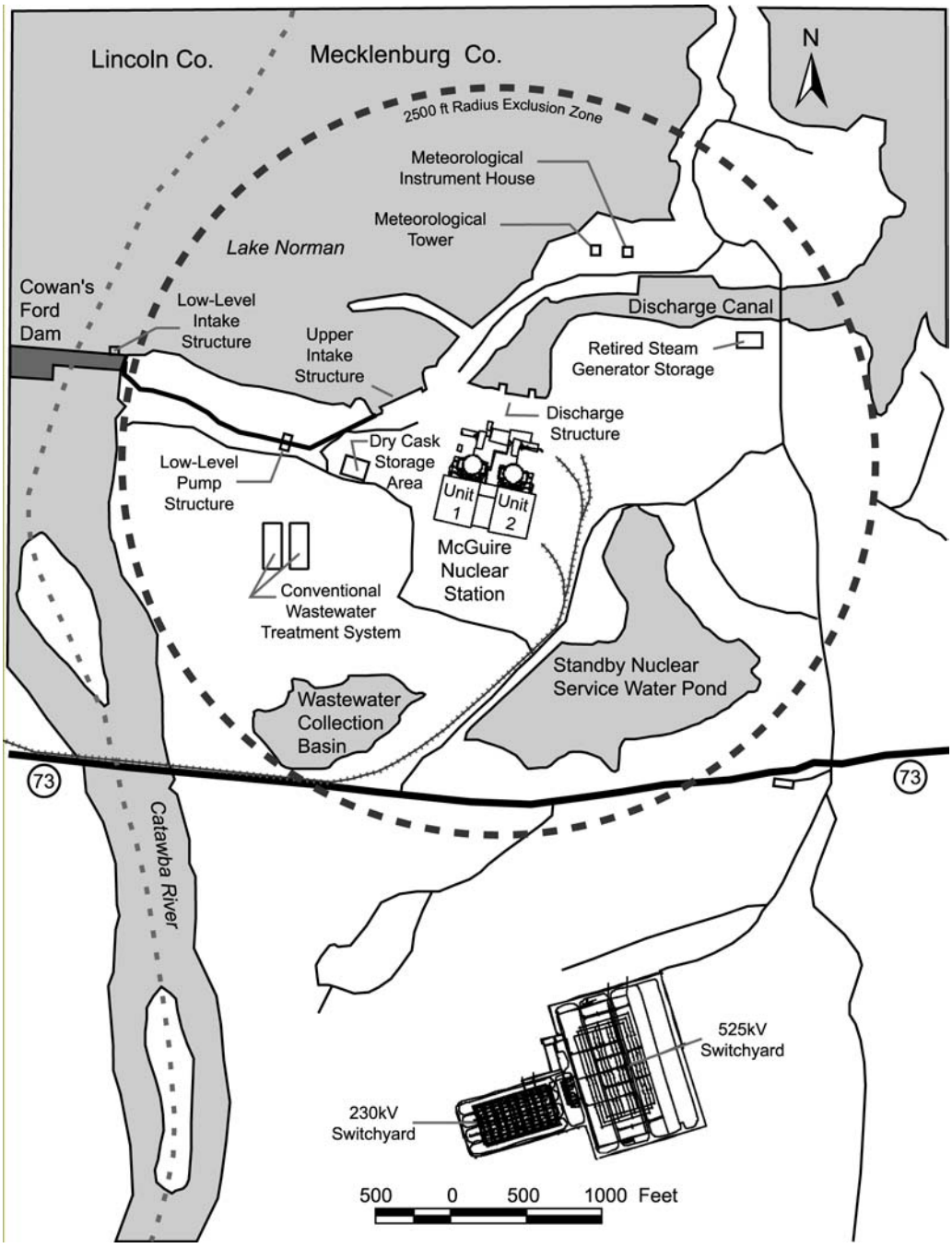

Figure 2-3. McGuire Nuclear Station

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 licensed fuel pin burnup limit of 60,000 MWd/MTU (Duke 2001a).

2.1.3 Cooling and Auxiliary Water Systems

The site currently uses water from Lake Norman for main condenser cooling and process water. Water is withdrawn from the lake at an average daily rate (two-unit operation) of about 111 m^3/s (2530 million gpd), circulated through the two units and discharged back into the lake through the discharge canal. The plant has an upper-level intake and a separate, lower-level intake structure.

For most of the year, cooling and process water is withdrawn from Lake Norman through the upper-level intake structure. The upper-level intake structure is located at the lake surface at the end of the intake channel. It withdraws from the surface water layers of the lake (epilimnion). The water in the intake channel flows through trash bars and through 1-cm (3/8-in.) mesh vertical traveling screens before entering the McGuire plant. Water velocity in the upper intake channel is less than 0.3 m/s (1 ft/s).

During periods of high lake-surface temperature, cooler water (hypolimnion) is withdrawn from the lake bottom through the lower-level intake structure. The lower-level intake structure is located west of the upper intake structure and approximately 30 m (100 ft) below the lake surface. Cooler water from the lower intake structure is pumped and discharged in front of the upper intake structure. The water from the lower intake structure supplements, but cannot completely replace, the surface water flow from the upper intake channel. Thus, water from the lower intake structure drawn primarily during the hot summer months reduces the temperature of the water that is drawn into the plant for cooling. This results in a lower station discharge water temperature. There are no traveling screens on the lower-level intake structure. Water velocity through the lower-level intake structure, when operating, can be as high as 0.43 m/s (1.4 ft/s).

Operation of the rotating vertical traveling screens can be in either automatic or manual mode. Automatic rotation of the screens is controlled by differential pressure across the screen surface. Manual operation and cleaning of the traveling screens is prescribed weekly. Backwash water and screen debris are discharged into a refuse removal trench, which drains into a debris retention basket.

The increase in temperature of cooling system water discharged back into Lake Norman is related to flow and intake water temperature. During the winter, when the incoming water is the

coolest and the flow is the lowest, the increase in temperature is 13.7°C (24.7°F). During the summer, when the intake temperatures are the warmest and the flow is the highest, the temperature increase is 8.6°C (15.5°F).

Potable water at McGuire is supplied by the Charlotte-Mecklenburg Utilities Department (CMUD) water supply system. Six groundwater wells provide specific low-volume uses (e.g., irrigation, remote restrooms) with a combined maximum pumping rate of 4.3 L/s (68 gpm).

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

McGuire 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 McGuire operation. These systems process radioactive liquid, gaseous, and solid effluents before they are released to the environment. The waste disposal systems for McGuire meet the design objectives of 10 CFR Part 50, Appendix I (Numerical Guides for Design Objectives and Limiting Conditions for Operations to Meet the Criterion "As Low As Reasonably Achievable" for Radioactive Material in Light-Water Cooled Nuclear Power Reactor Effluents), and control the processing, disposal, and release of radioactive liquid, gaseous, and solid wastes. Radioactive material in the reactor coolant is the source of gaseous, liquid, and solid radioactive wastes in LWRs. Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products are contained in the sealed fuel rods, but small quantities escape from the fuel rods 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 are 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 (Duke 2001a).

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. Refueling outages are staggered so both units are not in an outage at the same time (Duke 2001a). Spent fuel is stored onsite in one of the two spent fuel pools or in containers in the McGuire ISFSI (Duke 2001a). Each unit has its own spent fuel pool located in the auxiliary building. Spent fuel storage in the McGuire ISFSI was initiated in 2001.

The waste disposal system used for processing liquid, gaseous, and solid wastes is common to Units 1 and 2, with the exception of the reactor coolant drain tanks located in each reactor containment (Duke 2000a).

The offsite dose calculation manual (ODCM) for McGuire (Duke 2001e) describes the methods used for calculating radioactivity concentrations in the environment and the estimated potential offsite doses associated with liquid and gaseous effluents from McGuire. 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 (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 (i.e., 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 the nuclear facility operations will not exceed the maximum limits of 40 CFR Part 190 (i.e., less than 0.25 mSv [25 mrem])

and 10 CFR Part 20 (i.e., less than or equal to 5 mSv [0.5 rem] in a year and less than or equal to 0.02 mSv [2 mrem] in any hour).

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 reactor- or primary-grade liquids are recycled. Potentially contaminated radioactive liquid wastes in the plant are collected in tanks in the auxiliary building and processed by filtration, demineralization, or evaporation prior to their monitoring and discharge to Lake Norman (Duke 2001a). Liquid wastes from the auxiliary building floor drains, sumps, and equipment drains, as well as from the plant's containment sumps, laboratory drains, and waste evaporator feed tank drainage are collected in the floor drain tank (Duke 2000a). Dependent on the activity of liquid wastes in the floor drain tank, further processing (i.e., filtering, chemical treatment, demineralization) may be required prior to collection in one of two waste monitor tanks (Duke 2000a). Liquid wastes from the laundry hot shower tank also are collected in the waste monitor tanks after filtering (Duke 2000a). From the waste monitor tanks, liquid wastes are sampled and monitored. When they are found to be within the regulated levels, they then are discharged into the condenser cooling water system (i.e., condenser circulating water) that flows into Lake Norman (Duke 2000a). Condensate from the containment ventilation units is collected in the ventilation unit condensate drain tank (Duke 2000a). Liquid wastes from this tank are monitored and discharged into the condenser cooling water system (i.e., condenser circulating water) flowing into Lake Norman similar to the discharge from the waste monitor tanks.

Liquid wastes from the turbine building sump (typically not contaminated) are monitored and released to the conventional wastewater system and the wastewater collection basin discharge point to the Catawba River downstream of Cowan's Ford Dam (Duke 2001e). If monitoring shows elevated radioactivity levels in the Turbine Building sump, liquid waste is routed into the floor drain tank for processing as described above and eventual discharge to Lake Norman (Duke 2001e).

The ODCM 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 containment ventilation unit condensate drain tank release lines, and the turbine building sump release line (Duke 2001e). The alarm/trip setpoint for each liquid effluent monitor is based on the measurements of radioactivity in a batch of liquid to be released or in the continuous liquid discharge (Duke 2001e).

During 2000, there were 246 batch releases of liquid effluents for the two units in a total volume of 1.37×10^7 L (3.62×10^6 gal) prior to dilution (Duke 2001c). The combined liquid waste volume prior to dilution for batch and continuous releases for 2000 was 3.35×10^8 L (8.84×10^7 gal) (Duke 2001c). The liquid waste holdup capacity for the plant is approximately 1.48×10^6 L (390,000 gal) (Duke 2001a). The actual liquid waste generated is reported in the *McGuire Nuclear Station Annual Radioactive Effluent Release Report* (Duke 2001c).

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

The waste gas system, containment and auxiliary building ventilation, and flow from the condenser air ejectors exhaust into the unit vents (Duke 2001e). These four contributors to the unit vent exhaust are discussed below. The unit vents are the primary (major) gaseous release points from the plant (Duke 2001e).

- Waste Gas System. The waste gas system in the auxiliary building (Duke 2000a) 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 2001e). Letdown flow from the reactor coolant system is processed through the waste gas system, and the resultant gases (hydrogen, nitrogen, and small quantities of the fission products xenon and krypton) are collected in the waste gas decay storage tanks. Gases are allowed to decay in these tanks, then are released at permissible rates and activity to the Unit 1 vent as prescribed by the ODCM (Duke 2001e).

- Containment Ventilation. The containment ventilation includes atmosphere from the containment purge, containment air release and addition, and containment annulus (Duke 2000a). The containment atmosphere will pass through a charcoal adsorber and a high-efficiency particulate air (HEPA) filter prior to being exhausted into either the Unit 1 or Unit 2 vent (Duke 2001e).

- Auxiliary Building Ventilation. Radioactive gases generated within the auxiliary building will be exhausted through the building's ventilation system. Exhausted air is monitored and, upon radiation monitor alarm, the exhaust air is diverted through a charcoal adsorber and a HEPA filter prior to being released to the Unit 1 or Unit 2 vent (Duke 2001e).

- Condenser Air Ejectors. Gases from the condenser air ejectors are monitored continuously and discharged into either the Unit 1 or Unit 2 vent (Duke 2000a, 2001a).

Secondary (minor) release points include the waste management facility, the waste handling area, and the Unit 2 staging building (Duke 2001e). Exhausts from these three areas are monitored continuously and, upon a high radiation alarm, the supply and exhaust ventilation fans are stopped (Duke 2000a).

Radioactive gaseous wastes from McGuire are released primarily through the Unit 1 and 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 vents for each unit are continuously monitored for noble gases, radioiodines, and particulate activity (Duke 2000a). 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 of 10 CFR Part 20 for gaseous effluents (Duke 2001e).

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

2.1.4.3 Solid Waste Processing

Solid radioactive wastes from McGuire consist of spent resin, spent (contaminated) filter elements, contaminated oils and sludges, and miscellaneous solid materials (Duke 2000a, 2001a). Spent resin is flushed from plant demineralizers into spent resin storage tanks. The spent resin then is processed by dewatering or solidification and packaged in a cask liner, which is placed in a shielded cask truck (Duke 2000a). Spent filter elements are removed from their housing using filter-handling tools and filter transfer shields. They are transferred to a shielded filter storage bunker in the waste drumming area (Duke 2000a). Contaminated oils and sludges either are pumped to a processing area for solidification or are shipped to an offsite vendor for processing (Duke 2001a). Miscellaneous solid materials include rubber gloves, plastic bags, contaminated clothing, contaminated rags, and contaminated tools (Duke 2001a).

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 Barnwell, South Carolina, or Envirocare of Utah (Duke 2001a). Higher-activity wastes (i.e., spent resins) are typically sent directly to a licensed disposal facility such as Barnwell, South Carolina (Duke 2001a).

Disposal and transportation of solid wastes are performed in accordance with the applicable requirements of 10 CFR Part 61 and 10 CFR Part 71, respectively. There are no releases to the environment from radioactive solid wastes created at McGuire.

In 2000, McGuire Units 1 and 2 made eight shipments of solid waste with a volume of 47 m^3 (1650 ft^3) and a total activity of 0.19 TBq (5 Ci) (Duke 2001c). These shipments are representative of the shipments made in the past several years and are not expected to change appreciably during the license renewal period.

2.1.5 Nonradioactive Waste Systems

Nonradioactive solid wastes from McGuire are disposed of in the onsite landfill or in one of several offsite landfills operated by Mecklenburg County (Duke 2001a). The onsite landfill typically handles the following types of wastes: asbestos, empty containers and drums, insulation (nonasbestos), nonhazardous-spill cleanup, conventional wastewater sludge, alkaline batteries, and oil-contaminated materials. This landfill is permitted by the North Carolina Department of Environmental and Natural Resources (NCDENR), Solid Waste Section (Duke 2001a). General office trash is disposed in one of several offsite landfills operated by Mecklenburg County (Duke 2001a).

Nonradioactive liquid wastes are sampled and treated according to the site National Pollutant Discharge Elimination System (NPDES) permits issued to McGuire by the North Carolina Department of Environmental and Natural Resources (Duke 2001a). These wastes originate from system drainage/leakage, water treatment activities, housekeeping/cleaning wastes, stormwater runoff, and floor and yard drains (Duke 2001a). Sanitary wastes are treated offsite by the CMUD (Duke 2001a).

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation of a nuclear power plant. Maintenance activities conducted at McGuire 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. 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 McGuire units every 18 to 24 months (Duke 2001a). Each outage is typically scheduled to last approximately 30 to

40 days; the outage schedules are staggered so that both units are not in an outage at the same time (Duke 2001a). One-third of the core is offloaded at each refueling. Approximately 1015 additional workers are onsite during a typical outage (Duke 2001a).

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

2.1.7 Power Transmission System

Two switchyards connect the McGuire plant transmission lines to the transmission system: a 230-kV switchyard for Unit 1 and a 525-kV switchyard for Unit 2. The switchyards are located south of Highway NC-73 (see Figure 2-4). Power from Unit 1 is transmitted to the 230-kV switchyard over two separate three-phase 230-kV transmission lines with an average length of 1.2 km (4000 ft) (Figure 2-4). Power from Unit 2 is transmitted to the 525-kV switching station over two separate three-phase 525-kV transmission lines with an average length of 1 km (3300 ft) (Figure 2-4). The 230- and 525-kV lines are designed to meet the heavy loading condition as defined in the National Electrical Safety Code, 7th Edition (Duke 2001). The 230-kV switching station is tied into the Duke 230-kV network by seven double-circuit overhead lines. The 525-kV switching station is east of the 230-kV switching station and is tied into the Duke 525-kV network by four single-circuit overhead lines.

The right-of-way for the 525-kV lines is 151.5 m (500 ft) wide. The right-of-way for the 230-kV lines is 60.6 m (200 ft) wide (Gaddy 2001). Duke has a well established set of management practices for right-of-way maintenance. These best management practices include vegetation management, erosion and sediment control, soil stabilization, stream and wetland protection, and protection of sensitive areas and sensitive species. Vegetation management consists of mowing and herbicide application (Gaddy 2001). Arsenal and Accord with Garlon 4A or Krenite are used for stump treatments and basal applications. Each of these products has been evaluated for safety and environmental concerns. In particular, Arsenal and Accord are approved for use in wetland areas. Following initial treatment with Arsenal and Accord, rights-of-way are maintained thereafter on an approximate 3-year rotation. Subsequent herbicide applications are limited primarily to trees that could grow into transmission lines (Duke 2001a).

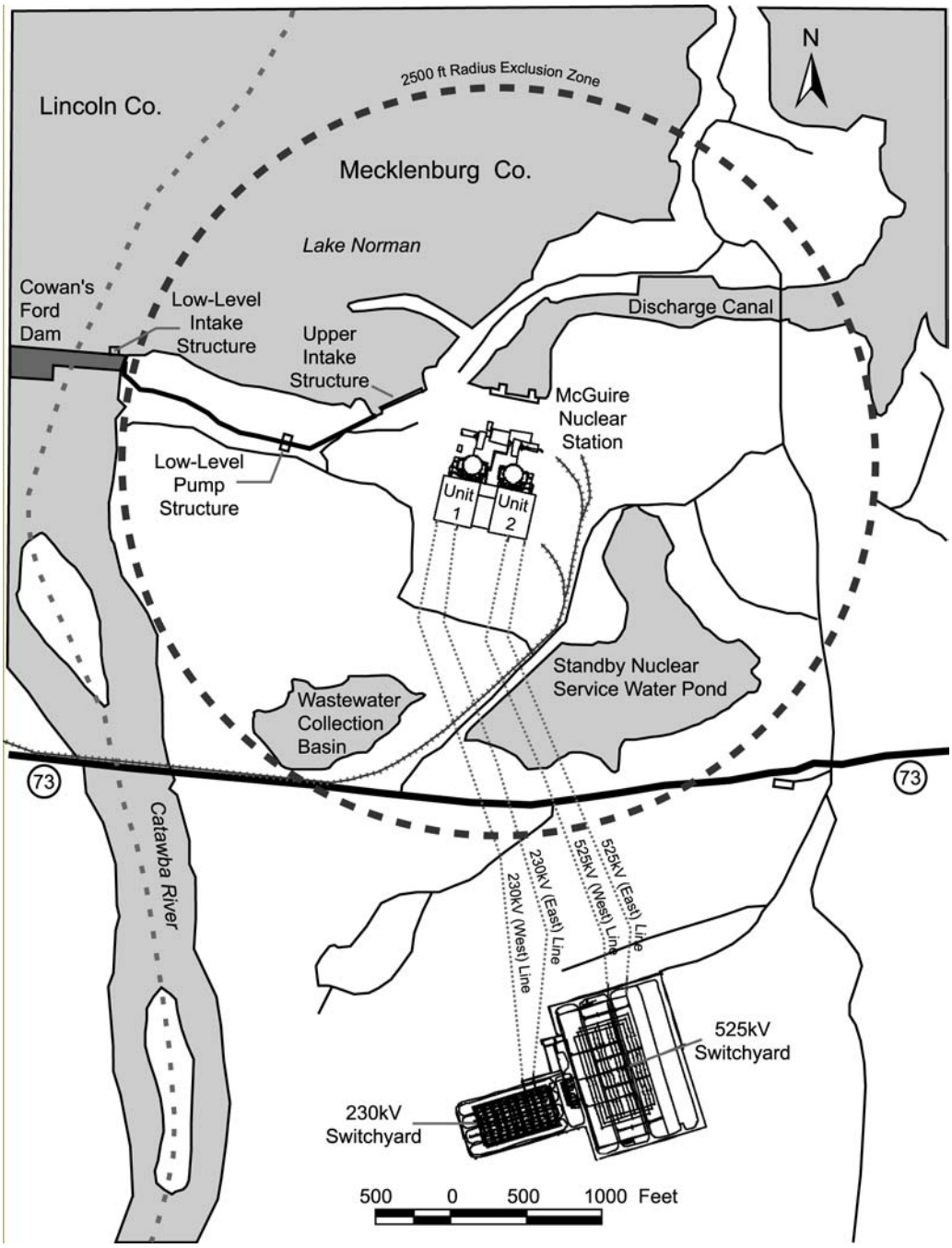

Figure 2-4. Transmission Lines Attributable to McGuire Nuclear Station

Duke maintains a working relationship with the NCDENR Natural Heritage Program and the U.S. Fish and Wildlife Service (FWS). Duke communicates with these agencies about pertinent natural heritage data such as Federal- and State-listed species, special habitats, and new findings. Information from the North Carolina Natural Heritage Program database is used to establish new and review existing vegetation management programs for the rights-of-way (Duke 2001a).

The transmission line connecting McGuire to the Oconee Nuclear Station was evaluated previously in the Supplemental Environmental Impact Statement for license renewal of the Oconee Nuclear Station (NRC 1999a).

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

Although the McGuire site is not within the town limits of Huntersville North Carolina (the nearest incorporated town), the site is subject to the extraterritorial zoning jurisdiction of Huntersville. Exercise of extraterritorial jurisdiction is authorized by Section 160A-360 of the General Statutes of North Carolina. The McGuire site is located in a special-purpose zoning district. Power generation plants are a permitted use in special-purpose districts (Town of Huntersville 2001).

2.2.2 Water Use

Lake Norman, North Carolina's largest reservoir, was created by constructing the Cowan's Ford Dam on the Catawba River. Lake Norman is part of the Catawba-Wateree Project, which consists of 11 reservoirs operated for hydroelectric power generation on the Catawba River and licensed by the Federal Energy Regulatory Commission.

In addition to supplying the cooling water for the McGuire plant, Lake Norman also supplies water for Duke Power's coal-fired Marshall Steam Station on the western shore of the lake, approximately 26 km (16 mi) upstream from McGuire. Lake Norman also is a source of

municipal drinking water for several cities in the region. Lake Norman supports extensive recreational use by fishermen, boaters, water skiers, and swimmers.

Construction of the Cowan's Ford Dam and impoundment of the Lake Norman reservoir to serve a variety of purposes, including providing cooling water for McGuire, have considerably altered the regional water resources environment. Lake Norman represents the critical landscape feature to lakeside development and regional recreation.

McGuire employs a once-through cooling system. The average daily withdrawal from Lake Norman for the cooling water and other service water systems is 9580 million L/d (2530 million gpd). The average daily discharge to Lake Norman from McGuire also is approximately 9580 million L/d (2530 million gpd). Approximately 4090 m^3/d (1.08 million gpd) from the conventional wastewater treatment system and from the wastewater collection basin are discharged to the Catawba River.

Potable water at McGuire is supplied by the CMUD water supply system. McGuire has six groundwater wells with a combined maximum pumping rate of 4.3 L/s (68 gpm).

2.2.3 Water Quality

Lake Norman provides water of sufficiently high quality to serve a variety of needs, including propagation of fish and wildlife and contact recreation. The NCDENR Division of Water Quality found Lake Norman fully supportive of all uses (NCDENR 1999).

Pursuant to the Federal Water Pollution Control Act of 1977, also known as the Clean Water Act, the water quality of the plant effluents is regulated through the NPDES. The Division of Water Quality within the NCDENR is delegated to issue NPDES permits. The current permit (NC0024392) was issued February 28, 2000, and is due to expire February 28, 2005. Any new regulations promulgated by the U.S. Environmental Protection Agency (EPA) or the State of North Carolina would be reflected in future permits.

2.2.4 Air Quality

The McGuire site is located in the Piedmont of the Carolinas, a transitional region between the Blue Ridge Mountains to the west and the Coastal Plain to the east. The region has a moderate climate with cool winters and warm summers. Climatological records for Charlotte, North Carolina (NCDC 2001), are generally representative of the McGuire site. Normal daily maximum temperatures for Charlotte range from about 9°C (49°F) in January to a high of

about 32°C (89°F) in July. Normal daily minimum temperatures range from about -1°C (30°F) in January to about 21°C (70°F) in July. The average precipitation of about 109 cm (43.1 in.) per year is rather evenly distributed through the year. Normal monthly precipitation ranges from 7 to 11 cm (2.7 to 4.4 in.).

The wind energy resource in the Piedmont of the Carolinas is limited. The annual average wind power in the region is rated 1 on a scale of 1 through 7 (Elliott et al. 1986). 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 2001). The average wind power of exposed coastal areas of North Carolina is rated 3, and the wind power rating for mountain summits and ridges to the west generally varies from 3 to 6.

Thunderstorms can occur in any month and occur on an average of more than 3 days per month from April through August. Hurricanes that strike the Carolina coast may produce heavy rains but seldom cause high winds at the site (NCDC 2001). Statistics for the 30 years from 1954 through 1983 indicate that the probability of a tornado striking the site is expected to be about 2×10^{-4} per year (Ramsdell and Andrews 1986).

The McGuire site is located within the Metropolitan Charlotte Interstate Air Quality Control Region. This region is designated as in attainment or unclassified for criteria pollutants in 40 CFR 81.334 except for the EPA's reinstated 1-hr ozone standard. Mecklenburg County is a maintenance area for the 1-hr ozone standard. The State of North Carolina and Mecklenburg County have adopted EPA's proposed 8-hr ozone standard. This standard was exceeded on 32 days in 1999 (Mecklenburg County Department of Environmental Protection [MCDEP] 2000). Monitoring data for Mecklenburg County also indicate that the annual average concentration of fine particles ($PM_{2.5}$) for 1999 exceeded the $PM_{2.5}$ standard adopted by EPA in 1997. 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). Six areas in North and South Carolina are designated in 40 CFR 81.422 and 40 CFR 81.426 as mandatory Class I Federal areas in which visibility is an important value. All of these Class I areas are more than 80 km (50 mi) from the site.

Diesel generators and other activities and facilities associated with McGuire emit various pollutants. Emissions from these sources are regulated under Air Quality Permit to Construct/Operate 00-019–269 issued by the MCDEP on February 23, 2000.

2.2.5 Aquatic Resources

Aquatic resources in the vicinity of the McGuire site are associated with the southernmost portion of Lake Norman, North Carolina's largest man-made reservoir. In addition to serving McGuire, Lake Norman also provides water to Duke Power's Marshall Steam Station and the Cowan's Ford Dam hydroelectric station. The lake also is a source of drinking water for several cities in the region. Boaters, fishermen, swimmers, and water skiers use the lake for recreation. Centers for tourism and conservation in the vicinity include Lake Norman State Park and three county parks on the shores of the lake. The Cowan's Ford Wildlife Refuge (owned and operated by Mecklenburg County Parks and Recreation Department) and the Cowan's Ford Waterfowl Refuge (managed by North Carolina Wildlife Resources Commission) are located along the shores of Mountain Island Lake, south of the McGuire site and immediately downstream of the Cowan's Ford Dam.

Lake Norman's major tributaries include the Catawba River, Lyle Creek, and Buffalo Shoals Creek. The lake itself covers 13,150 ha (32,500 ac) and averages 10 m (33 ft) deep, with a maximum 36.6-m (120-ft) depth.

Pelagic fish species are primarily forage fish, including threadfin shad (*Dorosoma petenense*), gizzard shad (*D. cepedianum*), and alewife (*Alosa aestivalis*). Game fish include black crappie (*Pomoxis nigromaculatus*) and white crappie (*P. annularis*), largemouth bass (*Micropterus salmoides*), white perch (*Morone americana*), white bass (*M. chrysops*), striped bass (*M. saxatilis*), and some spotted bass (*Micropterus punctulatus*). The primary fish caught in the nearshore littoral zone include sunfish (*Lepomis* spp.), largemouth bass, crappie and carp (*Cyprinus carpio*). Numbers of previously abundant catfish species like snail bullhead (*Ameiurus brunneus*), white catfish (*Ictalurus catus*), and flat bullhead (*I. platycephalus*) have dwindled significantly due to suspected predation by blue catfish (*I. furcatus*) and flathead catfish (*Pylodictis olivaris*). The Blue catfish, white perch, threadfin shad, white bass, spotted bass, and alewife are introduced species, some of which may impact native species populations. In addition, striped bass are not indigenous to Lake Norman and do not reproduce naturally. Instead, they are stocked on an annual basis to provide a resource for sport fishermen.

In addition to finfish, numerous aquatic invertebrate and plant species are found in the vicinity of McGuire. These include diverse phytoplankton, zooplankton, periphyton and benthic macroinvertebrates. In 1999, 135 varieties and forms of phytoplankton were collected, the dominant types being cryptophytes and diatoms (Duke 2001a). Zooplankton communities in Lake Norman also are diverse and tend to fluctuate seasonally and spatially. Since 1987, Duke researchers have recorded 108 zooplankton taxa (Duke 2001a). Most recently (1999), immature copepods dominated the zooplankton standing crop during most of the year, while rotifers and cladocerans had the highest densities in February and August, respectively.

Information from 1977 through 1984 indicates that benthos at sublittoral locations was dominated by chironomids, chaoborids, *Corbicula* sp., *Hexagenia* spp., and oligochaetes (Duke Power Company 1985). Since 1989, benthic macroinvertebrate studies have been limited to determining seasonal densities of *Corbicula* sp. in front of the McGuire intake structures. Recent studies indicate that the potential for biofouling from these organisms is moderate to high, but population numbers in front of the intake structures vary widely from year to year (Hall and Wilda 2000, 2001; Duke 2001a). Adult clams capable of reproduction generally comprise 10 percent or less of the samples (Duke 2001a).

The McGuire site lies entirely in Mecklenburg County. However, Lincoln County, immediately west of the site, also could harbor species that would be affected by plant refurbishment or continued operation. A search through the FWS database and the North Carolina National Heritage Program for Federally and State-listed species indicated that two fish – Carolina darter (*Ethostoma collis collis*) and highfin carpsucker (*Carpoides velifer*) – and three mussel species – Carolina heelsplitter (*Lasmigona decorata*), dwarf threetooth (*Triodopsis fulciden*), and Carolina creekshell (*Villosa vaughnaniana*) – could inhabit the region around McGuire (Table 2-1), though the probability is low based on the lack of lotic environment. In addition, a summer 2000 biological assessment of species associated with McGuire and related power transmission lines (Gaddy 2001) indicated that three other important species, including two mussels – the Carolina elktoe (*Alasmidonta robusta*) and Eastern creekshell (*V. delumbis*) – and one fish – the Santee chub (*Cyprinella zanema*) – could also inhabit the region around McGuire (Table 2-1).

Gaddy (2001) inventoried the site environs, excluding the industrial areas in the center of the site, using aerial photographs supplemented by field work. Gaddy also walked the four power line rights-of-way in their entirety. Areas that appeared to be reasonable habitat for Federally and State-listed species were inventoried in the summer and the early autumn. Despite an extensive survey program conducted by the State and licensee, no Federal- or State-listed species or critical habitat for such species was found within the McGuire site exclusion area (see Figure 2-4) or along related power transmission rights-of-way (Gaddy 2001).

Of the species mentioned, only the Carolina heelsplitter is listed as endangered. The other species are considered species of concern or “significantly rare.” The Carolina heelsplitter was known historically in the Catawba River system in Mecklenburg County. However, recent collection records indicate the Carolina heelsplitter has been eliminated from all but one of the streams where it was originally known to exist. In North Carolina, the only remnant populations appear to exist in Union County, far to the southeast of the site (Fridell 2001). All of the streams supporting this species are free-flowing and natural (EPA 2002) and no longer occur in the vicinity of the plant. The last known occurrence in Mecklenburg County was more than 20 years ago (Fridell 2001).

Table 2-1. Federal and State of North Carolina Listed Aquatic Species Potentially Occurring in Lincoln and Mecklenburg Counties

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]	County
Ethostoma collis collis	Carolina darter	FSC	–	Mecklenburg
Carpoides velifer	highfin carpsucker	–	SC	Mecklenburg
Cyprinella zanema	Santee chub	–	SR	Mecklenburg or Lincoln
Lasmigona decorata	Carolina heelsplitter	E	E	Mecklenburg
Triodopsis fulciden	dwarf threetooth	–	SC	Lincoln
Villosa vaughnaniana	Carolina creekshell	FSC	SC	Mecklenburg
Villosa delumbis	Eastern creekshell	–	SR	Mecklenburg or Lincoln
Alasmidonta robusta	Carolina elktoe	–	EX	Mecklenburg or Lincoln

(a) E = endangered; EX = extirpated (no longer found in the area); FSC = Federal species of concern; SC = State species of concern but not protected under State regulations; SR = significantly rare but not protected under State regulation; – = no listing.

Menhinick (1991) lists the highfin carpsucker from Lake Norman considerably north of the study area and lists only historic records of the Santee chub in Lake Norman but north of the study area (Gaddy 2001). However, detailed and thorough historical documentation on both species in the North Carolina Natural Heritage Program records is incomplete or non-existent, and there have been no recorded observations of these species in the recent past.

The three freshwater mussel species – dwarf threetooth, Eastern creekshell, and Carolina creekshell – are not reported from the Lake Norman South quadrangle, according to the North Carolina Natural Heritage Program database <http://www.ncsparks.net/nhp/search.html>.

2.2.6 Terrestrial Resources

Forest is the primary land cover near the McGuire site, with pasture, cropland, and residential development each contributing substantially to total land use. Noteworthy natural habitats outside the McGuire site include the 270-ha (668-ac) Cowan's Ford Wildlife Refuge (owned and operated by Mecklenburg County Parks and Recreation Department) and the Cowan's Ford Waterfowl Refuge (managed by the North Carolina Wildlife Resources Commission) to the south along the shores of Mountain Island Lake (Figure 2-2). These areas, as well as adjacent

lands, are occupied by bottomland hardwood forests and other habitats that support nearly 200 species of birds, 54 of which are neotropical migrants. Because of this rich avian diversity, the lands from Cowan's Ford to Mountain Island Lake have been officially designated as IBAs by the National Audubon Society. In addition, wildlife such as wild turkey *(Meleagris gallopavo*), numerous raptor species, whitetail deer *(Odocoileus virginianus*), and red fox *(Vulpes vulpes*) use these IBAs and the properties around the McGuire site to move freely along the Catawba River corridor (Duke 2001a).

The McGuire exclusion area is a circle with a 760-m (2500-ft) radius (Figure 2-5) that covers 182 ha (450 ac). Two man-made water bodies, the standby nuclear service water pond (13.3 ha [32.9 ac]) and the wastewater collection basin (4.13 ha [10.2 ac]), are located within the exclusion area (Figure 2-5). The exclusion area includes portions of Lake Norman and the McGuire discharge canal. Approximately 58.7 ha (145 ac) of the exclusion area are composed of generation and maintenance facilities, parking lots, roads, storage yards, and mowed grass. The remaining 41.3 ha (102 ac) consist of forest communities (Duke 2001a). In addition, 4.5 km (2.8 mi) of transmission line right-of-way connects the exclusion area to the McGuire switching station via nonforested terrestrial habitat.

The exclusion area harbors typical Piedmont plant communities (Duke 2001a) and land cover types. As shown in Figure 2-5, seven plant communities or cover types have been identified at the McGuire site: (1) marsh; (2) marsh/wetland mixed hardwood/open water; (3) mixed hardwood-pine; (4) pine; (5) wetland mixed hardwood; (6) wetland mixed hardwood/marsh; and (7) open water (Gaddy 2001). Cecil sandy loam dominates the site, with some Monacan clay loam found along the Catawba River. The more rare and more alkaline Mecklenburg and Iredell soils, which often support prairie plant species, are absent from the site (Duke 2001a; Gaddy 2001).

Marshes are nonforested and found along the margin of the floodplain of the Catawba River. Dominant marsh species include black willow (*Salix nigra*), tag alder (*Alnus serrulata*), a mallow (*Hibiscus* sp.), false nettle (*Boehmeria cylindrica*), fringed sedge (*Carex crinita*), cattail (*Typha latifolia*), rice cut-grass (*Leersia oryzoides*), and the exotic Asiatic dayflower (*Analeima keisak*) (Gaddy 2001).

Marsh/wetland mixed hardwood/open water describes a small wetland altered by beavers (*Castor canadensis*) found along the eastern edge of the exclusion area boundary. Common needlerush (*Juncus effusus*), sedges (*Carex* spp.), and false nettle occur in the backwaters of a small pond on the site. Black willow, tag alder, and sycamore (*Platanus occidentalis*) are found in the wetland mixed hardwood community upstream from the pond (Gaddy 2001).

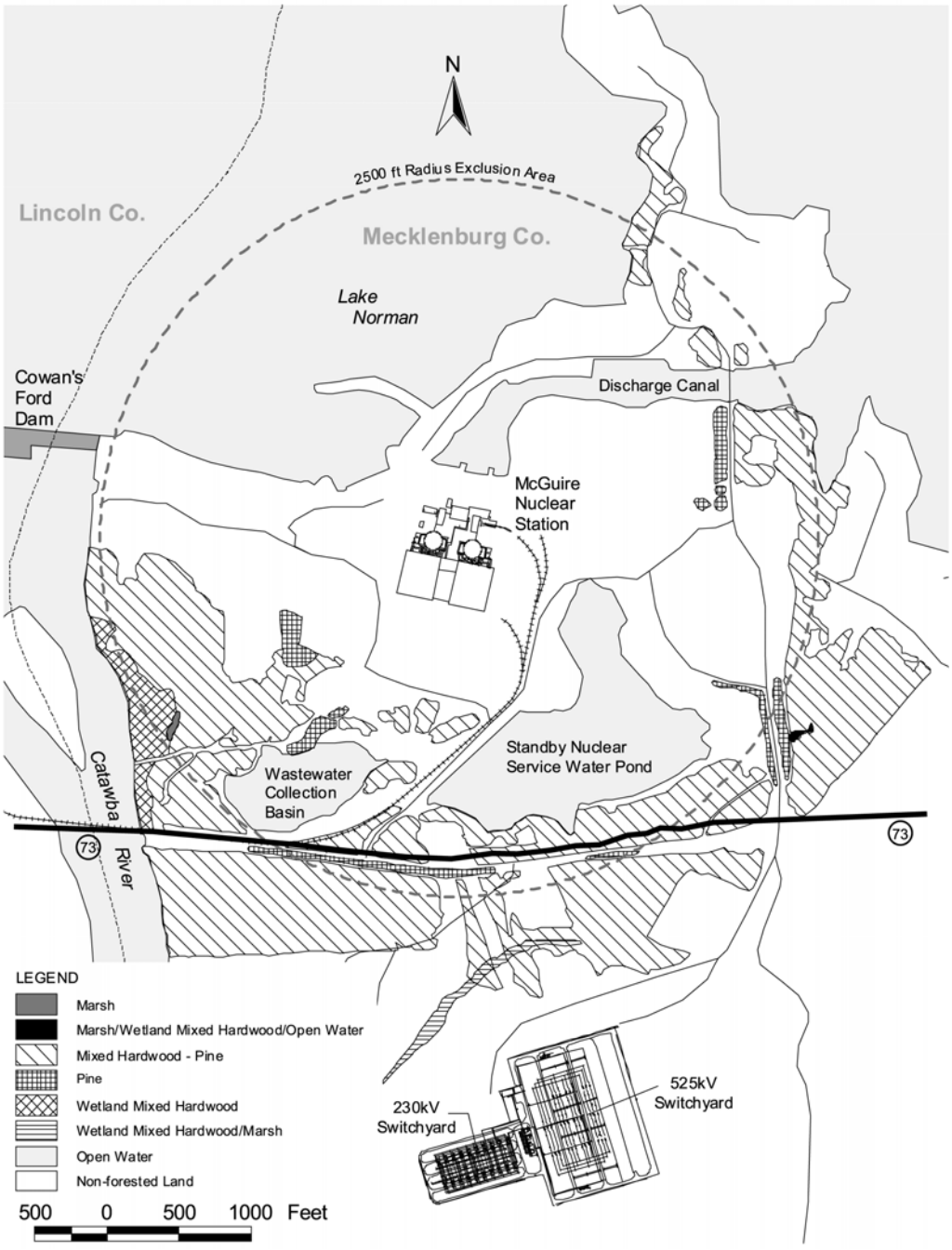

Figure 2-5. McGuire Site Vegetation Types

The mixed hardwood-pine community is the most widespread forest type on the McGuire site. Dominant species include white oak (*Quercus alba*), red oak (*Q. rubra*), tulip poplar (*Liriodendron tulipifera*), post oak (*Q. stellata*), hickories (*Carya* spp.), shortleaf pine (*Pinus echinata*), and Virginia pine (*P. virginiana*). Gaddy (2001) identified a portion of this forest community as a "significant natural area." This area supports a well-developed mixed hardwood forest with scattered mature trees (some greater than 2 ft in diameter). Tulip poplar, white oak, red oak, white ash (*Fraxinus americana*), and hickories dominate the canopy of this area, while dogwood (*Cornus florida*), sourwood (*Oxydendrum arboreum*), strawberry bush (*Calycanthus floridus*), and big-leaved storax (*Styrax grandifolia*) are found in the shrub layer of the understory. The pine community is early successional and is dominated by loblolly pine (*P. taeda*) with a low-density groundcover. Most of these stands occur in disturbed areas and along forest edges and appear to have been planted (Gaddy 2001).

The wetland mixed hardwood community is found in the floodplain of the Catawba River along the western edge of the exclusion area. Dominant overstory species include sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), American elm (*Ulmus americana*), river birch (*Betula nigra*), and sycamore. Box elder (*A. negundo*) is the understory dominant. The forest floor is occupied by sedges, Japanese honeysuckle (*Lonicera japonica*), and Vietnam grass (*Microstegium vimineum*) (Gaddy 2001).

The wetland mixed hardwood/marsh community occurs just south of the exclusion area where transmission lines pass over a small tributary of the Catawba River. Sycamore, black willow, tag alder, and sweet gum grow in the forested portions of the wetland, with Vietnam grass and cutgrass (*Leersia* sp.) in the understory. False nettle, common needlerush (*Scirpus polyphyllus*), and groundnut (*Apios americana*) grow in marshy openings (Gaddy 2001).

The forested portion of the exclusion area, as well as the transmission line rights-of-way, do not provide significant terrestrial habitat because of the small acreage involved. However, the McGuire site contains man-made wildlife food plots, including strip plots in the rights-of-way, that attract whitetail deer and other wildlife, including songbirds, a variety of mice and voles, raptors, gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), and opossum (*Didelphis virginiana*). Food plots include sorghum, sunflowers, rye, clover, and wheat that are mowed selectively to further enhance wildlife habitat value (Duke 2001a).

Notable wildlife species common to the McGuire site include whitetail deer, wild turkey, Canada geese (*Branta canadensis*), great blue heron (*Ardea herodias*), muskrat (*Ondatra zibethicus*), and osprey (*Pandion haliaetus*). Whitetail deer numbers have increased since McGuire has been operating. This is attributable largely to forest fragmentation, which provides for more open area and an increase in the foraging area for the deer. Fifteen wild turkeys were released on the McGuire site in 1996, and this population is apparently increasing. Wild turkeys are

commonly observed frequenting the food plots, rights-of-way, and bottomland hardwood areas. Canada geese numbers around McGuire also are increasing. These, and to a lesser extent other waterfowl and birds, routinely travel between the McGuire site and Cowan's Ford Waterfowl Refuge on Mountain Island Lake. Year-round access to reliable food sources in agricultural settings, yards, golf courses, and other open spaces explains why many of these are nonmigratory. A great blue heron rookery exists on a Davidson Creek island in Lake Norman approximately 4.5 km (3 mi) north of McGuire. This rookery consists of approximately 30 nests and is protected under the North Carolina Wildlife Resources Commission Colonial Waterbird Nesting Area Program. Island access is prohibited from April 1 to August 31. Muskrats, osprey, and various salamanders, aquatic snakes, and turtles have commonly been observed in marshy lowland areas and near open water (Duke 2001a).

Duke has a progressive wildlife enhancement program for which it received WAIT (Wildlife and Industry Together) certification from the North Carolina Wildlife Federation in 2001. This program is implemented both in the relatively unused portions of the plant site and offsite on nearby properties. It includes establishment and maintenance of food plots in the exclusion area and the rights-of-way; introduction of wild turkeys in cooperation with the Wild Turkey Federation; establishment of an osprey hacking (feed and release) site near Cowan's Ford Dam in cooperation with the Carolina Raptor Center; designation of a Davidson Creek island for heron management under the North Carolina Wildlife Resources Commission for management under the Colonial Waterbird Nesting Area Program; and establishment of bluebird houses.

Eight Federally listed and 10 State-listed threatened or endangered species, candidate species, or species of special concern are known to occur or may potentially occur in Mecklenburg County (Table 2-2) (Cole 2001; NCDENR 2001). Bald eagles (*Haliaeetus leucocephalus*) are known to nest at Lake Wylie (downstream of McGuire) and Lake James (upstream of McGuire) and are known from the Catawba River area (Cole 2001). The eagles are observed occasionally along Lake Norman (Cole 2001; Duke 2001a; Gaddy 2001), but sightings are rare and there are no known nest sites within 100 km (60 mi) of the McGuire site. Except for the bald eagle, no Federally or State-listed species are known to occur within the McGuire exclusion area or associated transmission line rights-of-way (Duke 2001a; Gaddy 2001). However, Schweinitz's sunflower (*Helianthus schweinitzii*) and Georgia aster (*Aster georgianus*) are known to occur on adjacent property (Cole 2001). No areas designated by the FWS as critical habitat for threatened/endangered species are known to exist within the McGuire exclusion area or associated transmission line rights-of-way (Duke 2001a; Gaddy 2001).

Table 2-2. Federal and State of North Carolina Listed Terrestrial Species Potentially Occurring in Mecklenburg County.

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
BIRDS			
Haliaeetus leucocephalus	bald eagle	T	E
Lanius ludovicianus ludovicianus	loggerhead shrike		SC
MAMMALS			
Condylura cristata	star-nosed mole - coastal plain population		SC
PLANTS			
Aster georgianus	Georgia aster	C	T
Delphinium exaltatum	tall larkspur	FSC	E
Echinacea laevigata	smooth coneflower	E	E
Helianthus schweinitzii	Schweinitz's sunflower	E	E
Isoetes virginica	Virginia quillwort	FSC	C
Lotus helleri	Carolina birdfoot-trefoil	FSC	C
Rhus michauxii	Michaux's sumac	E	E

(a) E = endangered; T = threatened; FSC = Federal species of (special) concern; C = candidate for Federal or State listing; SC = State species of special concern, but not protected under State regulations.

2.2.7 Radiological Impacts

Duke has conducted a radiological environmental monitoring program (REMP) around the McGuire site since 1977 (Duke 2001d). The radiological impacts to workers, the public, and the environment have been routinely monitored, documented, and compared to the appropriate standards. The REMP has four key objectives:

- Provide assurance that McGuire's contribution of radioactivity to the environment is and remains within applicable limits (Duke 2000a).

- Detect and identify changes in environmental levels as a result of station operations (Duke 2001d).

- 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.

- Supplement the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways (Duke 2001d).

Radiological releases are summarized in the annual reports – *McGuire Nuclear Station Units 1 and 2 – Annual Radiological Environmental Operating Report* (Duke 2001d) and *McGuire Nuclear Station Annual Radioactive Effluent Release Report* (Duke 2000b, 2001c). The limits for all radiological releases are specified in the McGuire ODCM (Duke 2001e), and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the air, direct radiation, surface water, drinking water, shoreline sediment, milk, fish, broadleaf vegetation, and food products.

Review of historical data on releases and the resultant dose calculations revealed that the doses to maximally exposed individuals in the vicinity of the McGuire 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 for which data were available), dose estimates were calculated based on actual liquid and gaseous effluent release data (Duke 2001c) and on measured concentrations of radionuclides from the REMP (Duke 2001d). 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 McGuire site boundary from effluent-based releases and environmental-based releases for the year 2000 is as follows:

- Total body dose from liquid effluent-based estimates was 0.001 mSv (0.102 mrem) compared to 0.00056 mSv (0.056 mrem) from environmental-based estimates. These estimates were between 1 and 2 percent of the 0.06-mSv (6-mrem) dose limit.[(a)] The maximum total organ dose for the liquid effluent-based estimates was 0.0013 mSv (0.13 mrem) to the child liver compared to 0.00064 mSv (0.064 mrem) to the child liver from the environmental-based estimates. These estimates were between 0.32 and 0.65 percent of the 0.20 mSv (20-mrem) dose limit (Duke 2001d).

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

- The air dose due to noble gases in gaseous effluents was 0.00084 mSv (0.084 mrad) gamma (0.42 percent of the 0.20-mGy [20-mrad] gamma dose limit)[(a)] and 0.00031 mGy (0.031 mrad) beta (0.08 percent of the 0.40-mGy [40-mrad] beta dose limit)[(a)] (Duke 2001d). Noble gases are not collected as part of the REMP; therefore, an environmental-based estimate was not calculated (Duke 2001d).

- The critical organ dose from gaseous effluents due to iodine-131, iodine-133, tritium, and particulates with half-lives greater than 8 days is 0.0055 mSv (0.55 mrem), which is approximately 2 percent of the 0.30-mSv (30-mrem) dose limit[(a)] (Duke 2001d).

Duke does not anticipate any significant changes to the radioactive effluent releases or exposures from McGuire operations during the renewal period; therefore, the impacts to the environment are not expected to change.

2.2.8 Socioeconomic Factors

The staff reviewed the McGuire Environmental Report (ER) and information obtained from several county, city, and economic development staff during a site visit from September 24 to 28, 2001. The following information describes the economy, population, and communities near the McGuire site.

2.2.8.1 Housing

Approximately 1345 full-time workers employed by Duke or site contractors work at McGuire during normal plant operations. Approximately 23 percent of these employees live in Mecklenburg County, 22 percent live in Lincoln County, 13 percent live in Gaston County, 11 percent live in Iredell County, and the rest live elsewhere in the region (see Table 2-3).

Duke refuels each nuclear unit at the McGuire site every 18 to 24 months. During these refueling outages, site employment increases by approximately 1015 temporary workers for 30 to 40 days. No major plant refurbishment activities were identified as necessary beyond routine replacement of components as part of normal plant maintenance (Duke 2001a). Duke has no plans to augment its current work force during the term of the license renewal period (Duke 2001a).

Table 2-4 provides the number of housing units, vacancies, vacancy percentages, and 10-year census percentage change for the seven counties in which 90 percent of McGuire employees reside. The vacancy rate for the principal counties of residence is similar, between 5 and 9 percent.

Table 2-3. McGuire Employee Residence Information by County

County	Number of Personnel	Percent	Cumulative Percent
Mecklenburg	318	24	23
Lincoln	305	23	47
Gaston	180	13	60
Iredell	155	11	71
Catawba	121	8	79
Cabarrus	93	7	86
Rowan	63	5	91
South Carolina	41	3	94
Other North Carolina	48	4	98
Other States	21	2	100
Total	1345	100	–

Source: Duke (2001a)

Table 2-4. Housing Units and Housing Units Vacant by County During 1990 and 2000

	1990	2000	Approximate Percentage Change
MECKLENBURG COUNTY			
Housing Units	216,416	292,780	35
Occupied Units	200,219	273,416	37
Percent Vacant	7	7	0
LINCOLN COUNTY			
Housing Units	20,189	25,717	27
Occupied Units	18,764	24,041	28
Percent Vacant	7	7	0
GASTON COUNTY			
Housing Units	69,133	78,842	14
Occupied Units	65,347	73,936	13
Percent Vacant	5	6	20
IREDELL COUNTY			
Housing Units	39,191	51,918	32
Occupied Units	35,573	47,360	33
Percent Vacant	9	9	0
CATAWBA COUNTY			
Housing Units	49,192	59,919	22
Occupied Units	45,700	55,533	22
Percent Vacant	7	7	0
CABARRUS COUNTY			
Housing Units	39,713	52,848	33
Occupied Units	37,515	49,519	32
Percent Vacant	6	6	0
ROWAN COUNTY			
Housing Units	46,264	53,980	17
Occupied Units	45,512	49,940	10
Percent Vacant	8	7	-13

2.2.8.2 Public Services

Public services include water supply, education, and transportation.

- **Water Supply**

  The CMUD, the largest public water and wastewater utility in the Carolinas, provides drinking water to more than 700,000 people via an estimated 192,000 active water service connections in the City of Charlotte and greater Mecklenburg County – including the towns of Matthews, Mint Hill, Pineville, Huntersville, Davidson, and Cornelius. The drinking water is pumped from the Catawba River – either at Mountain Island Lake or Lake Norman – to one of three treatment plants where the water is cleaned, tested, and pumped into the distribution system. The three plants treat and deliver an average of roughly 386 million L/day (102 million gpd) of water or about half the system's capacity.

  Six groundwater wells at McGuire supply specific low-volume needs totaling less than 0.0063 m^3/s (100 gpm). The site also has a passive dewatering system for the reactor building and auxiliary buildings. The total water usage at McGuire from CMUD for the year 2000 was 71.4 million liters (18.9 million gallons). Based on this figure, McGuire's average daily consumption of CMUD-supplied potable water was 0.0023 m^3/s (0.052 million gpd). CMUD estimates that the average annual system demand will be 7.14 m^3/s (163 million gpd) through the year 2030. McGuire's usage is 0.03 percent of the total system usage.

- **Education**

  The Charlotte-Mecklenburg schools serve about 106,000 students in 86 elementary, 27 middle, and 16 high schools, as well as 9 special programs, not counting an extensive pre-kindergarten program. There is excess capacity in general for all grade levels except high school, for which enrollment equals capacity. This does not include local school or individual classroom-level allocations, for which there may be space/teacher/resource shortfalls.

- **Transportation**

  The McGuire vicinity is served by Interstate 77 (I-77), which enters Mecklenburg County from the north and proceeds southwest through the city of Charlotte and south to Columbia, South Carolina. North Carolina Highway 16 (NC-16) provides north-south travel on the west side of the Catawba River. Sixteen miles west of McGuire, U.S. Highway 321 (US 321) runs north and south through the city of Gastonia.

Highway NC-73 runs east and west and passes McGuire at the south end of Lake Norman. Interstate 85 (I-85) is a major east-west highway that traverses the middle of the county through the city of Charlotte.

The plant is located approximately halfway between NC-16 and I-77. Road access to the McGuire site is via NC-73, a two-lane road for most of its length between NC-16 and I-77. An access railroad enters the site from the south along NC-73.

Duke contacted the North Carolina Department of Transportation (NCDOT) Statewide Planning Branch for information on traffic counts near McGuire. The NCDOT provided Average Annual Daily Traffic (AADT) count data and Level of Service (LOS)[(a)] designations for the requested locations (Duke 2001a). The AADTs and LOS designation for roads in the vicinity of McGuire are shown in Figure 2.6. The highest AADT counts are south on NC-16 to NC-73, and then along NC-73 to SR 2145. NC-16 is a major corridor for traffic to and from the Charlotte area. The portion of NC-73 between NC-16 and SR 2145 is a major corridor of travel to Interstate I-77. In summary, the LOS on NC-73 in the vicinity of McGuire is D—a high-density, stable flow in which speed and freedom to maneuver are severely restricted and where small increases in traffic will generally cause operational problems.

Continued growth in population, unrelated to McGuire operations, will likely occur in the area through the period of the extended license. This growth will necessitate increases in traffic capacity to accommodate the population increase. Traffic planning for the region is conducted by the Mecklenburg-Union Metropolitan Planning Organization (MUMPO). The MUMPO maintains a 20-year planning horizon for transportation improvements in the region (MUMPO 1999). The most recent plan extends to the year 2020 and is reviewed and revised on a 5-year cycle. The current plan does not include improvements to the road system near McGuire.

2.2.8.3 Offsite Land Use

The majority of the land area in the region near McGuire is a mixture of pasture, cropland, forest, and residential development. The shoreline of Lake Norman is developed with both vacation and permanent residences, along with campgrounds, boat launch areas, marinas, golf courses, and small retail establishments. The dominant land uses are residential housing (38 percent) and vacant (44 percent).

Two wildlife refuges are close to the plant site. Cowan's Ford Waterfowl Refuge abuts the plant site beginning at the Cowan's Ford Dam and extends south about 11 km (7 mi) along the

(a) LOS is a qualitative measure describing operational conditions within a traffic stream and their perception by motorists (NRC 1996).

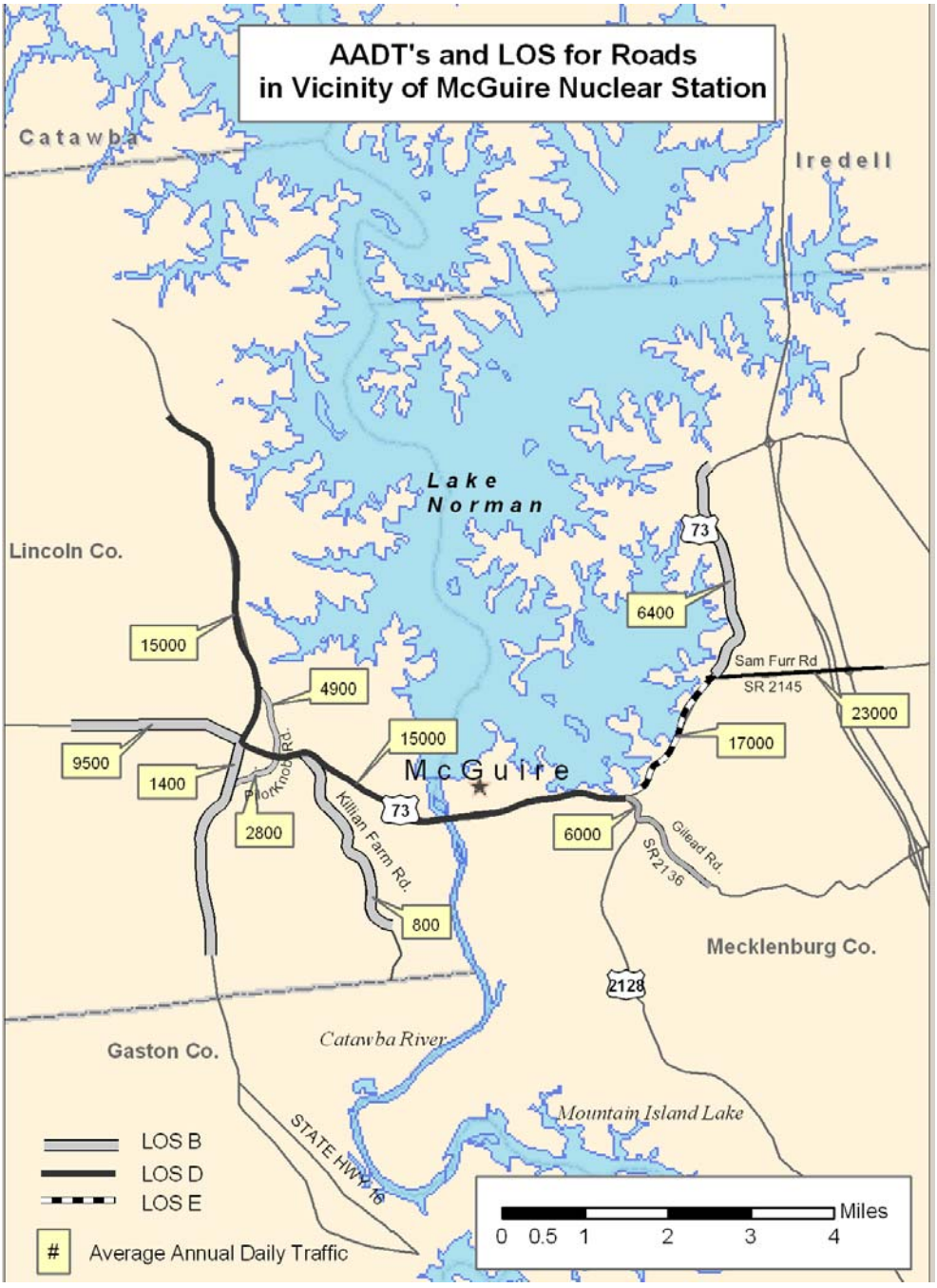

Figure 2-6. Traffic Counts and Level of Service on Roads Surrounding McGuire Nuclear Station

Catawba River. The Cowan's Ford Wildlife Refuge is about 7 km (4 mi) south of the plant site, within an oxbow bend in the riverine section of Mountain Island Lake. Kings Mountain National Military Park and Kings Mountain State Park are about 48 km (30 mi) southwest of McGuire. South Mountain State Park is approximately 64 km (40 mi) to the west-northwest. Crowder's Mountain State Park is approximately 39 km (24 mi) southwest of McGuire. Morrow Mountain State Park and a small portion of the Uwharrie National Forest are to the east within an 80-km (50-mi) radius of the McGuire site. The Catawba Indian Reservation occupies several sites south of the plant near Rock Hill, South Carolina. The nearest of these sites is approximately 48 km (30 mi) from the McGuire site.

2.2.8.4 Visual Aesthetics and Noise

McGuire is visible from a few vantage points on adjoining roads and from Lake Norman. However, its presence does not seem to affect the many recreational boaters or the relatively expensive homes that dot the shoreline. Very little noise from the nuclear station is evident from offsite.

2.2.8.5 Demography

Population was estimated in the region of McGuire in an 80-km (50-mi) zone in 16-km (10-mi) concentric rings. Population estimates for the 80-km (50-mi) area surrounding the site are based on information from the *Updated Final Safety Analysis Report* for McGuire (Duke 2000a).

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

  In 2000, an estimated 2,425,097 people lived within 80 km (50 mi), and 904,943 lived within 32 km (20 mi) of McGuire.

  Within 80 km (50 mi) of McGuire are located all or parts of 23 counties in North Carolina and 6 in South Carolina. Within this circle, Charlotte, North Carolina, is the only major city with a population over 500,000 (2000 Census). The next largest city is Gastonia, North Carolina, to the southwest, with a population of 66,277 (2000 Census) and Rock Hill, South Carolina, on Highway 21, with a population of 49,765 (2000 Census). Population data for the counties surrounding McGuire (in which 90 percent of McGuire employees live) are shown in Table 2-5.

- **Transient Population**

  There is very little transient population, either from seasonal travelers or migrant workers, in the vicinity of McGuire (personal communication with Richard W. Jacobsen, Jr., Director, Mecklenburg County Department of Social Services, October 2001; personal

Table 2-5. Historic and Projected Population in the Principal McGuire Area of Impact –The Seven Counties with 90 Percent of the McGuire Employees

County	1980	1990	2000	2010	2020
Mecklenburg	404,270	511,481	695,454	888,137	1,089,258
Lincoln	42,372	50,319	63,780	77,234	90,778
Gaston	162,568	175,093	190,365	203,623	215,587
Iredell	82,538	92,935	122,660	152,177	182,758
Catawba	105,208	118,412	141,685	163,889	186,058
Cabarrus	85,895	98,935	131,063	164,700	200,092
Rowan	99,186	110,605	130,340	150,599	171,889

Source: 1980 census data available at http://www.nationalatlas.gov/census1980m.html. 1990 and 2000 census data available at http://factfinder.census.gov. Projections for 2010 and 2020 are available at http://demog.state.nc.us/.

communications with Steve Patterson, Charlotte–Mecklenburg Planning Commission, March 2002; personal communication with Donny Hicks, Executive Director, Gaston County Economic Development Commission, March 2002). McGuire is actually in a relatively affluent part of Mecklenburg and surrounding counties, in part because the homes and lots on Lake Norman are considered very desirable.

2.2.8.6 Economy

According to the North Carolina Department of Commerce, Economic Development Information System (available at http://cmedis.commerce.state.nc.us/region/carolinas.asp), Mecklenburg County is in the Charlotte Regional Partnership, one of seven economic development regions in North Carolina. Charlotte is the hub of this economic development region. Population growth in Mecklenburg County over the past 20 years is shown in Table 2-5. This region's population and employment grew more rapidly than the state totals in recent years. The largest employment sectors in this region are manufacturing and wholesale/retail trade, while the fastest-growing sectors are construction and services. The business failure rate and business startup rate are slightly below the state average. Per-capita income and average wages are approximately 7 percent above the statewide levels. The unemployment rate is lower than the state average, and the region's poverty rate is the lowest in North Carolina.

Charlotte, the Piedmont Triad, and the Research Triangle region are the state's economic "hot spots," with growth predicted at 19 percent, 17 percent, and 15 percent, respectively, by the year 2005. Firms such as Hilton Hotels, Marriott Hotels, Hannaford Brothers, Coltec, SeaLand, Omni Hotels, Nations Bank, Hearst Corp., Black & Decker, and Canteen are located in Charlotte. Charlotte's financial sector is also growing and includes Nations Bank and First Union Bank.

Table 2-6 shows the employment by sector and wages in the Mecklenburg area. Table 2-7 shows the employment of the 20 largest manufacturing companies, as reported by the North Carolina Department of Commerce, Economic Development Information System. McGuire's 1370 employees would place it sixth among public and private concerns behind Mecklenburg County itself.

The unemployment rates for Mecklenburg County and surrounding localities are shown in Table 2-8. Most are below the North Carolina State average of 3.6 percent (U.S. Department of Labor 2001), with the notable exception of Gaston County, reflecting the diverse and healthy economy of the region.

McGuire paid about $8.5 million in property taxes to both Mecklenburg County and the town of Huntersville in fiscal year 1998-99. This represents about 2 percent of the property tax revenue and about 1 percent of the total operating budget of Mecklenburg County. McGuire also pays $333,333 per year to Huntersville, representing 7 percent of its property tax and 4 percent of its operating budget, as shown in Table 2-9.

Table 2-6. Employment and Earnings in Key Economic Sectors in Mecklenburg County, North Carolina

	Workforce		Average Weekly Earnings ($)	
	Number	**Percent**	**County**	**State**
Agriculture	4,864	0.90	472.16	383.00
Construction	32,622	6.30	690.74	571.00
Finance/Insurance/Real Estate	58,199	11.30	1,124.78	844.00
Government	48,103	9.40	724.07	621.00
Manufacturing	49,765	9.70	855.04	689.00
Retail Trade	84,054	16.40	409.79	334.00
Wholesale Trade	45,101	8.80	870.05	733.00
Service	145,914	28.40	676.46	550.00
Transportation/Communications/ Public Utilities	45,150	8.80	945.34	757.00
Total Workforce[(a)]	513,722	100.00		

(a) Mining is excluded because of its very small share of employment in NC and for confidentiality reasons.
Source: North Carolina Department of Commerce, Economic Development Information System available at http://cmedis.commerce.state.nc.us/countyprofiles/county.profile.asp?county=Mecklenburg

Table 2-7. Twenty Largest Manufacturers in Mecklenburg County

Company	Primary Product Category	Staff
IBM Corp.	Electronic Computers	3000
Solectron Technology Inc.	Printed Circuit Boards	2500
Continental General Tire Inc.	Tires and Inner Tubes	1700
Lance Inc.	Potato Chips and Similar Products	1600
Microsoft Corp.	Prepackaged Software	1300
Knight Publishing Co.	Newspapers: Publishing and Printing	1000
Interstate Brands Corp.	Bread, Bakery Products Except Cookies and Crackers	900
Frito-Lay Inc.	Potato Chips and Similar Products	720
Clariant Corp.	Cyclic-Crudes, Intermediates, Dyes and Org. Pigments	650
Siemens Westinghouse Power	Steam, Gas, and Hydraulic Turbines and Engines	610
Charlotte Pipe and Foundry Co.	Gray Iron Foundries	520
Blythe Construction Inc.	Commercial Physical and Biological Research	500
Connor, Wilton Packaging Limited Liability Company	Corrugated and Solid Fiber Boxes	500
Hoechst Celanese Corp.	Commercial Physical and Biological Research	500
Continental General Tire Inc.	Tires and Inner Tubes	400
Compass Group North America	Food Preparations	400
Carolina Tractor/Equipment Co.	Machinery and Equipment, Industrial and Commercial	400
AmeriSteel Corp.	Blast Furnaces, Coke Ovens, Steel and Rolling Mills	400
Okuma Machine Tools Inc.	Machine Tool Accessories	400
Conbraco Industries Inc.	Valves and Pipe Fittings	350

Source: North Carolina Department of Commerce, Economic Development Information System available at http://cmedis.commerce.state.nc.us/countyprofiles/countyprofile.asp?county=Mecklenburg

Table 2-8. Unemployment in Counties Surrounding McGuire

County	2000 Annual Unemployment Rates (%)
Cabarrus	2.6
Catawba	2.2
Gaston	6.1
Iredell	3.3
Lincoln	4.1
Mecklenburg	2.5
Rowan	4.8
State of North Carolina	3.6

Source: U.S. Department of Labor, Bureau of Labor Statistics, 2000 data (DOL 2001)

Table 2-9. Property Tax Revenues Generated in Mecklenburg County: 1998-2001[a]

Tax or Fiscal Year	Total Mecklenburg County Property Tax Revenues ($)[b]	Property Tax Paid to Mecklenburg County by McGuire ($)[c]	McGuire Property Taxes as a Percentage of Total County Property Tax Revenue	Total County Operating Budget ($)[b]	McGuire Property Taxes as a Percentage of Total County Operating Budget
1998	385,673,079	8,100,866	2	760,190,762	1
1999	399,009,088	7,624,712	2	850,502,587	1
2000	445,135,437	7,421,517	2	940,575,290	1
2001	473,588,913	9,311,874	2	1,029,528,662	1

(a) In addition, McGuire pays $333,333 a year to the town of Huntersville, a part of an agreement for payments in lieu of annexation of the McGuire site by the town of Huntersville. The payments will be made on an annual basis until the year 2027, when the agreement expires. The total revenues received in 1999 by the town of Huntersville were $9,462,699, of which $4,832,573 were revenues from property taxes (Duke 2001a, Section 4.18) The payment by McGuire represents about 7 percent of Huntersville's property tax revenue and 4 percent of its total operating budget.
(b) Source: Personal communication from Mecklenburg-Charlotte Tax Assessor, February 2002
(c) Source: Personal communication from North Carolina Department of Revenue, Property Tax Division, March 2002

2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known historic and archaeological resources at McGuire and in the surrounding area. This section draws on information contained in the McGuire ER (Duke 2001a) and from archives and records stored at the North Carolina Department of Cultural Resources, Office of Archives and History, as well as published literature that treats the history of the North Carolina Piedmont (Piedmont).

2.2.9.1 Cultural Background

McGuire is in the southwest section of the Piedmont geologic province. The Piedmont is a large, highly dissected plateau covering some 58,000 km^2 (20,000 mi^2) between the coastal plain and the foothills of the Blue Ridge Mountains (Ward 1983). The Piedmont has an archaeological sequence that extends back at least 12,000 years before the present.

The Piedmont's cultural history can be divided into five major periods: Paleoindian (10,000 B.C., and perhaps as early as 13,000 B.C., to around 8000 B.C.), Archaic (8000 to 500 B.C.), Woodland (500 B.C. to around A.D. 1000), Mississippian (A.D. 1000 to around 1500), and Historic and Modern (A.D. 1500 to the present).

During the Paleoindian period, the native peoples seemingly were organized into small mobile bands with a hunting- and a fishing-based economy. Animals hunted included megafauna, such as the now extinct mammoth. The environment of the Paleoindian period was significantly different from the present. This was at the end of the last ice age, in which the climate was cooler than at present and glaciers covered much of the northern portion of North America.

The transition between the Paleoindian and Archaic periods was accompanied by substantial environmental change. As glaciers began to melt, sea level began to rise. These changing environmental conditions led to a greater dependance on river systems and the beginnings of the use of domesticated plants. Middle Archaic sites in the Piedmont are numerous and likely reflect small groups of socially noncomplex peoples widely ranging across the landscape (Anderson 1996). Middle and Late Archaic archaeological sites typically exhibit greater evidence of sedentary economies, such as the presence of storage pits, extensive refuse middens, and large quantities of fire-cracked rock. Archaic period habitation sites appear to have been divided into base camps used during the the spring, summer, and winter months, and smaller upland sites used during the fall for deer hunting and nut gathering.

In the Woodland period, Native American cultures reached their modern configurations as noted at the time of initial European contact in the 16th and 17th centuries. The middle of the Woodland period witnessed the establishment of large sedentary base camps in river valleys, with associated smaller resource-gathering sites being established in surrounding areas.

Toward the end of the Woodland period and during the subsequent Mississippian period, Native American villages throughout the Midwest and much of the Southeast apparently were organized into chiefdom-level societies (Bense 1994; Perdue 1985). The use of long-houses, palisades, earth lodges, mounds and other earthen works, and designated burial grounds are hallmarks of the Mississippian period.

The staff assumes that the ancestors of the modern Catawba Indians lived in the region surrounding McGuire and the Catawba River at the time of historic contact with the Europeans (Perdue 1985; Merrell 1989; Lee 1997; De Vorsey 1998). The Catawba are an eastern Siouan-speaking tribe who likely lived in the Carolinas for several hundred years before European contact.

The Historic period in North Carolina began in the early 16th century with the first incursions of European explorers along the Carolina Coast (Bense 1994; Cumming 1998; De Vorsey 1998). Beginning around 1660, a steady stream of Euroamericans began moving from Virginia into the coastal sounds and rivers of North Carolina (Perdue 1985; Lee 1997). In 1670, the Carolina colony was established by the British at Charles Town (modern Charleston). The stream of settlers finally led to a series of conflicts between the tribes and the settlers, with the most

serious being the Tuscarora, Yamassee, and Cheraw Wars of 1711-1718. In these wars, the Catawba first assisted the Euroamericans against Tuscarora and then turned on the Euroamericans, particularly in the Yamassee War. Ultimately, the Catawba joined the Cherokee in making peace.

In 1701, the surveyor John Lawson reported that several thousand Catawba Indians were observed living in many different villages (Perdue 1985; Lee 1997). By 1738, smallpox and other diseases had reduced the tribe to around 1000 people living in six villages in proximity along the Catawba River in the area around the present border between South and North Carolina. A second smallpox epidemic in 1759-1760 further reduced the Catawba population.

By 1750, so many Euroamericans had moved into the Piedmont that Anson County was created, a county which then covered roughly the western half of North Carolina. Mecklenburg County itself was carved out from Anson County and established in 1763. The current county boundaries were set up in 1842. Treaties in 1760 and 1763 set up an approximately 39-km^2 (15-mi^2) reservation for the Catawba tribe at the eastern edge of South Carolina; however, these lands were soon overrun by Euroamerican colonists. In 1768, the town of Charlotte was incorporated at the juncture of two major transportation and trade routes (Rogers and Rogers 1996). John Collet's detailed 1770 map of North Carolina depicts Charlotte (Charlottesburgh) and the small nearby Catawba Tribal Reservation but depicts no settlements, mills, or transportation corridors in the general vicinity of the current McGuire site (Cumming 1998).

In early 1779, the British concentrated on consolidating their power in the southern states during the American Revolution. Charles, First Lord Cornwallis, entered Charlotte on September 28, 1780; however, his reception was so contested that he retreated from Charlotte to Charleston on October 14, 1780.

In December 1780, Nathanael Greene, the commanding general for the Continental Army in the South, arrived in Charlotte. Greene decided that the Charlotte area did not contain enough provisions to satisfactorily supply his army, so he removed the majority of the Army to the Pee Dee River to the east of Charlotte. Some 1000 men under the command of General Daniel Morgan were sent to northwest South Carolina. Lord Cornwallis began to pursue Morgan, who was fleeing east to attempt to rejoin with Greene. Greene, riding west from his camp, met Morgan at the Catawba River, and was joined by General William Lee Davidson, the local militia commander for the area.

Because there were no bridges crossing the Catawba River, Davidson and a small force were tasked to slow the advance of the British Army so that Morgan's forces would have time to join up with those of Greene. Just before daybreak the next morning, the British Army led by Cornwallis surprised Davidson's sleeping militia at Cowan's Ford. This action was to prove the last that occurred in the Charlotte area during the American Revolution.

During the period between the American Revolution and the Civil War, the Piedmont was divided into regions devoted to the cultivation of tobacco (north and east of Charlotte) and cotton (around and to the south of Charlotte). The period of 1789 through 1860 saw the development of plantations (primarily using African slaves for labor), independent farms, and small towns through the Piedmont, in which agriculture dominated local economies. This agriculture-based economy was facilitated by the invention of the cotton gin in 1793, which allowed short-fiber cotton to be grown virtually anywhere in the region.

The Catawba Indians were active resisters to the forced relocation plans of the Federal government during the 1820s to 1850s, such as President Andrew Jackson's Indian Removal Act of 1830 (Bense 1994). The Catawba attempted to hang onto their old reservation lands ceded in the 18th century, but in 1840 were finally forced to sell most of them to South Carolina. The Catawba then variously lived with the North Carolina Cherokee and the Oklahoma Choctaw and then surreptitiously returned to South Carolina.

The Charlotte area and the Mecklenberg County portion of the Catawba River did not play a major role in the battles and strategy of the Civil War (Barrett 1987). Some Catawba soldiers fought for the Confederacy during the Civil War.

Due to the physical effects of the Civil War and to the abolishment of slavery, the economic basis of the Southeast was fundamentally changed between 1865 and 1917 (Bense 1994). While plantations typically were returned to their former owners, plant operations became dependent on voluntary contracts or tenant farming with their labor force. Over time, plantations became smaller, averaging less than 40 ha (100 ac) by 1920. The expansion of the railroads, the rebuilding of basic infrastructure, and the Industrial Revolution all led to major changes.

The period between World War I and World War II saw the continued growth of small towns and the continuation of the use of small plantations and independent farms. In 1941, the Catawba Tribe first received Federal recognition but petitioned to terminate their status in 1959, with lands being distributed among tribal members (Merrell 1989). After a period of reassessing this decision to divest, the tribal council was reorganized and in 1973 was given state recognition by South Carolina. After a lengthy court process, Federal recognition was reinstated in 1993.

The period since the end of World War II has witnessed the creation of Lake Norman, North Carolina's largest man-made lake, which reached full capacity in 1964. As a consequence, numerous residential developments have blossomed around its margins, a trend that is ongoing. Construction began in the mid-1970s on McGuire Units 1 and 2, and in 1981 and 1984, respectively, the units were put into operation.

2.2.9.2 Historic and Archaeological Resources at the McGuire Site

Historic and archaeological site file searches were conducted at the North Carolina Department of Cultural Resources, Office of Archives and History, to determine what specific historic cultural resources may be present at the McGuire site. In addition, record searches were conducted for nearby locations to gain a perspective on the types of historic resources that may be present in the previously undeveloped and unsurveyed portions of the grounds of the McGuire Nuclear Station.

These record searches revealed that there are no known historic and archaeological resources at McGuire. During the construction of McGuire, a forgotten historic marker commemorating the death of General Davidson at Cowan's Ford was discovered (Duke 2001a). Cowan's Ford and the location of Davidson's death are now inundated. General Davidson's body was interred at the Hopewell Church cemetery about 8 km (5 mi) away. In 1971, Duke incorporated this marker, as well as a new marker provided by the North Carolina Department of Archives and History, into a public area adjacent to McGuire. The markers were dedicated in 1971 and are still maintained by Duke.

An archaeological survey was not conducted at McGuire before construction activities. However, based on the records of nearby sites and properties, it is unlikely that significant Native American resources were present. A number of Native American archaeological sites were identified and recorded in the early 1960s just north of McGuire before the creation of Lake Norman. These sites were poorly defined and described but appear to represent Archaic, Woodland, and Mississippian period occupations. Most consisted of a few scattered stone and ceramic artifacts in areas heavily disturbed by historic agriculture, specifically from the cultivation of cotton. Erosion caused by cotton farming was a major impact in virtually every site, with many of the sites being exposed to bedrock.

No structures or buildings at McGuire are 50 years of age or older. A number of structures and buildings within a 5.0-km (3.1-mi) radius of McGuire have been evaluated for historic significance; however, only three of these have been determined eligible for listing in the National Register of Historic Places (Duke 2001a). These include the Ingleside house, which was built in the 1850s, and is about 3.7 km (2.3 mi) from McGuire; the Rural Hill Plantation, which has features dating to the late 18th century, and is about 4.6 km (2.8 mi) from McGuire; and the Holly Bend house, which was built at the end of the 18th century, and is about 4.9 km (3.0 mi) from McGuire. The Gilead Associated Reformed Presbyterian church and cemetery and the Caldwell-Rosenwald School are currently pending evaluation.

The Catawba Indian Reservation (in three separate parcels) is situated in South Carolina about 48 km (30 mi) south of McGuire.

2.2.10 Related Federal Project Activities and Consultations

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

The Federal Power Commission, now the FERC, issued a license (FERC Project No. 2232) to Duke Power Company on September 17, 1958, for the Catawba-Wateree hydroelectric project (FERC 2001a). One component of the project is the Cowan's Ford Dam hydroelectric station. The Cowan's Ford Dam impounds Lake Norman. The license for the Catawba-Wateree project will expire August 31, 2008 (FERC 2001a). Under current FERC rules, Duke Power will need to file a notice of intent with FERC by August 2003 declaring whether or not it intends to seek a new license for the Catawba-Wateree hydroelectric project (18 CFR 16.6). Assuming that Duke Power intends to seek a new license, it will need to file an application for the relicensing of the project at least 2 years before the license expires. FERC will prepare an environmental assessment or an EIS under NEPA in conjunction with reviewing the application. FERC's procedures for processing a license application are set out in a handbook (FERC 2001b).

The Federal lands closest to McGuire are within the Kings Mountain National Military Park. The park is located near Blacksburg, South Carolina, and is operated by the National Park Service. The park is approximately 48 km (30 mi) southwest of McGuire.

The Native American land closest to the McGuire site is the Catawba Indian Reservation. The tribe occupies a 260-ha (640-ac) reservation in York County, South Carolina, near the city of Rock Hill. The reservation is approximately 48 km (30 mi) south of McGuire.

Duke's Catawba Nuclear Sation is located approximately 48 km (30 mi) south of McGuire. Duke has requested that the NRC renew the OLs for the Catawba plant also.

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

The 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. During the preparation of this SEIS, the NRC staff consulted with the FWS. 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 10, *Energy,* Part 50, "Domestic Licensing of Production and Utilization Facilities."

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

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

10 CFR Part 42. Code of Federal Regulations, Title 10, *Energy*, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."

18 CFR Part 16. Code of Federal Regulations, Title 18, *Conservation of Power and Water Resources*, Part 16, "Procedures Relating to Takeover and Relicensing of Licensed Projects."

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

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

Anderson, D. G. 1996. "Approaches to Modeling Regional Settlement in the Archaic Period Southeast." In *Archaeology of the Mid-Holocene Southeast*, eds. K. E. Sassaman and D. G. Anderson, pp. 157-176. University Press of Florida, Gainesville.

Barrett, J. G. 1987. *North Carolina as a Civil War Battleground, 1861-1865*. North Carolina Division of Archives and History, Raleigh.

Bense, J. A. 1994. *Archaeology of the Southeastern United States*. Academic Press, New York.

Cole, B. 2001. Letter from U.S. Fish and Wildlife Service State Supervisor, Asheville Field Office, Asheville, North Carolina to Cynthina A. Carpenter, Chief, Risk Informed Initiatives, Environmental Decommissioning and Rulemaking Branch, Division of Nuclear Regulatory Improvement Programs, Office of Nuclear Reactor Regulation, Nuclear Regulatory Commission. Subject: "McGuire Nuclear Station, Units 1 and 2, License Renewal Project, Mecklenburg County, North Carolina (Docket Nos. 50-369 and 50-370)." November 1, 2001.

Cumming, W. P. 1998. *The Southeast in Early Maps*. Third edition. University of North Carolina Press, Chapel Hill, North Carolina.

De Vorsey, L., Jr. 1998. "American Indians and the Early Mapping of the Southeast." In *The Southeast in Early Maps*, third edition, by W. P. Cumming, pp. 65-98. University of North Carolina Press, Chapel Hill, North Carolina.

Duke Energy Corporation (Duke). 2000a. *Duke Energy Company McGuire Nuclear Station Updated Final Safety Analysis Report.* Revision 9, Oct. 14, 2000. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2000b. *McGuire Nuclear Station Annual Radioactive Effluent Release Report (January 1, 1999 Through December 31, 1999)*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001a. *Applicant's Environmental Report—Operating License Renewal Stage—McGuire Nuclear Station*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. *Application to Renew the Operating Licenses of McGuire Nuclear Station, Units 1 and 2 and Catawba Nuclear Station, Units 1 and 2*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001c. *McGuire Nuclear Station Annual Radioactive Effluent Release Report (January 1, 2000 Through December 31, 2000)*. Charlotte, North Carolina.

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

Duke Energy Corporation (Duke). 2001e. *McGuire Nuclear Station Units 1 and 2 Offsite Dose Calculation Manual (ODCM).* Revision 42, January 2001. Charlotte, North Carolina.

Duke Power Company. 1985. McGuire Nuclear Station 316(a) Demonstration. 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 United States*. DOE/CH 10093-4, U.S. Department of Energy, Washington, D.C. <http://rredc.nrel.gov/wind/pubs/atlas/titlepg.html> (accessed March 26, 2002).

Federal Water Pollution Control Act (FWPCA). 33 USC 1251, et seq.

Fridell, J. A. 2001. *Carolina heelsplitter in North Carolina*. U.S. Fish and Wildlife Service, Asheville, North Carolina. <http://nc-es.fws.gov/mussel/carolheel.html> (accessed September 12, 2001).

Gaddy, L. L. 2001. *Biological Assessment for Endangered, Threatened, and Noteworthy Species, Wetlands, and Significant Natural Areas in Association with McGuire Nuclear Station and Related Power Transmission Lines*. Prepared for Duke Power Company, Charlotte, North Carolina, March 2001.

Hall, J. J. and T. J. Wilda. 2000. *Corbicula* Populations and Their Biofouling Potential in the McGuire Nuclear Station Intake Structures in 1999. Duke Power Company internal report, Charlotte, North Carolina.

Hall, J. J. and T. J. Wilda. 2001. *Corbicula* Populations and Their Biofouling Potential in the McGuire Nuclear Station Intake Structures in 2000. Duke Power Company internal report, Charlotte, North Carolina.

Lee, E. L. 1997. *Indian Wars in North Carolina*. North Carolina Division of Archives and History, Raleigh, North Carolina.

Mecklenburg County Department of Environmental Protection (MCDEP). 2000. *State of the Environment 2000*. Charlotte, North Carolina. <http://www.co.mecklenburg.mn.us/cenv/SOER/SOER.htm> (accessed October 3, 2001).

Mecklenburg – Union Metropolitan Planning Organization (MUMPO). 1999. Charlotte, North Carolina.

Menhinick, E. F. 1991. *The Freshwater Fishes of North Carolina*. Delmar Co., Charlotte, North Carolina.

Merrell, J. H. 1989. *The Indians' New World: Catawbas and Their Neighbors from European Contact Through the Era of Removal.* W. W. Norton & Company, Inc., New York.

National Climatic Data Center. (NCDC) 2001. "Local Climatological Data Annual Summary With Comparative Data, Charlotte, North Carolina." Asheville, North Carolina.

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

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

Perdue, T. 1985. *Native Carolinians: The Indians of North Carolina*. North Carolina Division of Archives and History, Raleigh, North Carolina.

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

Rogers, J. R., and A. T. Rogers. 1996. *Charlotte and Its Historic Neighborhoods*. Arcadia Publishing, Charleston, South Carolina.

Town of Huntersville. 2001. "The Zoning Ordinance of the Town of Huntersville." <http://www.huntersville.org/planning/ordinances.htm> (accessed February 15, 2002).

U.S. Department of Energy (DOE). 2001. "U.S. Wind Energy Resource Map." <http://www.eren.doe.gov/wind/we_map.html> (accessed March 27, 2001)

U.S. Department of Labor (DOL). 2001. "State and Regional Unemployment. 2000 Annual Averages." <ftp://ftp.bls.gov/pub/news.release/srgune.txt> (accessed February 27, 2001).

U.S. Environmental Protection Agency (EPA). 2002. "Proposed Carolina Heelsplitter Critical Habitat". <http://www.epa.gov/fedrgstr/EPA-SPECIES/2001/July/Day-11/e16867.htm> (accessed March 20, 2002).

U.S. Federal Energy Regulatory Commission (FERC). 2001a. *Hydroelectric Projects Under Commission License*. <http://www.ferc.gov/hydro/docs/projlic.pdf> (accessed February 18, 2002).

U.S. Federal Energy Regulatory Commission (FERC). 2001b. *Hydroelectric Project Licensing Handbook*. <http://www.ferc.gov/hydro/docs/licensing_handbook.pdf> (accessed February 18, 2002).

U.S. Nuclear Regulatory Commission (NRC). 1976. "*Final Environmental Statement Related to Operation of William B. McGuire Nuclear Station, Units 1 and 2, Duke Power Company*." Docket Nos. 50-369 and 50-370, NUREG-0063, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1991. "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors." NUREG-1301, 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). 1999a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 2, Oconee Nuclear Station*. NUREG-1437, Supp. 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *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.

Ward, H. T. 1983. "A Review of Archaeology in the North Carolina Piedmont: A Study of Change." In *The Prehistory of North Carolina: An Archaeological Symposium*, eds. M. A. Mathis and J. J. Crow, pp. 53-81. North Carolina Division of Archives and History, Raleigh, North Carolina.

Water Resources Development Act of 1999. Pub. L. 106-53, August 17, 1999, 113 Stat. 269.

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 did not meet one or more of the criteria of 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 McGuire Nuclear Station, Units 1 and 2 (McGuire) because they are related to plant design features or site characteristics not found at McGuire are listed in Appendix F.

10 CFR 54.21 describes a required review to demonstrate that the effects of aging will be managed such that the structure and component intended functions will be maintained consistent with the current licensing basis during the period of extended operations. Duke Energy Corporation (Duke) provided this review in the Technical Information portion of its application for license renewal (Duke 2001). Duke stated that, "Based on this 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." Therefore, the staff does not further consider refurbishment in this Supplemental Environmental Impact Statement.

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.

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 to Renew the Operating Licenses of McGuire Nuclear Station, Units 1 and 2 and 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, NRC, Washington, D.C.

4.0 Environmental Impacts of Operation

Environmental issues associated with plant operations 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, 1999b).[(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 characteristics.

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

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

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

Category 2 issues are those that did not meet one or more of the criteria of 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 McGuire Nuclear Station, Units 1 and 2 (McGuire). Section 4.1 addresses the issues applicable to the McGuire cooling water systems. Section 4.2 addresses issues related to transmission lines and 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 new information that was raised during the scoping period. The results of the evaluation of environmental issues related to operation during the renewal term are

(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.

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

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to cooling system operation for McGuire during the renewal term are listed in Table 4-1. Duke Energy Corporation (Duke) stated in its environmental report (ER) that "no new information existed for the issues that would invalidate the GEIS conclusions" (Duke 2001a). The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), 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, for each of these issues follows:

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

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

  The staff has not identified any significant new information during its independent review of the McGuire 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 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.

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.3.2.2; 4.4.2
Altered thermal stratification of lakes	4.2.1.2.3; 4.4.2.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Microbial organisms (occupational health)	4.3.6
Noise	4.3.7

The staff has not identified any significant new information during its independent review of the McGuire 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 altered thermal stratification of Lake Norman 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 McGuire 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 McGuire 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 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 McGuire 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 McGuire 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 McGuire or discussion with the NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

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

  > Effects are readily controlled through 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 McGuire ER, the staff's site visit, the scoping process, its evaluation of other available information including the NPDES permit for McGuire or discussion with 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 McGuire ER, the staff's site visit, the scoping process, its evaluation of other available information including the NPDES permit for McGuire or discussion with 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.

- Water-use conflicts (plants with once-through cooling systems). Based on information in the GEIS, the Commission found that

  > These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

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

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

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

  The staff has not identified any significant new information during its independent review of the McGuire 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 McGuire 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 McGuire 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 McGuire 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 plumes 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 McGuire 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 distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the McGuire 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 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 McGuire 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 McGuire 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 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 McGuire 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 sub-lethal stresses during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the McGuire 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 stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's onsite visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there is 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 McGuire 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 McGuire are discussed in the section that follows, and are listed in Table 4-2.

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.4.3	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3; 4.4.3	B	4.1.2
Heat shock	4.2.2.1.4; 4.4.3	B	4.1.3
HUMAN HEALTH			
Microbiological organisms (public health)(plants using lakes or canals, or cooling towers or cooling ponds that discharge into a small river)	4.3.6	G	4.1.4

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

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

The staff independently reviewed the McGuire ER (Duke 2001a), visited the site, and reviewed the application for NPDES Permit No. NC0024392, which was issued by the North Carolina Department of Environment and Natural Resources (NCDENR) and expires February 28, 2005.

In response to requirements set by the North Carolina Department of Natural Resources and Community Development (NCDNRCD), Division of Environmental Management, Duke submitted a Clean Water Act (CWA) Section 316(b) demonstration for McGuire in October 1978 (Duke Power Company 1978).

The 316(b) study conclusions related to entrainment of juvenile fish were based on determinations of larval fish species composition and abundance evaluated on a biweekly basis when larval fish were present between 1974 and 1977 (Duke Power Company 1978). Species known to spawn in the McGuire intake cove are the introduced forage fish—threadfin shad (*Dorosoma petenense*), yellow perch (*Perca flavescens*), bluegill sunfish (*Lepomis macrochirus*), and crappie (*Poxomis* spp). The collection site was in the upper intake area, at a depth of 15 m (49 ft). Icthyoplankton losses to entrainment were primarily threadfin shad eggs and larvae. Because of the rapid threadfin shad reproduction rate and the presence of more suitable spawning habitat outside the influence of the intake structures, losses do not have a

measurable effect on the standing crop of shad. Most fish species that reside in the vicinity of McGuire spawn in shallow shoreline areas and produce demersal, adhesive eggs that would not be subject to entrainment. In addition, during summer up to 45 percent of the intake water is predicted to come from the low-level intake, which pulls water from the hypolimnion at a depth of approximately 30 m (100 ft). Because there are few plankton of any sort in this cold, low-oxygen water, opportunities for larval fish entrainment are expected to be further reduced during the summer period.

After reviewing Duke's submittal, the NCDNRCD concurred with the conclusions of the study (NCDNRCD 1984) and re-issued the site's NPDES permit (dated September 1, 1984) with no additional monitoring or studies required.

The staff has reviewed the available information, the results of entrainment studies, and operating history of the intake and concludes that the potential impacts of the cooling-water-intake system's entrainment of fish and shellfish in the early life stages are SMALL, and additional mitigation is not warranted.

4.1.2 Impingement of Fish and Shellfish

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment prior to license renewal.

The staff independently reviewed the McGuire ER (Duke 2001a), visited the site, and reviewed the application for NPDES Permit No. NC0024392, which was issued by the NCDENR and expires February 28, 2005.

In response to requirements set by the NCDNRCD, Division of Environmental Management, Duke submitted a CWA Section 316(b) demonstration for McGuire in October 1978 (Duke Power Company 1978).

The 316(b) study conclusions related to impingement of fish and shellfish were based on studies of fish species composition and abundance evaluated on a monthly, quarterly, or annual basis using electrofishing, gillnetting, and rotenone sampling techniques between 1974 and 1977 (Duke Power Company 1978). Based on studies conducted in the 1970s, most fish impinged at McGuire were threadfin shad, especially during the fall and winter when the introduced species is susceptible to low-temperature stress and exhibits high mortality associated with cool water temperatures. Fish swimming between the trash racks and screens were predicted to be most susceptible to impingement. However, it was predicted that fish approaching the upper-level trash racks when the low-level pumps were operating could be

repelled by the low temperature and oxygen levels associated with water drawn from the hypolimnion by the low-level pumps.

After reviewing Duke's submittal, the NCDNRCD concurred with the conclusions of the study (NCDNRCD 1984) and re-issued the site's NPDES permit (dated September 1, 1984), with no additional monitoring or studies required.

An in-house impingement sampling program that began in December 2000 and is scheduled to continue through November 2002 incorporates a full count of all fishes impinged on condenser cooling water intake screens for Units 1 and 2 through a weekly sampling program (Duke 2001b). Preliminary results indicate that impingement rates at McGuire are very low. Between December 2000 and December 2001, a total of 1746 fish were impinged. Weekly impingement ranged from a low of 5 fish to a high of 455 fish. Threadfin shad was the species most commonly impinged (50 percent). Seventy-one percent of these threadfin shad were observed during a 14-day period between December 29, 2000, and January 12, 2001, when the water temperature reached a low of 10°C. Threadfin shad are a nonindigenous, temperate species with documented potential for cold shock morbidity and mortality when water temperatures drop below 9°C (Strawn 1963). These data suggest that the high impingement rate for threadfin shad during the 14-day period resulted from a natural die-off in the vicinity of the intake. Other species observed on the intake screens were bluegill sunfish (*Lepomis macrochirus*; 9 percent), alewife (*Alosa pseudoharengus*; 8 percent), and a combination of other species that individually comprised less than 5 percent of the total number impinged (30 percent).

Impacts to shellfish from impingement are not considered important because adult shellfish are not motile and susceptible to impingement.

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

4.1.3 Heat Shock

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

The staff independently reviewed the McGuire ER (Duke 2001a), visited the site, and reviewed the application for NPDES Permit No. NC0024392, which was issued by the NCDENR and expires February 28, 2005.

Duke submitted a CWA Section 316(a) demonstration for McGuire to the NCDNRCD, Division of Environmental Management, in June 1985 (Duke 1985). In summary, the NCDNRCD indicated that "the effects of the discharge from the McGuire Nuclear Station is such that the protection and propagation of a balanced indigenous aquatic community is assured in Lake Norman and that interaction of the two thermal plumes of McGuire and Marshall do not occur" (NCDNRCD 1985). Thus, the 316(a) submittal was successful and suggested that the limits in the NPDES permit were sufficient to protect the aquatic environment of Lake Norman.

Studies performed for the 316(a) submittal were initiated in 1973 and continued through submission of the document. Physical and mathematical models were developed to determine Lake Norman hydrodynamics and thermal plume characteristics in relation to station operation (Duke Power Company 1985). Both models were validated with surface-temperature data and were found to predict surface thermal plume size with a high degree of confidence. Both predicted that operation of McGuire would not result in discharge temperatures outside those allowed in the NPDES permit. Fish species collected during preoperational and operational studies indicated no substantial change in species composition over time (Duke Power Company 1985). The most significant changes were increases in specific fish taxa abundance in winter at the McGuire discharge, associated with fish congregating in the discharge plume due to increased water temperature.

McGuire currently operates under thermal limits established in its NPDES permit issued February 1, 1990. Annual aquatic monitoring to assess impacts of current thermal limits on the aquatic biota of Lake Norman is required. Results of the monitoring studies conducted in support of this requirement are reported annually to the NCDENR (formally NCDNRCD).

Monitoring of fish populations in and around the McGuire mixing zone is coordinated with the North Carolina Wildlife Resource Commission (NCWRC). The latest report covers data collected in 1999 (Duke 2000). Observed striped bass mortalities during the summer of 1999 included one mortality within the mixing zone and five mortalities in the main channel outside the mixing zone which may or may not have been related to heat shock. Shoreline electrofishing catches at the McGuire mixing zone area were only slightly lower than a reference area in total biomass and taxa composition. Hydroacoustic and purse seine sampling were also conducted in 1999, in cooperation with the NCWRC, to evaluate Lake Norman forage fish populations. According to the applicant, "fisheries data to date indicate that the Lake Norman fishery is consistent with the trophic status and productivity of the reservoir" (Duke 2000).

Based on its review of available information, the staff concludes that the potential heat shock impacts resulting from operation of the plant's cooling water discharge system to the aquatic environment on or in the vicinity of the site are SMALL, and additional mitigation is not warranted.

4.1.4 Microbiological Organisms (Public Health)

McGuire has a once-through cooling system that uses the Catawba River as the cooling source. The Catawba River, which was impounded to form Lake Norman, has an annual average flow rate of 2.38×10^{9} cubic meters per year (8.42×10^{10} cubic feet per year). This flow rate is lower than the 9×10^{10} cubic meters per year (3.15×10^{12} cubic feet per year) specified in 10 CFR 51.53 (c)(3)(ii)(G), which requires an evaluation of potentially harmful thermophylic (heat-loving) microorganisms on human health. The flow rate raises a concern from the standpoint of the potential for enhancement of thermophylic microorganisms such as *Naegleria fowleri*. This type of organism could be a potential health concern for members of the public swimming in the cooling source and can under certain conditions cause a fatal condition called primary ameobic meningoencephalitis (PAME).

Lake Norman is a popular site for a variety of water-based recreational activities, including boating, fishing, water skiing, and swimming. All of these activities are dispersed throughout the lake, rather than being concentrated in certain areas. Swimming occurs from private boat docks and piers located around the lake shoreline and from boats anchored offshore.

McGuire uses Lake Norman as a source for condenser cooling water. The heated effluent from the condenser discharge enters Lake Norman through a discharge canal that is 1 km (0.6 mi) long and has an average depth of 12.2 m (40 ft). The heated effluent mixes initially in the canal with surface waters of the main lake before stabilizing vertically and spreading over the lake surface, ultimately dissipating its heat to the atmosphere.

No swimming or boating is allowed in the canal, although fishing is permitted from its banks. Boating, fishing, and water contact activities take place at the confluence of the canal and the lake. The closest privately owned dock is located outside the 760-m (2500-ft) exclusion zone and is approximately 150 m (495 ft) from the confluence of the canal and the lake.

The state agency responsible for public health is the North Carolina Department of Health and Human Services (NCDHHS), Division of Public Health. Duke consulted with this agency to determine if there is a concern about the potential existence and concentration of *N. fowleri* in the receiving waters for the plant cooling discharge waters. By letter dated June 12, 2000, the Division of Public Health summarized the agency's position and opinion regarding the risk to individuals using Lake Norman for recreational activities. The Division of Public Health concluded that only a small percentage of cases of PAME have been associated with thermally enhanced waters and the disease is exceedingly rare given the millions of swimming events in warm fresh water bodies in the United States. Therefore, the NCDHHS feels the risk to individuals utilizing Lake Norman for recreational activities is extremely low (Duke 2001a).

There has been no known impact of operation of McGuire on public health related to thermophylic microorganisms. These data indicate that the impact of deleterious microbiological organisms during continued operation of the plant during the renewal term is low.

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

4.2 Transmission Lines

The McGuire ER (Duke 2001a) describes four transmission lines with a total length of 4.5 km (2.8 mi) that connect the McGuire plant to two substations within the local transmission system. These lines are situated on 2.2 km (1.4 mi) of corridor on approximately 22.8 ha (56.2 ac). Transmission corridor rights-of-way are generally maintained on a 3-year cycle. Mechanical mowing and selective herbicide application are the standard methods of corridor maintenance. Duke cooperates with the U.S. Fish and Wildlife Service (FWS) and North Carolina Natural Heritage Program to identify Federally-and State-listed species, special habitats, new findings, and other pertinent factors. This information is used to establish new and review existing vegetation management programs for the rights-of-way so that adverse impacts to these may be avoided during corridor maintenance. As noted in Section 2.1.7, the NRC staff conducted a separate evaluation of the rights-of-way from the McGuire station to the Oconee Nuclear Station, in South Carolina, under the Supplemental Generic Environmental Impact Statement for Oconee Nuclear Station (NRC 1999a).

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to the McGuire transmission lines are listed in Table 4-3. Duke stated in its ER that "no new information existed for the issues that would invalidate the GEIS conclusions" (Duke 2001a). The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), 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 plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-3. Category 1 Issues Applicable to the McGuire Nuclear Station 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, and livestock)	4.5.6.3
Floodplains and wetlands on power line right-of-way	4.5.7
Air Quality	
Air quality effects of transmission lines	4.5.2
Land Use	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

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

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

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

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, discussions with the FWS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of power line right-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 (of bird collisions with power lines) are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the McGuire ER, the staff's site visit, the scoping process, discussions with the FWS, or its evaluation of other available 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 McGuire 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 electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Floodplains 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 McGuire ER, the staff's site visit, the scoping process, discussions with the FWS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on floodplains 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 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 McGuire ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

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

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

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

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

  > Ongoing use of power line right of ways 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 McGuire 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 use of power line rights-of-way during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-4 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 McGuire 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 *National Electrical Safety Code* (NESC) criteria, (Institute of Electrical and Electronic Engineers [IEEE] 1997) it was not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is

necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed specifically to connect the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

Two 230-kV transmission lines and two 525-kV transmission lines connect McGuire Nuclear Station to the transmission system. The 230-kV lines connect McGuire Unit 1 to a 230-kV switchyard and have a length of approximately 1200 m (4000 ft). Similarly, the 525-kV lines connect Unit 2 to a 525-kV switchyard and have a length of approximately 1000 m (3300 ft). The two switchyards are adjacent to each other.

The transmission lines were constructed to meet the 1973 NESC requirements. Duke (2001a) has compared the clearances calculated using the 1973 NESC with clearance requirements of the 1997 NESC and found the 1973 NESC clearance requirements to be greater. Duke further states that measured clearances from the sagged plan and profile of each bus line indicate that the designed clearances of the transmission lines exceed the 1997 NESC vertical clearance requirements and that there have been no changes in the design voltages of the lines. Therefore, the staff 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 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 McGuire in regard to radiological impacts are listed in Table 4-5. Duke stated in its ER (Duke 2001a) that "no new information existed for the issues that would invalidate the GEIS conclusion." The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), 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, 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 4-5. 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 McGuire 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 McGuire 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 its ER (Duke 2001a) that "no new information existed for the issues that would invalidate the GEIS conclusions." The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), 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 all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff'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 McGuire 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.

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

- 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 McGuire 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 McGuire 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 McGuire 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, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS.

Table 4-7. Environmental Justice Analysis 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 ER and the staff's SEIS.

4.4.1 Housing Impacts During Operations

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. 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). Increases in rental rates or housing values in these areas would be expected to equal or slightly exceed the statewide inflation rate. No extraordinary construction or conversion of housing would occur where small impacts are foreseen.

The impacts on housing are considered to be of MODERATE significance when there is a discernible but short-lived reduction in available housing units because of project-induced in-migration. The impacts on housing are considered to be of LARGE significance when project-related demand for housing units would result in very limited housing availability and would increase rental rates and housing values well above normal inflationary increases in the

state. MODERATE and LARGE impacts are possible at sites located in rural and remote areas, at sites located in areas that have experienced extremely slow population growth (and thus slow or no growth in housing), or where growth control measures that limit housing development are in existence or have been recently lifted. Because impact significance depends on local conditions, housing is a Category 2 issue (NRC 1996).

The NRC has developed a method of characterizing population that is based on two factors: "sparseness" and "proximity" (NRC 1996). "Sparseness" measures population density and city size within 32-km (20-mi) of the site. “Proximity” measures population density and city size within 80 km (50 mi). In these calculations, the density is averaged over the land area covered by the ring; large water bodies are excluded. Each factor has categories of density and city size and a matrix is used to rank the population category as low, medium, or high.

An analysis of the 2000 census data indicates that 781,783 people live within a 32-km (20-mi) radius of McGuire with an average population density of 240 persons/km^2 (622 persons/mi^2). There are also four communities of 25,000 or more in this area (Table 4-8). This population density and number of cities correspond to “sparseness” Category 4, “least sparse.” An analysis of the 2000 census data also indicates that 2,309,976 people live within 80 km (50 mi) of McGuire, with an average population density of 114 persons/km^2 (294 persons/mi^2). There is one city, Charlotte, with a population of 100,000 or more in this area. This population density and number of cities correspond to “proximity” Category 4 "in close proximity.” According to the GEIS, these “sparseness” and “proximity” sources indicate that McGuire is located in a high-population area.

Table 4-8. Analysis of Population “Sparseness” and “Proximity” in the Vicinity of McGuire

Radial Distance from McGuire	2000 Census Population	Population Density persons/km^2 (persons/mi^2)	Communities of 25,000 or More Persons	Cities of 100,000 or More Persons
32 km (20 mi)	781,783	240 (622)	3	1
80 km (50 mi)	2,309,976	114 (294)	6	1

McGuire is located in northwestern Mecklenburg County, approximately 27 km (17 mi) north-northwest of Charlotte, North Carolina, within the rapidly developing Charlotte metropolitan area. There are no prohibitions on the development of residential housing within Iredell, Mecklenburg, Gaston, or Lincoln counties. In the McGuire ER, Duke made the case for considering no further employment increases for its operating Units 1 and 2 rather than the standard GEIS assumption of 60 new employees per unit (Duke 2001a). Adding full-time employees to the plant workforce for the license renewal operating term would have the potential indirect effect of creating additional jobs and related population growth in the

community. Section 4.14.2 of Supplement 1 to Regulatory Guide 4.2 (NRC 2000) states: "If additional workers are not anticipated there will be no impact on housing and no further analysis is required." McGuire has approximately 1345 full-time workers employed by Duke or site contractors during normal plant operations. Duke does not anticipate that additional full-time workers will be employed during the license renewal period. Therefore, no analysis is required for this issue.

Duke has concluded that the impact on housing from the continued operation of McGuire will be SMALL and that no mitigation is required. This conclusion is based on the following:

(1) Duke does not anticipate an increase in employment during the license renewal period.

(2) The number of McGuire employees will continue to be a small percentage of the population in the adjacent counties during the period of the extended license.

The staff reviewed the available information relative to housing impacts and Duke's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period will continue to 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 add capital facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs during periods of peak demand. Impacts are considered LARGE if existing levels of service (e.g., water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. In the GEIS, the staff concluded 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).

There are no identified increases in demand of the water supplied by the Charlotte-Mecklenburg Utilities District (CMUD) during the period of extended operation at McGuire. The current water use at McGuire, from water supplied by CMUD, is 0.03 percent of the average daily demand on the CMUD system. Duke does not anticipate that additional workers will be employed during the period of extended operations. Therefore, there will be no impact to public utilities from additional plant workers.

The staff reviewed the available information relative to impacts on public utility services and Duke's conclusions. Based on this review, the staff concludes that the impact on public utilities during the license renewal period would be SMALL, and additional 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 of 10 CFR Part 51 Subpart A, Appendix B notes that "significant changes in land use may be associated with population and tax revenue changes resulting from license renewal."

The GEIS (NRC 1996) defines the magnitude of land-use changes as a result of plant operation during the license renewal term as follows:

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

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

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

Based on predictions for the case study plants, the staff projected that all new population-driven land-use changes during the license renewal term at all nuclear plants will be small because population growth caused by license renewal will represent a much smaller percentage of the local area's total population than has operations-related growth. Also, any conflicts between offsite land use and nuclear plant operations are expected to be small (NRC 1996).

Duke concluded (Duke 2001a) that there will be no adverse impact to the offsite land use from plant related population growth because they do not anticipate that additional workers will be employed at McGuire during the period of extended operations.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. In the GEIS, the staff states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development (NRC 1996).

In general, if a plant's tax payments are projected to be small relative to the community's total revenue, new tax-driven land-use changes during the plant's license renewal term 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 charges would be MODERATE. If the plant’s tax payments are projected to be a dominant source of the community’s total revenue, new tax-driven land-use changes would be LARGE.

In the GEIS, the staff states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdictions revenue, the significance level would be SMALL, MODERATE if the plant tax payments represent 10 to 20 percent, and LARGE if the payments are over 20 percent of the jurisdiction's revenues.

The payments made by McGuire represented 7 percent of the property tax revenues and 4 percent of the total revenues collected by the town of Huntersville; the percentages are 2 percent and 1 percent for Mecklenburg County (Table 2.11). No major refurbishment activities are anticipated during the period of license renewal at McGuire. The relative importance of tax payments to Mecklenburg County would slowly decline as other development occurs.

The impacts from tax driven offsite land-use changes will be SMALL for the following reasons:

(1) The significance of tax payments made by Duke for McGuire to local governments will continue to be SMALL.

(2) The area around McGuire has pre-established land patterns of development, such as land use plans and controls. McGuire is located within the town of Huntersville's planning zone.

(3) The area around McGuire has public services in place to support and guide development. Therefore, the impact to tax-driven land-use changes from the continued payment of property taxes at McGuire is SMALL and no mitigation is required.

The staff reviewed the available information relative to land use impacts and Duke's conclusions. Based on this review, the staff concludes that the impact on land use during the license renewal period would 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 SEIS.

Approximately 1345 full-time workers are employed by Duke or site contractors at McGuire during normal plant operations (non-outage periods). These workers reside primarily in Mecklenburg County and in adjoining counties. An average of 1015 additional workers are onsite during plant outage periods. The plant outages last from 30 to 40 days and occur about every 18 to 24 months. There are no identified increases in the total number of employees that will be onsite during the term of the renewed license. As shown in Table 2-3, the workers

employed at McGuire reside in locations that are well distributed geographically. Therefore, with the exception of travel along North Carolina Highway 73 (NC-73), the workers would travel to the plant along many different routes.

The North Carolina Department of Transportation classifies some of the segments of NC-73 in the vicinity of McGuire as having Level of Service (LOS) D. This is a regional growth and transportation planning issue. However, Duke has taken the following steps to minimize the impacts to local traffic:

(1) The starting times for workers at the station has been staggered to minimize the impact of plant workers entering and leaving the site.

(2) Turn lanes have been added on NC-73 for plant traffic. Traveling east to west on NC-73, there are right turn lanes into the plant site at both entrances. Traveling west to east on NC-73, there is a left turn lane at the east plant entrance.

There are no identified increases in the total number of employees that will be onsite during the term of the renewed license. Increases in traffic capacity will be required to accommodate the projected growth in the population in the areas adjacent to McGuire. The growth in population in the area near McGuire will not be attributed to increases in employment at McGuire. Therefore, the impact of continued operation of McGuire on any future degradation in traffic service will be SMALL, and no mitigation measures are warranted.

The staff reviewed Duke's assumptions and resulting conclusions. The staff concludes that any impact of McGuire 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) requires that Federal agencies take into account the effects of their undertakings on historic properties. The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation at 36 CFR Part 800 as amended. Renewal of an operating license (OL) is an undertaking that could potentially affect historic properties. Therefore, according to the NHPA, the NRC is to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, 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 January 26, 2000, Duke wrote to the North Carolina SHPO, requesting its comment on the McGuire license renewal process and on the determination by Duke that the continued operation of McGuire will have no effect on historic properties (Huff 2000). In a response dated January 31, 2000, the North Carolina SHPO stated that the extension of the operating license was not an undertaking that is likely to affect historic properties; thus, no further compliance with Section 106 was required (Brook 2000).

Due to disturbance by historic agriculture and the original construction of McGuire, it is unlikely that significant historic resources are present on the McGuire site. Major refurbishment of McGuire is not required during the license renewal period, and it is anticipated that there will be no need to utilize the few currently undeveloped portions of the McGuire site for operations during the renewal period. Continued operation of McGuire would have a beneficial effect on any potential unknown or undiscovered historic or archaeological resources in undisturbed areas for the duration of the license renewal period by protecting the natural landscape and vegetation and by providing restricted access to the plant.

However, care should be taken by the licensee while undertaking normal operational and maintenance activities to ensure that historic properties are not inadvertently impacted. These activities may include not only operation of the plant itself, but also land management-related actions such as recreation, wildlife habitat enhancement, or maintaining/upgrading plant access roads through the plant site.

Based on the staff's cultural resources analysis and consultation, the staff concludes that the potential impacts on historic and archaeological resources are SMALL, and no additional mitigation is warranted.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its actions 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 the Executive Order is not mandatory for independent agencies,

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

the NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-203, "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" (NRC 2001).

The environmental justice review involves identifying offsite environmental impacts, their geographic locations, minority and low-income populations that may be affected, the significance of such effects, and whether they are disproportionately high and adverse compared to the population at large within the geographic area, and if so, what mitigative measures are available and which will be implemented.

For the purpose of the staff's review, a minority population is defined to exist if the percentage of each minority, or aggregated minority category within the census block groups[(a)] potentially affected by the license renewal of the McGuire OLs, exceeds the corresponding percentage of minorities in a comparison area (by convention, the state) 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 exceeds the corresponding percentage of low-income population in the comparison area (again by convention, the state) 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 McGuire, the percentage of minority and low-income populations is comparable to the percentage of minority and low-income populations in North and South Carolina, as applicable.

Within a 80 km (50-mi) radius of McGuire, 24.5 percent of the population are minorities. Also within that 80 km (50-mi) radius, 284 block groups with minority populations meet the definition outlined in the NRC review guidance (NRC 2001). This represents 11.5 percent of the total number of block groups within the 80-km (50-mi) radius. These populations are shown in Figure 4-1. The majority of these block groups are located in urban areas associated with Charlotte, Gastonia, Statesville, and Salisbury, North Carolina, and Rock Hill, South Carolina. There are no known environmental pathways by which these minority populations would be disproportionately and adversely affected by the renewal of the McGuire license.

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

Low-income households comprise 11 percent of all households located within a 80-km (50-mi) radius of McGuire. Within the 80-km (50-mi) radius, there are 88 low-income block groups. This represents 5.5 percent of the total number of block groups within the 80-km (50-mi) radius. These populations are shown in Figure 4-2.[(a)] The majority of these block groups are located in the urban areas of Charlotte and Gastonia, North Carolina, and Gaffney, South Carolina. There are no known environmental pathways by which these low-income populations would be disproporionately and adversely affected by the renewal of the McGuire license.

As part of its environmental assessment of this proposed action, Duke has determined that no significant offsite environmental impacts will be created by the renewal of the McGuire OLs. This conclusion is supported by the review performed of the Category 2 issues defined in Section 51.53(c)(3)(ii) presented in the McGuire ER (Duke 2001a). As the NRC review guidance recognizes, if no significant offsite impacts occur in connection with the proposed action, then no member of the public will be substantially affected. Therefore, there can be no disproportionately high and/or adverse impacts or effects on any member of the public, including minority and low-income populations, resulting from the renewal of the McGuire licenses.

The staff found no unusual resource dependencies or practices, such as subsistence agriculure, hunting, or fishing, through which minority or low-income populations could be disproporionately adversely impacted. In addition, the staff did not identify any location-dependent disproportionately adverse impacts affecting these minority and low-income populaions. The staff concludes that offsite impacts from McGuire to minority and low-income populations would be SMALL, and no additional mitigation actions are warranted.

4.5 Groundwater Use and Quality

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to McGuire groundwater use and quality are listed in Table 4-9. Duke stated in its ER that “no new information existed for the issues that would invalidate the GEIS conclusions” (Duke 2001a). The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001a), 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.

(a) Figure 4-2 was prepared using 1990 income data because the 2000 census income data were not yet available.

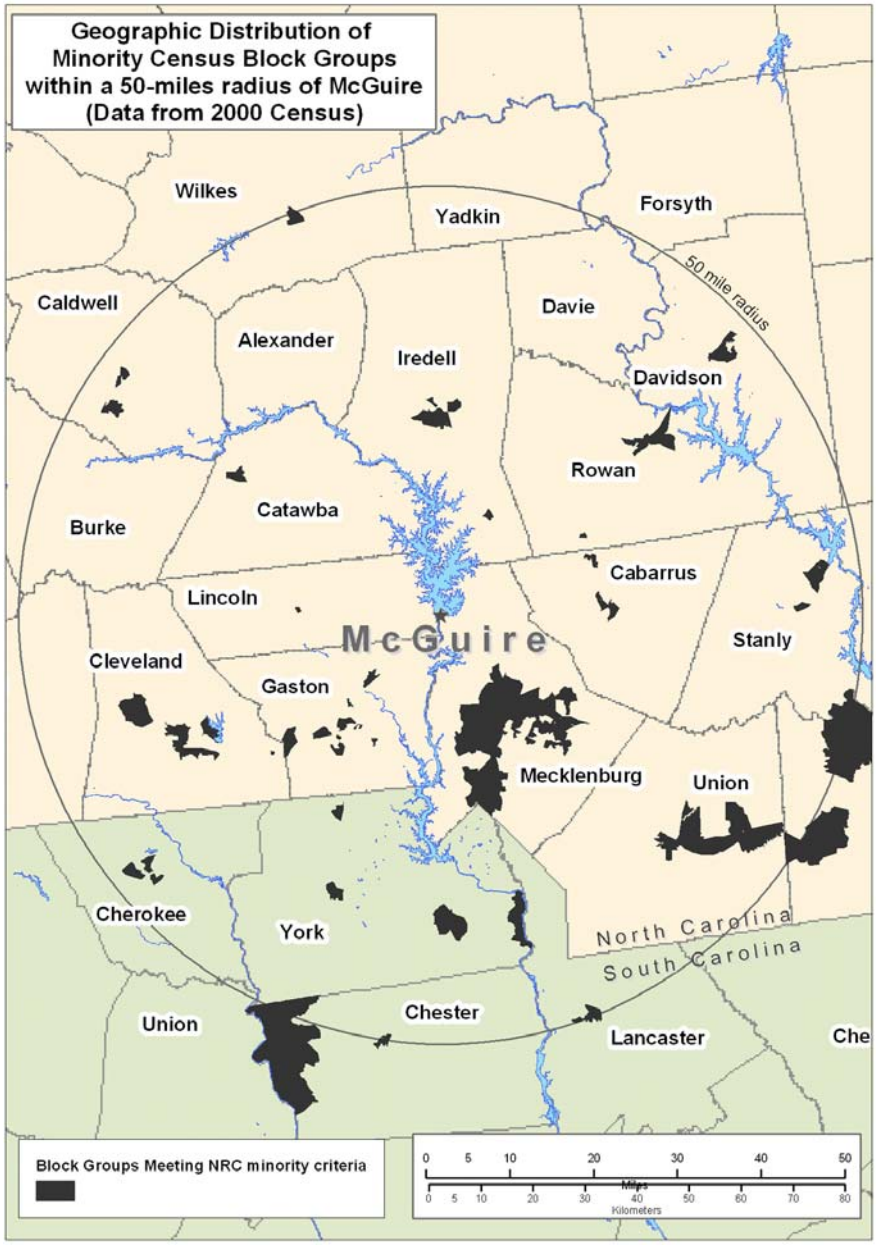

Figure 4-1. Census 2000 Block Groups Identified as Meeting NRC Criteria for Minority Status in an 80-km (50-mi) Area Around McGuire

Figure 4-2. Census 1990 Block Groups Identified as Meeting NRC Criteria for Low-Income Status in an 80-km (50-mi) Area Around McGuire

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

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

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

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

4.6 Threatened or Endangered Species

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

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of the nuclear plant during the license renewal term. NRC Staff initiated informal consultation with the FWS by letter requesting information on species protected under the Endangered Species Act that occur in the vicinity of the McGuire site. The FWS responded by letter (Cole 2001) indicating no known occurrences on the McGuire site. The presence of threatened or endangered species in the vicinity of the McGuire site is discussed in Sections 2.2.5 and 2.2.6.

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

4.6.1 Aquatic Species

As described in Section 2.2.5, the only Federally or State-listed threatened or endangered aquatic species with potential to inhabit waters near McGuire, the Carolina heelsplitter (*Lasmigona decorata*), is not present in the vicinity of the plant (Fridell 2001) and does not occur in impounded water. Thus, continued operation of the plant should not result in impacts to threatened or endangered aquatic species.

Based on these considerations, the staff has determined that the continued operation of McGuire and the continued maintenance of the transmission lines will not impact listed aquatic species.

4.6.2 Terrestrial Species

A field survey for species of concern was conducted within the McGuire exclusion area and on the related transmission line rights-of-way in summer and fall 2000. During this survey, no Federally listed threatened or endangered species were located (Gaddy 2001). In a letter dated November 1, 2001, the FWS (Cole 2001) concurred with the findings of the survey report (Gaddy 2001).

However, the bald eagle is known to infrequently visit the shore of Lake Norman. Based on a review of the applicant's report and the staff's independent analysis, the NRC staff concluded that continued operation of the McGuire site under license renewal will not adversely impact the bald eagle.

Schweinitz's sunflower (*Helianthus schweinitzii*) (Federal endangered) occurs in relatively open habitats, such as road and power line rights-of-way, early successional fields, forest ecotonal margins, and forest clearings. Georgia aster (*Aster georgianus*) (Federal threatened) occurs in dry open woods along roadsides, woodland borders, old fields, and pastures (Cole 2001). Neither of these species is currently known to occur on the McGuire site nor is expected to colonize this area due to lack of appropriate soils (Gaddy 2001).

Based on a review of the applicant's report and the staff's independent analysis, the NRC staff concluded that continued operation of the McGuire site and related transmission corridors under license renewal will not adversely impact Schweinitz's sunflower and Georgia aster.

It is the staff's determination that the impact to threatened or endangered species of an additional 20 years of operation on aquatic and terrestrial listed species would be SMALL, and additional mitigation is not required.

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 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 Chapter 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 McGuire operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that "plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation."

Plant-specific environmental evaluations were conducted for 11 Category 2 issues applicable to McGuire operation during the renewal term and for environmental justice. For all 11 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of McGuire would be of SMALL significance in the context of the standards set forth in the GEIS and that mitigation would not be warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse effects from electromagnetic fields. Therefore, the staff did not conduct an evaluation of this issue.

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 Preservation."

Brook, D. 2000. Letter from Deputy State Historic Preservation Officer (signed by Renee Gledhill-Early), North Carolina Department of Cultural Resources, to J. R. Huff, Duke Power. (January 31, 2000).

Cole, B. 2001. Letter from U.S. Fish and Wildlife Service State Supervisor, Asheville Field Office, Asheville, North Carolina to Cynthina A. Carpenter, Chief, Risk Informed Initiatives, Environmental Decommissioning and Rulemaking Branch, Division of Nuclear Regulatory Improvement Programs, Office of Nuclear Reactor Regulation, Nuclear Regulatory Commission. Subject: "McGuire Nuclear Station, Units 1 and 2, License Renewal Project, Mecklenburg County, North Carolina (Docket Nos. 50-369 and 50-370)." November 1, 2001.

Council on Environmental Quality (CEQ). 1997. Environmental Justice Guidance Under the National Environmental Policy Act. Executive Office of the President, Washington, D.C. <http://ceq.eh.doe.gov/nepa/regs/ej/justice.pdf> (accessed February 9, 2002).

Duke Energy Corporation (Duke). 2001a. *Applicant's Environmental Report - Operating License Renewal Stage - McGuire Nuclear Station*. Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2001b. *McGuire Impingement Study - Preliminary Results* (Draft). Charlotte, North Carolina.

Duke Energy Corporation (Duke). 2000. *Lake Norman: 1999 Summary, Maintenance Monitoring Program, McGuire Nuclear Station*. NPDES No. NC0024392. Charlotte, North Carolina.

Duke Power Company. 1978. *McGuire Nuclear Station, 316(b) Predictive Study of Impingement and Entrainment*. Charlotte, North Carolina.

Duke Power Company. 1985. *McGuire Nuclear Station, 316(a) Demonstration*. Charlotte, North Carolina.

Fridell, J. A. 2001. *Carolina heelsplitter in North Carolina.* U.S. Fish and Wildlife Service, Asheville, North Carolina. <http://nc-es.fws.gov/mussel/carolheel.html> (accessed 9/12/01).

Gaddy, L. L. 2001. *Biological Assessment for Endangered, Threatened, and Noteworthy Species, Wetlands, and Significant Natural Areas in Association with McGuire Nuclear Station and Related Power Transmission Lines.* Prepared for Duke Power Company, Charlotte, North Carolina, March 2001. (Attachment D to the Duke ER, Duke 2001a)

Huff, J. R. 2000. Letter from Scientist - Duke Power, to Ms. Renee Gledhill-Early, State Historic Preservation Office, Virginia Department of Historic Resources. (January 26, 2000).

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

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

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

National Institute of Environmental Health Sciences (NIEHS). 1999. *NIEHS Report on Health Effects from Exposure to Power Line Frequency and Electric and Magnetic Fields*. Publication No. 99-4493, Research Triangle Park, North Carolina.

North Carolina Department of Natural Resources and Community Development (NCDNRCD). 1984. Letter from W. L. Fleming, NCDNRCD, Water Quality Section, to W. A. Haller, Duke Power Company dated February 1, 1984.

North Carolina Department of Natural Resources and Community Development (NCDNRCD). 1985. Letter from R. P. Wilms, NCDNRCD, Department of Environmental Management, to H. B. Tucker, Duke Power Company, dated October 18, 1985.

Strawn, K. 1963. "Resistance of threadfin shad to low temperatures". *Proceedings of the Annual Conference of Southeast Association of Game and Fish Commissioners*, 17:290-293.

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). 1999a. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 2, Oconee Nuclear Station. NUREG-1437, Supp. 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *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. "Preparation of Supplemental Environmental Reports for Application to Renew Nuclear Power Plant Operating Licenses." Supplement 1 to Regulatory Guide 4.2. Washington D.C.

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

U.S. Nuclear Regulatory Commission (NRC). 2002. "Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses." Supplement 1 to Regulatory Guide 4.2. Washington, D.C.

5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999a).[(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.

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 in the following sections.

(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.

Design-Basis Accidents

To receive NRC approval to operate a nuclear power facility, an applicant for an initial operating license 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 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 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 licensing 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). A licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant including any extended-life operation. The consequences for these events are evaluated for the hypothetical 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. This issue, applicable to McGuire Nuclear Station, Units 1 and 2 (McGuire), is listed in Table 5-1. The early resolution of the DBAs makes them a part of the current licensing basis of the plant; the current

licensing basis of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal.

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.

In its Environmental Report (ER), Duke Energy Corporation (Duke) stated 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 McGuire 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 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 considered specifically for the McGuire site in the GEIS (NRC 1996). However, in the GEIS, the staff did evaluate existing impact assessments performed by the NRC and by the industry at 44 nuclear plants in the United States and concluded that the risk from beyond-design-basis earthquakes at existing nuclear power plants is SMALL. Additionally, 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. This issue, applicable to McGuire, 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 McGuire 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 severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for McGuire. The results of its review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives (SAMAs)

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 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 McGuire; therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

Duke submitted an assessment of SAMAs for McGuire as part of the ER (Duke 2001). The assessment was based on Revision 2 of the McGuire Probabilistic Risk Assessment (McGuire PRA, Revision 2) (Duke 1998), 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 1991), and the external events analysis is based on the Individual Plant Examination for External Events (IPEEE) model (Duke Power 1994). In identifying and evaluating potential SAMAs, Duke took into consideration the insights from the McGuire PRA, as well as other studies, such as the Watts Bar Severe Accident Mitigation Design Alternatives (SAMDA) Analysis (NRC 1995a) and NUREG-1560 (NRC 1997c). Duke concluded that none of the candidate SAMAs evaluated were cost effective for McGuire.

Based on a review of the initial 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. By a letter dated January 31, 2002, Duke submitted additional information (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 clarification in a conference call 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 one SAMA is cost-beneficial under the assumptions presented. This SAMA, which 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, has not been implemented at McGuire. 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 staff's assessment of SAMAs for McGuire is presented below.

5.2.2 Estimate of Risk for McGuire Units 1 and 2

Duke's estimates of offsite risk at McGuire 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 McGuire PRA model, which forms the basis for the SAMA analysis, is a Level 3 risk analysis; i.e., it includes the treatment of core damage frequency, containment performance, and offsite consequences. The model, which Duke refers to as PRA, Revision 2 (Duke 1998), consists of an internal events analysis based on an updated version of the original IPE (McGuire PRA, Revision 1) (Duke Power 1991) and an external events analysis based on the current version of the IPEEE (Duke Power 1994). The calculated total core damage frequency (CDF) for internal and external events in Revision 2 of the McGuire PRA is 4.9×10^{-5} per year.

The McGuire 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 since 1991. The CDF for internal and external events was reduced from 7.4×10^{-5} per year (Revision 1) to 4.9×10^{-5} per year (Revision 2). The Level 1 PRA changes associated with the McGuire PRA Revision 2 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 data changes are those related to diesel generator (DG) performance. Following the IPE, Duke proceeded with a program to improve the DG reliability at McGuire. The reliability improvement that occurred significantly reduced the CDF contributed by the loss of offsite power (LOOP) and tornado initiators. To a lesser extent, the seismic results are also impacted by the DG reliability data. The net effect is that the total CDF for SBO sequences (internal and external events) was reduced from approximately 4.1×10^{-5} per year in the IPE and IPEEE to 2.3×10^{-5} per year in PRA Revision 2. Another important change occurred in the interfacing system loss-of-coolant accident (ISLOCA) evaluation. The generic database adopted for the Revision 2 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 2 to the PRA is provided in Table 5-3. Internal event initiators represent about 57 percent of the total CDF and are composed of transients (31 percent of total CDF), loss-of-coolant accidents (LOCAs) (22 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 43 percent of the total CDF and are composed of seismic initiators (22 percent of total CDF), tornado initiators (13 percent of total CDF), and fire initiators (6 percent of the total CDF). Although not explicitly reported in Table 5-3, SBO events account for 47 percent of the total CDF for internal and external events in Revision 2 of the PRA.

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

Initiating Event	Frequency (per year)	% of Total CDF
Transients	1.5×10^{-5}	31
Loss-of-coolant accident (LOCA)	1.1×10^{-5}	22
Internal flood	8.7×10^{-7}	2
Anticipated transient without scram (ATWS)	1.5×10^{-7}	<1
Steam generator tube rupture (SGTR)	7.8×10^{-10}	<1
Reactor pressure vessel rupture (RPV)	1.0×10^{-6}	2
Interfacing system LOCA (ISLOCA)	2.2×10^{-7}	<1
CDF from internal events	**2.8×10^{-5}**	**57**
Seismic	1.1×10^{-5}	22
Tornado	6.5×10^{-6}	13
Fire	2.9×10^{-6}	6
CDF from external events	**2.1×10^{-5}**	**43**
Total CDF	**4.9×10^{-5}**	**100**

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

- modifications to reflect an emergency operating procedure change that reduced the likelihood of restarting a reactor coolant pump following core damage, thus reducing the potential for thermally induced steam generator tube rupture

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

- modification of the CET logic and quantification to reflect that the refueling water storage tank inventory would drain through a failed reactor vessel in some sequences (e.g., SBO).

These changes resulted in a large decrease in the potential for thermally-induced steam generator tube ruptures, 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 McGuire site from all initiators (internal and external) to be about 0.135 person-sieverts (Sv) (13.5 person-rem) per year (Duke 2001). The breakdown of the total population dose by containment end-state is summarized in Table 5-4. Internal events account for approximately 0.060 person-Sv (6.0 person-rem) per year, and external events account for approximately 0.075 person-Sv (7.5 person-rem) per year. As can be seen from this table, early and late containment failures account for the majority of the population dose.

Table 5-4. Breakdown of Population Dose by Containment End-State (Total dose = 0.135 person-Sv [13.5 person-rem] per year)

Containment End State	% of Total Dose Internal Initiators	% of Total Dose External Initiators	% of Total Dose All Initiators
SGTR[(a)]	<0.1	<0.1	<0.1
ISLOCA[(a)]	19.4	0.0	19.4
Containment isolation failure	0.1	0.3	0.4
Early containment failure	8.5	32.1	40.6
Late containment failure	15.9	23.3	39.2
Basemat melt-through	<0.1	<0.1	<0.1
No containment failure	0.3	0.1	0.4
Total	**44.2**	**55.8**	**100**

(a) Containment bypass events

5.2.2.2 Review of Duke's Risk Estimates

Duke's estimate of offsite risk at McGuire is based on the Revision 2 of the McGuire PRA and a separate MACCS2 analysis. For the purposes of this review, the staff considered the following major elements:

- the Level 1 and 2 risk models that form the bases for the November 1991 IPE submittal (Duke 1991)
- the major modifications to the IPE models that have been incorporated in Revision 2 of the PRA (Duke 1998)
- the external events models that form the basis for the June 1994 IPEEE submittal (Duke 1994)
- the analyses performed to translate fission product release frequencies from the Level 2 PRA model into offsite consequence measures (Duke 2001).

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 McGuire IPE is described in a staff report dated June 30, 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 McGuire for severe accident vulnerabilities and not specifically on the detailed findings or quantification estimates. Overall, the staff concluded that the McGuire 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 McGuire IPEEE is described in an evaluation report dated February 16, 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.

In a RAI (NRC 2001), the staff questioned why the CDF for steam generator tube rupture events in Revision 2 to the PRA is so low relative to other pressurized-water reactor (PWR) PRAs. In response (Duke 2002a), Duke stated that

> The McGuire SGTR model incorporated in both the IPE and in the 1997 update relied upon success criteria established during the IPE development. Where applicable, the system success criteria were established with the then current version of the MAAP [Modular Accident Analysis Program] code. Furthermore, a sequence was categorized as a success because core damage occurred beyond 24 hours, even though a safe stable state had not been attained, this is inconsistent with what is now the generally accepted industry practice. As a result of comments received during the McGuire peer review process, these success criteria were revisited. The new MAAP results showed core damage to occur where the original analysis did not. The outdated success criteria are judged to be the most significant contributors to the comparatively low SGTR initiated CDF previously reported. The SGTR analysis is being completely revisited in Revision 3 to the McGuire PRA, which is still in development. This new analysis estimates the CDF for SGTR at 5.3×10^{-7} per year, which is more in line with similar plants.

In a February 7, 2002, telephone conference with Duke, the staff questioned the impact that other Revision 3 PRA results might have on the conclusions drawn in the McGuire ER, because the change for the SGTR event was not trivial. In response (Duke 2002b), Duke provided the CDF values from Revision 3 of the McGuire Level 1 PRA, broken out by the major contributors. Peer review of the Level 2 and 3 portions of the PRA Revision 3 had not yet been completed. Thus, revised Level 2 and 3 information was not provided. A comparison of the CDF results from the various versions of the McGuire PRA is provided in Table 5-5. Duke's SAMA assessment was based on PRA Revision 2 since the Revision 3 results available at the time of the analysis (and reported in the draft SEIS) were preliminary. Results from the final approved version of Revision 3, completed subsequent to the draft SEIS, were provided by Duke by letter dated August 2, 2002 (Duke 2002b) and are included in Table 5-5. The differences between the final Revision 3 results and the preliminary Revision 3 results reported in the draft SEIS are not significant and do not have any impact on the staff's analysis or conclusions. The staff based its assessment on the CDF and offsite doses derived from PRA Revision 2, but also considered the impact that the use of CDF estimates from Revision 3 of the PRA might have on the risk results. Note that the CDF values for Revision 1 were not broken out for the individual internal event categories in Table 5-5 because Revision 2 was used as the basis of the staff's evaluation.

Based on a comparison of the frequency of major contributors to CDF, the following key differences were noted:

- The SGTR frequency in Revision 3 is more than a factor of 600 larger than in Revision 2 (5.3×10^{-7} per year versus 7.8×10^{-10} per year). This increase is due to the use of revised, more technically-supported success criteria as discussed above.

- The SBO frequency in Revision 3 is more than a factor of two smaller than in Revision 2 (1.0×10^{-5} per year versus 2.3×10^{-5} per year). This reduction is due to credit taken for installing improved reactor coolant pump O-ring seals that would be capable of withstanding higher temperatures and would have a higher likelihood of remaining intact under loss of seal-cooling conditions.

Table 5-5. Comparison of CDF Results by Accident Initiator or Sequence

Accident Initiator/Sequence	**PRA, Rev. 1** (IPE)	**PRA, Rev. 2**	**PRA, Rev. 3**
Internal Floods	--	8.7×10^{-7}	5.4×10^{-6}
Transients	--	1.5×10^{-5}	2.9×10^{-6}
LOCAs	--	1.1×10^{-5}	8.8×10^{-6}
RPV	--	1.0×10^{-6}	1.0×10^{-6}
SGTR	--	7.8×10^{-10}	5.3×10^{-7}
ATWS	--	1.5×10^{-7}	5.3×10^{-7}
ISLOCA	--	2.2×10^{-7}	9.8×10^{-7}
CDF from internal events	**4.0×10^{-5}**	**2.8×10^{-5}**	**2.0×10^{-5}**
	(IPEEE)		
Seismic	1.1×10^{-5}	1.1×10^{-5}	8.9×10^{-6}
Tornado	1.9×10^{-9}	6.5×10^{-6}	1.6×10^{-6}
Fire	2.3×10^{-7}	2.9×10^{-6}	6.3×10^{-6}
CDF from external events	**3.0×10^{-5}**	**2.0×10^{-5}**	**1.7×10^{-5}**
Total CDF	**7×10^{-5}**	**4.8×10^{-5}**	**3.7×10^{-5}**
SBO (internal & external events)[(a)]	4.1×10^{-5}	2.3×10^{-5}	1.0×10^{-5}

(a) the internal and external event frequencies above include contributions from SBO events; the CDF for SBO events is broken out here separately for illustrative purposes.

The impact of the revised SGTR and SBO frequencies on the risk reduction estimates for related SAMAs was considered in the staff's review (see Sections 5.2.4 and 5.2.6.2). The frequency of other CDF contributors was impacted to a much lesser degree, and these changes are not expected to alter results of the SAMA analysis.

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 of Duke's IPE submittal. Duke used the MAAP code to analyze postulated accidents and develop radiological source terms for each of 31 containment release categories used to represent the containment end-states. These source terms were incorporated as input to the MACCS2 analysis. The MACCS2 code is the current standard for assessing consequences of accidents at nuclear power plants. The staff reviewed Duke's source term estimates for the major release categories and found these predictions to be in reasonable agreement with estimates from 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 McGuire reactor core radionuclide inventory, emergency response evacuation modeling based on McGuire evacuation time estimate studies, release category source terms from the McGuire PRA, Revision 2 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 McGuire SAMA analysis, meteorological data was obtained from the meteorological tower located on the McGuire site; the meteorological data used in MACCS2 contained data for one year, January 1 through December 31, 1999.

The McGuire PRA, Revision 2 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 (e.g., 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 were developed from information given in the latest update to the McGuire evacuation time estimate study for the 16-km (10-mi) Emergency Planning Zone (EPZ). The evacuation schemes include additional information such as evacuation distance, average evacuation speed, sheltering, and shielding considerations. In the McGuire 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. Those responses confirmed that Duke used appropriate values for the consequence analysis.

The staff concludes that the methodology used by Duke to estimate the CDF and offsite consequences for McGuire 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. The staff based its assessment of offsite risk on the CDF and offsite doses reported by Duke, but also considered the impact that the use of CDF estimates from Revision 3 of the PRA might have on the risk results.

5.2.3 Potential Plant 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 Plant Improvements

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

- The core damage cut sets from Revision 2 of the McGuire 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 and 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 McGuire (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 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 0.06 percent contribution to the total CDF. Additionally, some cut sets contributing as little as 0.05 percent to the total CDF were considered. Duke reviewed the cut sets to identify potential SAMAs that could reduce CDF. A cutoff value of 3.5×10^{-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 responses to the RAIs (Duke 2002) that the estimated CDF for the 200 cut sets is 4.4×10^{-5} per year, which is about 90 percent of the total CDF.

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 $200,000 per person-Sv ($2000 per person-rem) conversion factor, a discount factor of 7 percent, and an additional 20-year license renewal period. This process was repeated for each of the remaining seismic initiator cutsets above the cutoff frequency. The present worth of averted risk for all of the seismic cutsets combined was estimated to be about $275,000 (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 [0.041 person-Sv (4.1 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 McGuire PRA report, Revision 2, and identified several basic events for further consideration. These included internal event initiators, seismic-related events, equipment failures, and human-error events. Seismic-related events were not evaluated further for the reasons discussed above. Seven potential enhancements to reduce CDF were identified through this process and are presented in Table 5-6.

In the 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 5-7. This effectively reduces the number of containment-related SAMAs to eight.

Duke also considered potential alternatives to reduce containment failure modes of concern for McGuire. 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 and 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 are either (1) already implemented at McGuire or (2) not applicable to the McGuire containment

Table 5-6. SAMA Cost/Benefit Screening Analysis – SAMAs That Reduce CDF

Potential Alternative	Sequences/Failures Addressed	Risk Reduction		Total Benefit	Cost of Enhancement
		CDF[a]	Population Dose[b] (person-rem[c])		
Man standby shutdown facility (SSF) 24 hours/day with trained operator	Loss of service water (RN), failure of operators to align safe shutdown (SS) system for operation, filter (standby makeup pump) restricts flow, failure to align containment ventilation cooling water system (RV) cooling/other Unit RN Vital instrumentation and control (I&C) Fire causes a Loss of RN, failure of operators to align SS system for operation, failure to use other Unit or remote control during fire Loss of 4160V essential bus and failure to align SS system for operation AND Tornado causes LOOP, DG 1A and 1B fail to fun, operators fail to initiate SS system operation	1.1×10^{-5}	3.2	$380,000	>$2.5 M[d][e]

(a) Total CDF = 4.9×10^{-5} per year
(b) Total population dose = 13.5 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 a per-unit basis. 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 =millions

Table 5-6. (contd)

Potential Alternative	Sequences/Failures Addressed	Risk Reduction		Total Benefit	Cost of Enhancement
		CDF[a]	Population Dose[b] (person-rem[c])		
Install automatic swap over to high-pressure recirculation	LOCA cut sets with failure of operators to establish high pressure recirculation	1.0×10^{-5}	0.4	$291,000	>$1 M[e]
Install automatic swap to RV/other unit RN system upon loss of RN	Loss of RN, failure of operators to align SS system for operation, filter (Standby Makeup Pump) restricts flow, failure to align RV/other Unit RN	8.8×10^{-6}	1.2	$275,000	>$1 M
Install third diesel generator	Tornado causes LOOP, DG 1A and 1B fail, and operators fail to initiate SS system operation	8.4×10^{-6}	3.1	$304,000	>$2 M
Install automatic swap to other unit	Vital I&C Fire causes a Loss of RN, failure of operators to align SS system for operation, failure to use other Unit or remote control during fire	2.9×10^{-6}	1.1	$106,000	>$1 M
Increase test frequency of standby makeup pump flow path (currently tested quarterly)	Loss of RN, failure of operators to align SS system for operation, filter (Standby Makeup Pump) restricts flow, failure to align RV cooling/other Unit RN	1.8×10^{-6}	0.5	$62,000	>$0.4 M
Replace reactor vessel with stronger vessel	Failure of reactor pressure vessel with failure to prevent core damage following a reactor pressure vessel breach	1.0×10^{-6}	<0.1	$30,000	>$1 M

(a) Total CDF = 4.9×10^{-5} per year
(b) Total population dose = 13.5 person-rem per year
(c) One person-Sv = 100 person-rem
(e) M = millions

Table 5-7. 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	NA	10.8	$349,000[b]	>$1 M[c]
Install filtered containment vent system	NA	10.8	$349,000[b]	>$1 M
Install back-up power to igniters and install back-up power to air return fans	NA	10.8	$349,000[b]	$540,000
Install containment inerting system	NA	10.8	$349,000[b]	>$1 M
Install additional containment bypass instrumentation	NA	2.6	$84,000	>$1 M
Add independent source of feedwater to reduce induced SGTR	NA	< 0.1	< $3,200	>$1 M
Install reactor cavity flooding system	NA	5.6	$181,000	>$1 M
Install core retention device	NA	< 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 = millions

design. 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 5-7.

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 McGuire. Risk insights from various McGuire risk assessments have been identified and implemented to improve both the design and operation of the plant. For example, using the IPE process, Duke (1) modified procedures to better cope with a loss of nuclear service water event and to better prioritize operator actions in a loss of alternating current (ac) power event; (2) added procedures to exercise the nuclear service water cross-connect valves between Unit 1 and 2 during each refueling outage; (3) fitted expansion joints in the nuclear service water piping located in the auxiliary feedwater pump room with a collar to limit the leak rate; (4) made a number of changes to enhance the reliability of the Emergency Diesel Generator System; (5) performed training exercises to ensure that the operators can

activate the standby shutdown facility (SSF) within 10 minutes; and (6) expanded the refueling water storage tank (FWST) level instrumentation span to the full range to reduce the potential for operator error during switchover to sump recirculation. Examples of plant improvements being planned for implementation by Duke based on IPEEE findings include:

(1) adding spacers between the Unit 1 DG batteries and racks

(2) adding grout between component cooling heat exchangers saddle base and concrete curb

(3) trimming the grating around the steam vent valves

(4) replacing some missing bolts on the Unit 2 upper surge tanks

(5) adding some additional procedural guidelines to secure movable equipment and structures to prevent potential seismic interactions.

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

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 alternative power to hydrogen igniters for SBO and passive autocatalytic recombiners (PARs) as an alternative to igniters. Duke also provided an estimate of the cost to install a dedicated line from the Cowan's Ford hydroelectric station, as an alternative source of ac power. 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 McGuire and that the set of potential design improvements identified by Duke is reasonably comprehensive and, therefore, acceptable.

5.2.4 Risk Reduction Potential of Plant Improvements

Section 4.3 of Attachment K to the 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 the implementation of the SAMA would eliminate the basic event. 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 and 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.

In responses to follow-up RAIs (NRC 2002a), Duke noted that the risk reduction estimates had changed in some instances when the PRA was updated to Revision 3. The final Revision 3 CDF results are summarized in Section 5.2.2.2 (Duke 2002b). One significant change was an increase in the CDF for SGTR events. According to Duke, this change yielded an estimated increase in population dose of approximately 0.04 person-Sv (4 person-rem). Duke reassessed the benefits of completely eliminating SGTR based on this new information, and calculated a maximum benefit of approximately $101,000 (present worth for the 20-year license renewal period). It is Duke's position that it is unlikely that a cost-beneficial alternative could be implemented to further reduce the SGTR risk based on such a low benefit estimate. The staff concurs with this assessment. Use of the PRA Revision 3 CDF estimates in lieu of the PRA Revision 2 CDF values would not appear to introduce any other significant changes to the risk profile that would make any of the other candidate SAMAs more cost-beneficial and might make some SAMAs less cost-beneficial, particularly SAMAs related to SBO events.

The staff questioned Duke regarding why the SAMA involving addition of a third DG was estimated to provide only a small (about 36 percent) reduction in the CDF for SBO sequences (NRC 2001). 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 diesels. However, it was assumed that the third DG would not be seismically qualified; therefore, it would not be effective in seismic events. Because seismic events account for approximately half of the SBO CDF, the limited risk reduction estimated for the third DG appears reasonable. Duke also considered the additional benefit if the third DG were seismically qualified, similar to the existing DGs. Duke estimated that an additional reduction in CDF of about 1.3×10^{-6} 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 DG 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 from the Cowan's Ford 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, including the dedicated power line, 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. The staff also notes that use of the PRA Revision 3 CDF estimates in lieu of the PRA Revision 2 CDF values would not appear to introduce any significant changes to the risk profile that would make any of the candidate SAMAs cost-beneficial, 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 Plant Improvements

Duke's estimated costs for each potential design enhancement are provided in Table 4-2 and Section 5.3 of Attachment K to the ER. For most of the SAMAs, Duke estimated the cost of implementation to be greater than $1 million based on cost estimates developed in previous industry studies. For two SAMAs, Duke developed plant-specific cost estimates because there was no readily available information on the estimated cost to implement similar alternatives and because the basic events associated with these alternatives were found to have a high importance in the McGuire PRA. These SAMAs involve (1) installing a third DG, and (2) increasing the test frequency of the standby makeup pump flow path. The costs to implement these SAMAs were estimated to be on the order of $2 million and $435,000, respectively. Because the benefits of the potential SAMAs were significantly less than their estimated implementation costs (by a factor of three or more), none of the cost estimates were further

refined. Specifically, the benefit of adding a third DG was about $304,000 while the benefit of increasing the test frequency was about $62,000 (see Table 5-6).

The staff compared Duke's cost estimates with estimates developed elsewhere for similar improvements, including estimates developed as part of the evaluation of SAMDAs for operating reactors and advanced light-water reactors (LWRs). The staff notes that Duke's estimated implementation costs of $1 million dollars or greater are consistent with the values reported in previous analyses for 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 Cowan's Ford 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 ($3 million) is comparable to the cost estimate provided by Dominion Power (NRC 2002c) for a similar modification at the Surry Nuclear Power Station ($2 million to $5 million), but is far greater than the calculated benefit of $300K for McGuire.

The staff questioned Duke regarding the costs of less expensive alternatives that could offer similar risk reduction benefits, particularly with regard to hydrogen control in SBO events. In a January 31, 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 prestaging 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. 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 5-8, 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 two other SAMAs: (1) install automatic swap-over to high pressure recirculation, and (2) install automatic swap-over to the containment ventilation cooling water system or the other unit's service water system upon loss of the service water system. Duke (NRC 2002a) referenced NUREG-0498, Supp. 1 (NRC 1995a), which estimated a cost of about $2.1 million for a similar alternative, i.e., "automate the alignment of emergency core 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 applies to both of these candidate SAMAs and is considerably higher than the estimated averted risk benefits for McGuire of about $291,000 and $275,000 respectively. (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 - Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident (NRC 2002b).

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 in the McGuire 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 (ARPC) and averted offsite property damage costs (AOC).

The methodology used by Duke was based primarily on NRC's guidance for performing cost-benefit analysis in 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 + AOC + AOE + AOSC) - COE

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

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. 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 (Δ person-rem/reactor 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:

$$AOC = \$3.92 \times 10^{9} \times (\text{Change in annual CDF})$$

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

For containment-related SAMAs (which impact population dose but not CDF), Duke estimated the combined AOC and averted public exposure costs (APE) based on a conversion factor of $3000/person-rem, which was 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:

$$AOC + APE = \$3.23 \times 10^{4} \times (\text{Change in public exposure})$$

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:

$$AOE = \$3.1 \times 10^{8} \times (\text{Change in annual CDF})$$

Averted Onsite 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 this cost in the responses (Duke 2002a) to the staff's RAIs.

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

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

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in NUREG/BR-0184 (NRC 1997b) as $\$1.5\times10^9$ (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:

$ACC = \$1.18\times10^{10}$ x (Change in annual CDF)

Averted Power Replacement Cost (APRC)

The Duke estimate of the annual power replacement cost for McGuire 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):

$$PV_{RP} = [\$1.2\times10^8/0.07][1 - \exp(-0.07 \times 20)]^2$$

$$PV_{RP} = \$9.73\times10^8$$

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

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

$$U_{RP} = \$7.89\times10^9$$

APRC = URP x (Change in annual CDF)

Because the averted power replacement cost 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,

$APRC = \$1.21\times10^{10}$ x (Change in annual CDF)

Duke Results

The total benefit associated with each of the 15 SAMAs evaluated by Duke (seven that reduce CDF and eight that improve containment performance) is provided in Tables 5-6 and 5-7. One of the SAMAs has a positive net value (i.e., the total benefit is greater than the cost of the enhancement). 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 2001, 2002) was based primarily on NRC's *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997b). In the original ER, Duke did not include averted replacement power costs for SAMAs that reduce CDF or 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 averted replacement power costs 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 averted public exposure 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.

For most of the candidate SAMAs, the staff agrees with Duke that the SAMAs would clearly not be cost-beneficial because they have costs that are substantially (typically a factor of three or more) 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 because 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. However, the cost-benefit analyses for the some of the SAMAs related to hydrogen control in SBO events have benefits that are similar in magnitude to the costs. The frequency of SBO events for McGuire account for 47 percent of the total CDF of

4.9×10^{-5} per year based on Revision 2 of the PRA and 27 percent of the total CDF of 3.7×10^{-5} per year based on Revision 3 of the PRA. Also, ice condenser containments have a higher degree of vulnerability to hydrogen combustion in SBO events, as described in NUREG/CR-6427 (NRC 2000).

NUREG/CR-6427 provided a simplified Level 2 analysis that studied the direct containment heating (DCH) issue for plants with ice condenser containments (NRC 2000) and 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 plants, especially McGuire, 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 or 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 risk from eliminating early containment failures would rise from a base case value of 0.055 person-Sv (5.5 person-rem) per year to 0.21 person-Sv (21 person-rem) per year. The benefit values based on use of the NUREG/CR-6427 containment failure probability for McGuire are reported in Table 5-8. Also shown are the benefits values for the sensitivity cases involving use of a 3-percent discount rate compared to a 7-percent discount rate in the base case and use of the SBO CDF estimates from Revision 3 of the PRA rather than Revision 2. All of the values in Table 5-8 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 5-8 are based on eliminating all early containment failures.

Table 5-8. 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			
		Based on Revision 2 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	Based on SBO values from Revision 3 of the PRA
Back-up power to igniters & air return fans	$540,000	$178,000	$678,000	$248,000	$76,000
PARs	$750,000	$178,000	$678,000	$248,000	$76,000
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	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 an air-return fan 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 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 benefits are similar in magnitude to the costs 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 impact analyses) is bounded by the sensitivity study that assumed a 3-percent discount rate.

- The Revision 3 PRA results would reduce the averted risk benefits by about half. While this is a substantial reduction, it does not eliminate the generic concern that the benefits of additional hydrogen control are large.

The NRC has recognized that ice condenser containments like McGuire's are vulnerable to hydrogen burns in the absence of power to the hydrogen ignitor system. This issue is sufficiently important for all PWRs with ice condenser containments that 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 (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 McGuire 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 McGuire. As a result of this assessment, Duke concluded that no additional mitigation alternatives are cost-beneficial and warrant implementation at McGuire.

Based on its review of SAMAs for McGuire, the staff concurs that none of the candidate SAMAs are cost-beneficial with the possible exception of one SAMA related to hydrogen control in SBO events. This conclusion is consistent with the low level of risk indicated in the McGuire PRA and the fact that Duke has already implemented numerous plant improvements identified from previous plant-specific risk studies. Duke's position is that SAMAs that provide hydrogen control in SBO events are not cost-effective because back-up power would also need to be supplied to the air-return fans from ac-independent power sources in order to ensure mixing of the containment atmosphere; 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 an air-return fan 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 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 one of the SAMAs related to hydrogen control in SBO sequences (supplying existing hydrogen igniters with back-up power from an independent power source during SBO events) 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 McGuire 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 Power Company (Duke Power). 1991. Letter from T. C. McMeekin, DPC to NRC. Subject: Evaluation of the McGuire Units 1 and 2 Individual Plant Examination (IPE) – Internal Events, dated November 4, 1991.

Duke Power Company (Duke Power). 1994. Letter from T. C. McMeekin, DPC to NRC. Subject: Individual Plant Examination of External Events (IPEEE) Submittal, McGuire Nuclear Station, dated June 1, 1994.

Duke Energy Corporation (Duke). 1998. Probabilistic Risk Assessment, Individual Plant Examination, McGuire Nuclear Station, dated March 19, 1998.

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

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, January 31, 2002.

Duke Energy Corporation (Duke). 2002b. Letter from M.S. Tuckman of Duke Energy Corporation to U.S. Nuclear Regulatory Commission. Subject: Comments on draft plant-specific Supplement 8 to NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, McGuire Nuclear Station, Docket Nos. 50-369 and 50-370, August 2, 2002.

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. Supplement 4 to Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," June 28, 1991.

U.S. Nuclear Regulatory Commission (NRC). 1994. Letter from V. Nerses (NRC) to T. C. McMeekin (Duke Power Company), Subject: Staff Evaluation of the McGuire Nuclear Station, Units 1 and 2, Individual Plant Examination - Internal Events Only, June 30, 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, 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 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). 1999b. Letter from F. Rinaldi (NRC) to H. B. Barron (Duke Energy Corporation), Subject: Review of McGuire Nuclear Station, Units 1 and 2 - Individual Plant Examination of External Events Submittal, February 16, 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 McGuire Nuclear Station Units 1 and 2, November 19, 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 McGuire Nuclear Station, Units 1 and 2, March 14, 2002 (Accession No. ML0207450318).

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, 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 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 [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 of 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 10 CFR Part 51, Subpart A, Appendix B, and are applicable to McGuire Nuclear Station, Units 1 and 2 (McGuire). 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), Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear

(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.

Power Reactor." The GEIS also addresses the impacts from radon-222 and technetium-99. There are no Category 2 issues for the uranium fuel cycle and solid waste management.

6.1 The Uranium Fuel Cycle

Category 1 issues from 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to McGuire 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 high-level waste [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)	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

In its environmental report (ER; Duke 2001), Duke stated that “no new information existed for the issues that would invalidate the GEIS conclusions.” No significant new information has been identified by the staff in the review process and in the staff’s independent review.

Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those GEIS issues, the staff concluded 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 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 McGuire 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 during the renewal term beyond those discussed in the GEIS.

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

  > The 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about 14,800 person rem [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 U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful. However, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations.

> Nevertheless, despite all the uncertainty, some 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 McGuire 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.

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

> For the high level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 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 3×10^{-3}.
>
> Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously

compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980 [DOE 1980]. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a high level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, EPA's [Environmental Protection Agency] generic repository standards in 40 CFR part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR part 191 protect the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. Reporting performance standards that will be required by EPA are expected to result in releases and associated health consequences in the range between 10 and 100 premature cancer deaths with an upper limit of 1,000 premature cancer deaths world-wide for a 100,000 metric tonne (MTHM) repository.

Nevertheless, despite all the uncertainty, some 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 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 NRC 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) 0.15 mSv/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 ground-water 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 receipt of a recommendation by Secretary Abraham, U.S. 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 McGuire 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 related 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 McGuire 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 McGuire 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 non-radiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

  The staff has not identified any significant new information during its independent review of the McGuire 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.

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

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

  The staff has not identified any significant new information during its independent review of the McGuire 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.

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

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

  The staff has not identified any significant new information during its independent review of the McGuire 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.

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

  > The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52(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 Sec. 51.52.

  McGuire meets the fuel-enrichment and burnup conditions set forth in Addendum 1 to the GEIS. In recent years, licensees have requested authorization to increase fuel enrichment and fuel burnup. In its letter dated September 22, 1999 (NRC 1999b), the staff approved a maximum burnup rate of 60,000 MWd/MTU. Based on a reassessment of the impacts

resulting from the transportation of spent fuel (NRC 2001), the staff's preliminary determination is that the environmental impacts at a burnup rate of 62,000 MWd/MTU are unchanged from those summarized in Table S-4. The staff has not identified any significant new information during its independent review of the McGuire 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 transportation associated with license renewal beyond those discussed in the GEIS.

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 10, *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 Environmental Radiation Protection Standards for Yucca Mountain, Nevada."

Duke Energy Corporation (Duke). 2001. *Applicant's Environmental Report – Operating License Renewal Stage – McGuire Nuclear Station.* 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, Vols. 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). 1999a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report,* "Section 6.3 - Transportation, Table 9.1 Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999b. Letter from F. Rinaldi, NRC, to H.B. Barron, Vice President, McGuire Site, Duke Energy Corporation. Subject: McGuire Nuclear Station, Units 1 and 2 Re: ISSUANCE OF AMENDMENTS.

U.S. Nuclear Regulatory Commission (NRC). 2001. Environmental Effects of Extending Fuel Burnup Above 60 GWd/MTU, NUREG/CR-6703, 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, 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 characteristics.

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

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

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

Category 2 issues are those that did not meet one or more of the criteria of Category 1, and therefore, additional plant-specific review of these issues is required. No Category 2 issues are related to decommissioning McGuire Nuclear Station, Units 1 and 2 (McGuire).

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to McGuire decommissioning following the renewal term are listed in Table 7-1. In its environmental report (ER; Duke 2001), Duke Energy Corporation (Duke) stated "no new information exists for the issues that would invalidate the GEIS conclusions." The staff has not identified any significant new information during its independent review of the McGuire ER (Duke 2001), the staff's site visit, the scoping process, or its evaluation of other available

(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 McGuire Following the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
DECOMMISSIONING	
Radiation Doses	7.3.1; 7.4
Waste Management	7.3.2; 7.4
Air Quality	7.3.3; 7.4
Water Quality	7.3.4; 7.4
Ecological Resources	7.3.5; 7.4
Socioeconomic Impacts	7.3.7; 7.4

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, the staff concluded in the GEIS that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff'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 McGuire 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 McGuire 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 McGuire 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 McGuire 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 McGuire 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 McGuire 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 – McGuire Nuclear Station*. 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 McGuire Nuclear Station, Units 1 and 2 (McGuire); the possibility of purchasing electric power from other sources to replace power generated by McGuire 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 McGuire. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance – 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

The 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 OLs for McGuire, and Duke Energy Corporation (Duke) would then decommission McGuire when plant operations cease. The no-action alternative is a conceptual alternative resulting in a net reduction in power production, but with no environmental impacts assumed for the replacement power. In actual practice, the power

(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.

lost by not renewing the OLs for McGuire would likely be replaced by (1) demand-side management and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than McGuire, 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 McGuire 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.

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

- Socioeconomic. When McGuire ceases operation, there will be a decrease in employment and tax revenues associated with the closure. Employment (primary and secondary) impacts and impacts on population would occur over a wide area.

(a) The NRC staff is currently supplementing NUREG-0586 for reactor decommissioning. In October 2001, the staff issued draft 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.

Employees working at McGuire reside in a number of North Carolina counties including Mecklenburg, Lincoln, Gaston, Iredell, Catawba, Cabarrus, and Rowan (Duke 2001a).

Tax-related impacts would occur in Mecklenburg County as well as the town of Huntersville within Mecklenburg County. In 1998, Duke paid property taxes for McGuire to Mecklenburg County in the amount of $8,100,866 (Duke 2001a). This payment represented approximately 2 percent of total property tax revenues in Mecklenburg County and 1 percent of total revenues from all sources for Mecklenburg County. Duke also pays property taxes for McGuire to the town of Huntersville in the amount of $333,333 per year (Duke 2001a). In 1999, this payment represented approximately 7 percent of total property tax revenues and 4 percent of total revenues from all sources for the town of Huntersville.

The no-action alternative would result in the loss of the taxes attributable to McGuire as well as the loss of plant payrolls 20 years earlier than if the OLs were renewed. Given the relatively low percentage of revenue in Mecklenburg County and the town of Huntersville derived from McGuire, the property tax revenue would have a SMALL to MODERATE impact on the ability of the two jurisdictions to provide public services such as schools and road maintenance.

There would also be an adverse impact on housing values and the local nearby economy if McGuire were to cease operations.

Duke employees working at McGuire currently contribute time and money toward community involvement, including schools, churches, charities, and other civic activities. It is likely that with a reduced presence in the community following decommissioning, community involvement efforts 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 McGuire following decommissioning will depend on the future use of the site. Following decommissioning, the site would likely be retained by Duke for other corporate purposes. Eventual sale or transfer of the site, however, could result in adverse impacts to cultural resources if the land-use pattern changes dramatically. Notwithstanding this possibility, the impacts of this alternative on historic and archaeological resources are considered SMALL.

- Environmental Justice. Current operations at McGuire have no disproportionate impacts on the minority and low-income populations of Mecklenburg and surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Closure of McGuire would result in decreased employment opportunities and tax revenues in Mecklenburg County and surrounding counties, with possible negative

and disproportionate impacts on minority or low-income populations. Because McGuire 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.

Impacts for all other impact categories would be SMALL, as shown in Table 9-1. In some cases, impacts associated with the no-action alternative would be positive. For example, closure of McGuire would eliminate any impingement and entrainment of fish and shellfish and also eliminate any negative impacts resulting from thermal discharges to Lake Norman.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electric power to replace the power generated assuming that the McGuire 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 McGuire site and at an alternate greenfield[(a)] site (Section 8.2.1)
- natural-gas-fired generation at the McGuire site and at an alternate greenfield site (Section 8.2.2)
- nuclear generation at the McGuire site and at an alternate greenfield site (Section 8.2.3).

The alternative of purchasing power from other sources to replace power generated at McGuire is discussed in Section 8.2.4. Other power generation alternatives and conservation alternatives considered by the staff and found not to be reasonable replacements for McGuire are discussed in Section 8.2.5. Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

Each year, the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an Annual Energy Outlook. In its *Annual Energy Outlook 2002*, EIA projects that combined-cycle[(b)] or combustion turbine technology fueled by natural gas is likely

(a) A greenfield site is assumed to be an undeveloped site with no previous construction.
(b) In the combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

to account for approximately 88 percent of new electric generating capacity through the year 2020 (DOE/EIA 2001a). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[(a)] 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 and 2020, followed by coal-fired plants and then wind generation (DOE/EIA 2001a).

EIA projects that oil-fired plants will account for very little new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a).

EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States through the year 2020 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 McGuire 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).

8.2.1 Coal-Fired Generation

The coal-fired alternative is analyzed for both the McGuire site and an alternate greenfield site. The staff assumed construction of four 600-megawatt electric [MW(e)] units, which is consistent with Duke's environmental report (ER) for McGuire (Duke 2001a). This assumption will slightly overstate the impacts of replacing the 2258 MW(e) from McGuire.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the McGuire ER (Duke 2001a). 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

(a) 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; that is, these units generally run near full load.

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).

Coal and lime or limestone for a coal-fired plant sited at McGuire would most likely be delivered by railroad. The McGuire site is served by an existing rail line. Lime[(a)] or limestone is used in the scrubbing process for control of sulfur dioxide emissions. Rail delivery would also be the most likely option for delivering coal and lime/limestone to an alternate inland greenfield site for the coal-fired plant. Barge delivery of coal and lime/limestone is potentially feasible only for a coastal site. 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 2001a). Annual coal consumption would be approximately 5.76 million MT/yr (6.35 million tons/yr) (Duke 2001a). The McGuire ER 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 2001a).

8.2.1.1 Once-Through Cooling System

For purposes of this SEIS, the staff assumed that a coal-fired plant located at the McGuire site would use the existing once-through system as a source of cooling. An alternate greenfield site could use either a closed-cycle or a once-through 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 site would depend on the location of the particular site selected.

(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 out 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.

Table 8-2. Comparison of Environmental Impacts of Coal-Fired Generation Using Once-Through Cooling at McGuire and an Alternate Greenfield Site

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE to LARGE	Uses unused portion of McGuire site for plant, infrastructure, and waste disposal. Additional offsite land would also likely be needed. Additional offsite land impacts for coal and limestone mining.	MODERATE to LARGE	Uses up to 1000 ha (2460 ac) for plant, infrastructure, and waste disposal; additional land impacts for coal and limestone mining; possible impacts for transmission line and rail spur.
Ecology	MODERATE to LARGE	Uses undeveloped areas at McGuire site plus some offsite land. Potential habitat loss and fragmentation and reduced productivity and biological diversity.	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	SMALL	Uses existing once-through cooling system	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Air Quality	MODERATE	Sulfur oxides • 5757 MT (6346 tons) 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 McGuire site, although pollution control standards may vary.
Waste	MODERATE	Total waste volume would be approximately 900,000 MT/yr (1 million tons/yr) of ash, spent catalyst, and scrubber sludge requiring approximately 307 ha (760 ac) for disposal during the 40-year life of the plant.	MODERATE	Same impacts as McGuire 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 McGuire site.

Table 8-2 (contd)

	McGuire Site		Alternate Greenfield Site	
Category Impact	**Impact**	**Comment**	**Impact**	**Comment**
Socio-economics	MODERATE to LARGE	During construction, impacts would be MODERATE. Up to 2500 workers during the peak of the 5-year construction period, followed by reduction from current McGuire work force of 1345 to 250. Tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts associated with trains trips to and from the plant would be MODERATE to LARGE.	MODERATE to LARGE	Construction impacts depend on location, but could be LARGE if plant is located in a rural area. Mecklenburg County and the town of Huntersville would experience loss of Units 1 and 2 tax base and employment with potentially MODERATE impacts. Impacts during operation would be SMALL. Transportation impacts associated with construction workers could be MODERATE to LARGE. For rail transportation of coal and lime/limestone, the impact is considered MODERATE to LARGE. For barge transportation, the impact is considered SMALL.
Aesthetics	MODERATE	Exhaust stacks will be visible from nearby local parks and the Cowan's Ford Wildlife Refuge. Rail transportation of coal and lime/limestone would have a MODERATE aesthetic impact. Noise impact from plant operations would be MODERATE.	MODERATE to LARGE	Impact would depend on the site selected and the surrounding land features. If needed, a new transmission line or rail spur could have a LARGE aesthetic impact. Rail transportation of coal and lime/limestone would have a MODERATE aesthetic impact. 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)

		McGuire Site	Alternate Greenfield Site	
Category Impact	**Impact**	**Comment**	**Impact**	**Comment**
Historic and Archeological Resources	SMALL	Some construction would affect previously developed parts of McGuire site; cultural resource inventory should minimize any impacts on undeveloped lands.	SMALL	Alternate location would necessitate cultural resource studies.
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 1095 operating jobs at McGuire could reduce employment prospects for minority and low-income populations.	SMALL to MODERATE	Impacts at alternate site vary depending on population distribution and makeup at site. Mecklenburg County and the town of Huntersville would lose tax revenue which could have a SMALL to MODERATE impact on minority and low-income populations.

- **Land Use**

  The existing facilities and infrastructure at the McGuire site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that the coal-fired replacement plant alternative would use the existing once-through cooling system, switchyard, offices, and transmission line rights-of-way. Some additional land beyond the current McGuire site boundary may be needed to construct a new coal-fired plant while the existing nuclear units continue to operate.

  The coal-fired generation alternative would necessitate 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 McGuire site to dispose of all waste products in landfills. Disposal of ash and scrubber sludge over a 40-year plant life would require approximately 307 ha (760 ac). Additional land-use changes would occur offsite in an undetermined coal-mining area to supply coal 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 McGuire Units 1 and 2 would be 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 McGuire Units 1 and 2. In the GEIS, the staff estimated that approximately 400 ha (1000 ac) would be affected for mining and processing uranium during the operating life of a 1000 MW(e) nuclear power plant (NRC 1996).

The impact of a coal-fired generating unit on land use at the McGuire site is best characterized as MODERATE to LARGE. The impact would definitely be greater than the alternative of renewing the OLs.

In the GEIS, the staff estimated that a 1000-MW(e) coal-fired plant would require approximately 700 ha (1700 ac) (NRC 1996). Duke believes that this acreage would be sufficient for a 2400-MW(e) coal-fired generation alternative at an alternate site (Duke 2001a). Additional land could be needed for a transmission line and for a rail spur to the plant site. Depending particularly on transmission line and rail line routing requirements, this alternative would result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a coal-fired plant at the McGuire site would alter ecological resources because of the need to convert most of the currently unused land at the site 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 land would likely be needed for disposal of waste products.

Siting a coal-fired plant at McGuire would have a MODERATE to LARGE ecological impact that would be greater than renewal of McGuire OLs.

At an alternate 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 would 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 aquatic resource impacts. If needed, construction and maintenance of a transmission line and a rail spur would have ecological impacts. Overall, the ecological impacts at an alternate site would be MODERATE to LARGE.

- **Water Use and Quality**

The coal-fired generation alternative at the McGuire site is assumed to use the existing once-through cooling system, which would minimize incremental water use and quality impacts. 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.

The staff assumed that a coal-fired plant at McGuire would follow the current practice of obtaining process and fire-protection water from Lake Norman and potable water from the Charlotte-Mecklenburg Utilities Department (Duke 2001a). The six groundwater wells that supply limited specific uses at the McGuire site would also likely continue to be used. Use of groundwater for a coal-fired plant at an alternate site is a possibility. Groundwater withdrawal at an alternate site could require a permit. Some erosion and sedimentation would likely occur during construction (NRC 1996).

For a coal-fired plant located at an alternate greenfield site, the impact on the surface water would depend on the discharge volume and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State. The impacts would be SMALL to MODERATE.

- **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, hazardous air pollutants such as mercury, and naturally occurring radioactive materials.

Mecklenburg County is in the Metropolitan Charlotte Interstate Air Quality Control Region (40 CFR 81.75). Mecklenburg County is in compliance with the national ambient air quality standards for particulate matter, carbon monoxide, nitrogen dioxide, lead, sulfur dioxide, and ozone (40 CFR 81.334).

A new coal-fired generating plant located at the McGuire 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 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).

The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR 51 Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the Clean Air Act. Mecklenburg County is classified as attainment or unclassified for criteria pollutants.[(a)]

(a) 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.

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. In addition, the EPA issued a new regional haze rule cited in the *Federal Register* on July 1, 1999, 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 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 new coal-fired power station were located close to a mandatory Class I area, additional air pollution control requirements could be imposed. However, the mandatory Class I Federal areas closest to the McGuire site are the Linville Gorge Wilderness Area approximately 116 km (72 mi) northwest, the Shining Rock Wilderness Area approximately 179 km (111 mi) west, and the Great Smoky Mountains National Park approximately 236 km (147 mi) west (40 CFR 81.422).

In 1998, the EPA issued a rule requiring 22 eastern states, including North Carolina, to revise their state implementation plans to reduce NO_x emissions. NO_x emissions contribute to violations of the national ambient air quality standard for ozone (40 CFR 50.9). The total amount of NO_x that 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). Any new coal-fired plant sited in North Carolina would be subject to this limitation. For South Carolina, the amount is 111,656 MT (123,105 tons).

Impacts for particular pollutants are as follows:

Sulfur oxides. Duke states in its ER that an alternative coal-fired plant located at the McGuire site would use wet scrubber technology utilizing lime/limestone for flue gas desulfurization (Duke 2001a).

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 would be approximately 5757 MT (6346 tons) of SO_2 (Duke 2001a).

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 at 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 and cited in the *Federal Register* 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 2001a). 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 (317 tons) 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 control (Duke 2001a). In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the OL renewal alternative.

During the construction of a coal-fired plant, fugitive dust would be generated. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process.

Carbon monoxide. Duke estimates that the total carbon monoxide emissions would be approximately 1439 MT (1586 tons) per year (Duke 2001a). This level of emissions is greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). These findings were cited in the *Federal Register* as 65 FR 79825. The EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit

arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000b). The EPA concluded that mercury is the hazardous air pollutant of greatest concern. The EPA found that (1) there is a link between coal consumption and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000b). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000b).

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 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 McGuire 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 would be MODERATE.

- **Waste**

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalyst, and scrubber

sludge. Four 600-MW(e) coal-fired plants would generate approximately 900,000 MT (1 million tons) of this waste annually. The ash and scrubber sludge would be disposed of onsite, accounting for approximately 307 ha (760 ac) of land area over the 40-year plant life. There would not be sufficient space on the existing McGuire site for this quantity of waste. Spent selective catalytic reduction catalyst would be regenerated or disposed of offsite. 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.

In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels" in the *Federal Register* as 65 FR 32214 (EPA 2000a). The 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 eleven 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 percent to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and (4) EPA identified gaps in state oversight of coal combustion wastes. Accordingly, EPA announced its intention to issue regulations for disposal of coal combustion waste under subtitle D of the Resource Conservation and Recovery Act. Construction-related debris would be generated during construction activities.

For all the reasons described above, 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 McGuire would not alter waste generation, although other sites might have more constraints on disposal locations. Therefore, the impacts would be MODERATE.

- **Human Health**

Coal-fired power generation introduces worker risks from 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.

The staff stated in the GEIS that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates from a coal-fired plant, 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 the 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, the 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 McGuire Units 1 and 2 continued operation and would be completed by the time the units permanently cease operations. The work force 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 approximately 1345 workers employed at McGuire. During construction of the new coal-fired plant, communities near the McGuire site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered because McGuire is in a relatively urban area and workers could commute to the site from many communities. After construction, the nearby communities would be impacted by the loss of the construction jobs. Duke estimates that the completed coal plant would employ approximately 250 workers (Duke 2001a).

If a coal-fired replacement plant were constructed at the McGuire site and Units 1 and 2 decommissioned, there would be a loss of approximately 1095 permanent high-paying jobs (1345 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. The coal-fired plants 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 an operating coal-fired plant constructed at the McGuire site would be MODERATE; the socioeconomic impacts would be noticeable but would be unlikely to destabilize the area.

During the 5-year construction period for a replacement coal-fired plant, up to 2500 construction workers would be working at the site in addition to the 1345 workers at Units 1 and 2. The addition of these workers could place significant traffic loads on existing highways near the McGuire site. Such impacts would be MODERATE to LARGE.

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. The current work force for McGuire Units 1 and 2 is approximately 1345. 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 McGuire operations.

The McGuire site is served by an existing rail spur. Coal would likely be delivered by rail trains of approximately 115 cars each. 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 690 trains per year would deliver the coal and lime/limestone for the four units. An average of roughly 26 train trips per week on the rail spur would be needed, because for each full train delivery there would be an empty return train. On several days per week, there could be four 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.

Construction of a replacement coal-fired power plant at an alternate site would relocate some socioeconomic impacts but not eliminate them. The communities around the McGuire site would experience the impact of McGuire operational job loss, and Mecklenburg County and the town of Huntersville would lose tax base. These losses would have SMALL to MODERATE socioeconomic impacts, given the relatively low proportion of the tax base in these jurisdictions attributable to McGuire (see Section 8.1). Communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2500 workers at the peak of construction) and a permanent work force of approximately 250 workers. The staff stated in the GEIS that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction work force would need to move to the area to work (NRC 1996). Alternate greenfield sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at a rural site could be 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.

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 MODERATE to LARGE.

- **Aesthetics**

The four coal-fired power plant units could be as much as 60 m (200 ft) tall and be visible in daylight hours offsite. The four exhaust stacks would be as much as 185 m (600 ft) high (Duke 2001a). The stacks would likely be highly visible in daylight hours for distances up to 16 km (10 mi). The stacks would be visible from a number of local parks and wildlife refuges in the vicinity of the McGuire site including the Cowan's Ford Waterfowl Refuge, Blythe Landing County Park, Ramsey Creek Park, and Jetton Road Park. 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 McGuire site would likely 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 operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to existing McGuire Units 1 and 2 operations are considered to be MODERATE.

At an alternate greenfield site, there would be an aesthetic impact from the buildings and exhaust stacks. There would be an aesthetic impact that could be LARGE if construction of 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. Nevertheless, given the frequency of train transport and the fact that many people are likely to be within hearing distance of the rail route, the impacts of noise on residents in the vicinity of the facility and the rail line is considered MODERATE. Noise associated with barge transportation of coal and lime/limestone would be SMALL. Noise and light from the plant would be detectable offsite. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power

plants. Overall, the aesthetic impacts associated with locating at an alternate site can be categorized as MODERATE to LARGE.

- **Historic and Archaeological Resources**

  At the McGuire site or an alternate site, a cultural resources 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 McGuire site or an alternate greenfield 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 corridors, 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 coal-fired plant were built at the McGuire site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Replacement of McGuire, Units 1 and 2 with a coal-fired plant would result in a decrease in employment of approximately 1095 operating employees. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, McGuire is located in a relatively 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, Mecklenburg County and the town of Huntersville would experience a loss of property tax revenue, which could affect their ability to provide services and programs. However, because the tax revenue attributable to McGuire is a relatively small percentage of total tax revenue for each jurisdiction, the impacts to minority and low-income populations are expected to be SMALL to MODERATE.

8.2.1.2 Closed-Cycle Cooling System

The environmental impacts of constructing a coal-fired generation system at an alternate greenfield site using closed-cycle cooling with cooling towers are essentially the same as the impacts for a coal-fired plant using the once-through system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-3 summarizes the incremental differences. Although minor differences exist for closed-cycle cooling systems, the staff's findings regarding the environmental impacts of coal-fired generation with once-through cooling remain bounding.

Table 8-3. Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Greenfield Site with Closed-Cycle Cooling System Utilizing Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 to 12 additional ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated by the State. Decreased water withdrawal and less thermal load on receiving body of water. Consumptive use of water due to evaporation from cooling towers.
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plumes. Natural draft towers could be up to 158 m (520 ft) high. Mechanical draft towers could be up to 30 m (100 ft) high and also have an associated noise impact.
Historic and Archaeological Resources	No change
Environmental Justice	No change

8.2.2 Natural-Gas-Fired Generation

The environmental impacts of the natural-gas-fired alternative are examined in this section for both the McGuire site and an alternate greenfield site. For the McGuire site, the staff assumed that the plant would use the existing once-through cooling system.

The McGuire site is located within 3 km (2 mi) of the Williams Transco interstate natural gas pipeline; however, a new pipeline would likely be needed to supply the gas capacities required for a replacement baseload gas-fired plant at the McGuire site (Duke 2001a). Additionally, Duke stated in its ER (Duke 2001a) that in the winter it may become necessary for a replacement natural-gas-fired plant to operate on fuel oil due to lack of gas supply. Operation with oil would result in more stack emissions.

If a new natural-gas-fired plant were built elsewhere to replace McGuire, a new transmission line could need to be constructed to connect to existing lines. In addition, construction or upgrade of a natural gas pipeline from the plant to a supply point where a firm supply of gas would be available could be needed. 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). The LNG imported to either facility would need to be vaporized and transported to the plant location via pipeline.

The staff assumed that a replacement natural-gas-fired plant would use combined-cycle combustion turbines (Duke 2001a). The following additional assumptions are made for the natural-gas-fired plant (Duke 2001a):

- 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
- low-sulfur number 2 fuel oil as backup fuel
- heat rate of 2 J fuel/J electricity (6800 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 throughout this section are from the McGuire ER (Duke 2001a). 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 (as a reasonable projection of the operating life of a natural-gas-fired plant).

8.2.2.1 Once-Through Cooling System

The overall impacts of the 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**

  For siting at McGuire, existing facilities and infrastructure would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that the natural-gas-fired replacement plant alternative would use the existing once-through cooling system, switchyard, offices, and transmission line right-of-way. At the McGuire site, the staff assumed that approximately 20 ha (50 ac) would be needed for the plant and associated infrastructure. There would be an additional land use impact if construction of a new natural gas pipeline to the plant site is needed.

  For construction at an alternate greenfield site, the staff assumed that 60 ha (150 ac) would be needed for the plant and associated infrastructure (NRC 1996). Additional land could be impacted for construction of a transmission line and/or natural gas pipeline to serve the plant. For any new natural-gas-fired power plant, additional land would be required for natural gas wells and collection stations. In the GEIS, the staff estimated that approximately 1500 ha (3600 ac) would be needed for a 1000-MW(e) plant (NRC 1996). Proportionately more land would be needed for a natural-gas-fired plant replacing the 2258 MW(e) from McGuire Units 1 and 2. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for McGuire Units 1 and 2. NRC staff states in the GEIS (NRC 1996) that approximately 400 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. Overall, land-use impacts at both McGuire and an alternate greenfield location would be MODERATE to LARGE.

- **Ecology**

  At the McGuire site, there would be ecological land-related impacts for siting of the gas-fired plant. If needed, there would also be significant ecological impacts associated with bringing a new underground gas pipeline to the site. 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/or gas pipeline. Construction of a transmission line and a gas pipeline to serve the plant would be expected to have temporary ecological impacts. Ecological

Table 8-4. Summary of Environmental Impacts of Natural-Gas-Fired Generation Using Once-Through Cooling at McGuire and an Alternate Greenfield Site

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE to LARGE	20 ha (50 ac) for powerblock, roads, and parking areas. Additional impact for construction of an underground gas pipeline.	MODERATE to LARGE	60 ha (150 ac) for power-block, offices, roads, switchyard, and parking areas. Additional land possibly impacted for transmission line and/or natural gas pipeline.
Ecology	MODERATE to LARGE	Uses undeveloped areas at McGuire plus land for a new 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 pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality	SMALL	Uses existing once-through cooling system	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
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	Same emissions as McGuire site.
Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Minimal waste product from fuel combination.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.

Table 8-4 (contd)

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Socioeconomics	MODERATE	During construction, impacts would be MODERATE. Up to 800 additional workers during the peak of the 3-year construction period, followed by reduction from current McGuire work force of 1345 to 150; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	MODERATE	During construction, impacts would be MODERATE. Up to 800 additional workers during the peak of the 3-year construction period. Mecklenburg County and the town of Huntersville would experience loss of McGuire tax base and employment associated with Units 1 and 2 with potentially MODERATE impacts. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE	MODERATE aesthetic impact. Exhaust stacks will be visible from nearby local parks and the Cowan's Ford Wildlife Refuge. Noise impact from plant operations would be MODERATE.	MODERATE to LARGE	Impact would depend on the site selected and the surrounding land features. If needed, a new transmission line or rail spur could have a LARGE aesthetic impact. Noise impact from plant operations would be MODERATE.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Same as McGuire site; any potential impacts can likely 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 1195 operating jobs at McGuire could reduce employment prospects for minority and low-income populations.	SMALL to MODERATE	Impacts at alternate site vary depending on population distribution and makeup at site. Mecklenburg County and the town of Huntersville would lose tax revenue which could have SMALL to MODERATE impacts on minority and low-income populations.

impacts to the plant site and utility easements could include impacts on threatened or endangered species, wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity. At an alternate site, the cooling makeup water intake and discharge could have aquatic resource impacts. Overall, the ecological impacts are considered MODERATE to LARGE at either location.

- **Water Use and Quality**

  Each of the natural-gas-fired units would include a heat-recovery boiler from which steam would turn an electric generator. Steam would be condensed and circulated back to the boiler for reuse. A natural-gas-fired plant sited at McGuire is assumed to use the existing once-through cooling system.

  The staff assumed that a gas-fired plant located at the McGuire site would follow the current practice of obtaining process and fire-protection water from Lake Norman and potable water from the Charlotte-Mecklenburg Utilities Department (CMUD; Duke 2001a). The six groundwater wells that supply limited specific uses at the McGuire site would also likely continue to be used and impacts would, therefore, be SMALL.

  For alternate sites, the impact on the surface water would depend on the discharge volume and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State. A natural-gas-fired plant sited at an alternate site may use groundwater. For a natural-gas-fired plant at an alternate site, the impacts on groundwater would vary depending upon site-specific characteristics, including competitive uses in the aquifer and plant design. Withdrawal from groundwater aquifers would also be regulated by the State. Therefore, impacts to groundwater would range from SMALL to MODERATE.

  Water-quality impacts from sedimentation during construction of a natural-gas-fired plant was characterized in the GEIS as SMALL (NRC 1996). NRC staff also noted in the GEIS that operational water quality impacts would be similar to, or less than, those from other generating technologies.

  Overall, water-use and quality impacts at an alternate greenfield site are considered SMALL to MODERATE.

- **Air Quality**

  Natural gas is a relatively clean-burning fuel. The gas-fired alternative would release similar types of emissions but in lesser quantities than the coal-fired alternative.

A new gas-fired generating plant located at the McGuire site 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 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

The 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 under the Clean Air Act. Mecklenburg County is classified as attainment or unclassified for criteria pollutants.

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 in the *Federal Register* 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 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 McGuire site are the Linville Gorge Wilderness Area located approximately 116 km (72 mi) northwest, the Shining Rock Wilderness Area located approximately 179 km (111 mi) west, and the Great Smoky Mountains National Park located approximately 236 km (147 mi) west (40 CFR 81.422).

In 1998, the EPA issued a rule requiring 22 eastern states, including North 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 2001a):

- 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 - 260MT/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, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). Natural-gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel (EPA 2000b). Unlike coal-and oil-fired plants, EPA did not determine that 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 McGuire site or at an alternate greenfield 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 natural gas-generating plant sited at McGuire or at an alternate greenfield site is considered MODERATE.

- **Waste**

There will be small amounts of solid-waste products (i.e., ash) from burning natural gas fuel. 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; impacts would be so minor that they would not noticeably alter any important resource attribute. Construction-related debris would be generated during construction activities. Overall, the waste impacts would be SMALL for a natural-gas-fired plant sited at McGuire or at an alternate greenfield site.

In the winter, it may become necessary for a 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.

- **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 contribute to health risks. NO_x emissions from any plant would be regulated. For a plant sited in North Carolina, NO_x emissions would be regulated by the North Carolina Department of Environment and Natural Resources. Human health effects are not expected to be detectable or 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 McGuire or at an alternate greenfield site are considered SMALL.

- **Socioeconomics**

  Construction of a natural-gas-fired plant would take approximately 3 years. Peak employment could be up to 800 workers (Duke 2001a). The staff assumed that construction would take place while Units 1 and 2 continue operation and would be completed by the time they permanently cease operations. During construction, the communities immediately surrounding the McGuire site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from more distant cities. After construction, the communities would be impacted by the loss of jobs. The current McGuire work force (1345 workers) would decline through a decommissioning period to a minimal maintenance size. The new natural-gas-fired plant would replace the nuclear plant tax base of McGuire or provide a new tax base at an alternate greenfield site and provide approximately 150 permanent jobs. Siting at an alternate greenfield site would result in the loss of the nuclear plant tax base in Mecklenburg County and the town of Huntersville and associated employment, with potentially SMALL to MODERATE socioeconomic impacts.

  In the GEIS, the staff concluded that socioeconomic impacts from constructing a natural-gas-fired plant would not be very noticeable and that the small operational work force would have the lowest socioeconomic impacts of any nonrenewable technology (NRC 1996). Compared to the coal-fired and nuclear alternatives, the smaller size of the construction workforce, the shorter construction time frame, and the smaller size of the operations work force would mitigate socioeconomic impacts.

  Transportation impacts associated with construction personnel commuting to the plant site would depend on the population density and transportation infrastructure in the vicinity of the site. The impacts can be classified as MODERATE for siting at McGuire or at an alternate greenfield site. Impacts associated with operating personnel commuting to the plant site would be SMALL.

Overall, socioeconomic impacts resulting from construction of a natural-gas-fired plant at McGuire would be MODERATE. For construction at an alternate greenfield site, socioeconomic impacts would also be MODERATE.

- **Aesthetics**

  The turbine buildings and stacks (approximately 60 m [200 ft] tall) would be visible during daylight hours from offsite. The gas pipeline compressors also would be visible. Noise and light from the plant would be detectable offsite. At the McGuire site, these impacts would result in a MODERATE aesthetic impact.

  At an alternate greenfield site, the buildings and stacks would be visible offsite. If a new transmission line is needed, the aesthetic impact could be as much as LARGE. Aesthetic impacts would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with a replacement natural-gas-fired plant at an alternate greenfield site are categorized as MODERATE to LARGE, with site-specific factors determining the final categorization.

- **Historic and Archaeological Resources**

  At both the McGuire site and an alternate greenfield 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 McGuire site or an alternate greenfield 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 and pipeline corridors, or other rights-of-way). Impacts to cultural resources can be effectively managed under current laws and regulations and kept 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 natural-gas-fired plant were built at the McGuire site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Replacement of McGuire

Units 1 and 2 with a natural-gas-fired plant would result in a decrease in employment of approximately 1195 operating employees, possibly offset by general growth in the immediate area. Resulting economic conditions could reduce employment prospects for minority or low-income populations. Overall, impacts would be SMALL to MODERATE.

Impacts at an alternate greenfield site would depend upon the site chosen and the nearby population distribution. If a replacement natural-gas-fired plant were constructed at an alternate site, Mecklenburg County and the town of Huntersville would experience a loss of property tax revenue which would affect their ability to provide services and programs. However, since these revenues are a relatively small portion of total tax revenue (see Section 8.1), the overall impacts to minority and low-income populations would be SMALL to MODERATE.

8.2.2.2 Closed-Cycle Cooling System

The environmental impacts of constructing a natural-gas-fired generation system at an alternate greenfield location using a closed-cycle cooling system with cooling towers are essentially the same as the impacts for a natural-gas-fired plant using once-through cooling. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-5 summarizes the incremental differences. Although minor differences exist for closed-cycle cooling systems, the staff's findings regarding the environmental impacts of natural-gas-fired generation with once-through cooling remain bounding.

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 the NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants. In addition, recent volatility 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 McGuire site using the existing once-through cooling system and at an alternate greenfield 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.

The 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 at the McGuire site or at an alternate greenfield 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 McGuire Units 1 and 2, which have a 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 Table B-1 of 10 CFR Part 51 Subpart A, Appendix B, is also relevant, although not directly applicable, for consideration of environmental

Table 8-5. Summary of Environmental Impacts of Natural-Gas-Fired Generation with Closed-Cycle Cooling Utilizing Cooling Towers at an Alternate Greenfield Site

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 to 12 additional ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated by the State. Decreased water withdrawal and less thermal load on receiving body of water. Consumptive use of water due to evaporation from cooling towers.
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plumes. Possible noise impact from operation of cooling towers.
Historic and Archaeological Resources	No change
Environmental Justice	No change

impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using once-through cooling is presented in Section 8.2.3.1 and using closed-cycle cooling in Section 8.2.3.2.

8.2.3.1 Once-Through 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 greenfield site will depend on the location of the particular site selected.

- **Land Use**

  The existing facilities and infrastructure at the McGuire 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 McGuire would require approximately 200 ha (500 ac), some of which may be previously undeveloped land. Some additional land beyond the current site boundary may be needed to construct a new nuclear power plant while the existing McGuire units 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 McGuire Units 1 and 2.

  The impact of a replacement nuclear generating plant on land use at the McGuire site is best characterized as 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 bring in equipment during construction. Depending particularly on transmission line routing, siting a new nuclear plant at an alternate greenfield site could result in MODERATE to LARGE land-use impacts.

- **Ecology**

  Locating a replacement nuclear power plant at the McGuire site would alter ecological resources because of the need to convert land to an industrial use. Some of this land, however, would have been previously disturbed.

  Siting at the McGuire site would have a MODERATE ecological impact that would be greater than renewal of the existing Unit 1 and 2 OLs.

Table 8-6. Summary of Environmental Impacts of New Nuclear Generation Using Once-Through Cooling at McGuire and an Alternate Greenfield Site

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	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.
Ecology	MODERATE	Uses undeveloped areas at current McGuire Nuclear Station 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	SMALL	Uses existing once-through cooling system	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amounts of emissions from diesel generators and possibly other sourcyes during operation.	SMALL	Same impacts as McGuire site
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 McGuire
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 McGuire site.

Table 8-6 (contd)

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Socioeconomics	MODERATE to LARGE	During construction, impacts would be MODERATE to LARGE. Up to 2500 workers during the peak of the 5-year construction period. Operating work force assumed to be similar to McGuire Nuclear Station. Mecklenburg County and town of Huntersville tax base preserved. Transportation impacts associated with commuting construction workers could be MODERATE to LARGE. Transportation impacts during operation would be SMALL.	MODERATE to LARGE	Construction impacts depend on location. Impacts at a rural location could be LARGE. Mecklenburg County and the town of Huntersville would experience loss of tax base and employment with MODERATE impacts. Transportation impacts associated with commuting construction workers could be MODERATE to LARGE. Transportation impacts during operation would be SMALL to MODERATE.
Aesthetics	SMALL to MODERATE	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	Similar to impacts at McGuire site. Potential LARGE impact if a new transmission line is needed.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely be effectively managed.
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 MODERATE	Impacts will vary depending on population distribution and makeup at the site. Mecklenburg County and the town of Huntersville would lose tax revenue which could have a SMALL to MODERATE impact on minority and low-income populations.

At an alternate site, there would be construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts would alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of cooling water from a nearby surface water body could have adverse aquatic resource impacts. If needed, construction and maintenance of the transmission line would have ecological impacts. Overall, the ecological impacts at an alternate greenfield site would be MODERATE to LARGE.

- **Water Use and Quality**

The replacement nuclear plant alternative at the McGuire site is assumed to use the existing cooling system, which would minimize incremental water-use and quality impacts. 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.

The staff assumed that a replacement nuclear plant located at the McGuire site would follow the current practice of obtaining process and fire-protection water from Lake Norman and potable water from the CMUD (Duke 2001a). The six groundwater wells that supply limited specific uses at the McGuire site would also likely continue to be used. Therefore, the impacts of a replacement nuclear plant on groundwater would be SMALL.

For alternate sites, the impact on the surface water would depend on the discharge volume and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the state of North Carolina. Overall, the impacts would be SMALL to MODERATE.

For a nuclear power plant at an alternate site, the impacts on groundwater would vary depending upon site-specific characteristics, including competitive uses in the aquifer and plant design. Withdrawal from groundwater aquifers would also be regulated by the State. Therefore, impacts to groundwater would range from SMALL to MODERATE.

- **Air Quality**

Construction of a new nuclear plant at the McGuire site or an alternate site would result in fugitive emissions during the construction process. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with diesel generators. These emissions would be regulated. Emissions from a plant sited in North Carolina would be regulated by the North Carolina Department of Environment and Natural Resources. 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. In addition to the impacts shown in Table B-1, construction-related debris would be generated during construction activities and removed to an appropriate disposal site. Overall, waste impacts are considered SMALL. Siting the replacement nuclear power plant at a site other than the McGuire site would not alter waste generation. Therefore, the impacts would be SMALL.

- **Human Health**

  Human health impacts for an operating nuclear power plant are set out in 10 CFR 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 the McGuire site would not alter human health impacts. Therefore, the impacts would be SMALL.

- **Socioeconomics**

  The construction period and the peak work force associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantified data, the staff assumed a construction period of 5 years and a peak work force of 2500. The staff assumed that construction would take place while the existing McGuire units continue operation and would be completed by the time McGuire permanently ceases operations. During construction, the communities surrounding the McGuire site would experience demands on housing and public services that could have MODERATE to LARGE impacts. These impacts would be tempered by construction workers commuting to the site from more distant communities and the fact that McGuire is located in a relatively urban area. After construction, the communities would be impacted by the loss of the construction jobs.

  The replacement nuclear units are assumed to have an operating work force comparable to the approximately 1345 workers currently working at McGuire Units 1 and 2. The replacement nuclear units would provide a new tax base to offset the loss of tax base associated with decommissioning of McGuire. The appropriate characterization of nontransportation socioeconomic impacts for operating replacement nuclear units constructed at the McGuire site would be SMALL.

  During the 5-year construction period, up to 2500 construction workers would be working at the McGuire site in addition to the 1345 workers at Units 1 and 2. The addition of the

construction workers could place significant traffic loads on existing highways, particularly those leading to the McGuire 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 McGuire and are considered SMALL.

Construction of a replacement nuclear power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. The communities around McGuire would still experience the impact of McGuire Units 1 and 2 operational job loss and the loss of tax base with potentially MODERATE impacts. The communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2500 workers at the peak of construction) and a permanent work force of approximately 1345 workers. In the GEIS, the staff noted that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction work force would need to move to the area to work (NRC 1996). The McGuire site is not considered a rural site. Alternate sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at a rural site could be LARGE. Transportation-related impacts associated with commuting construction workers at an alternate greenfield 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.

- **Aesthetics**

The containment buildings for a replacement nuclear power plant sited at McGuire and other associated buildings would likely be visible in daylight hours, especially from the north. Visual impacts could be mitigated by landscaping and selecting a color for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. No exhaust stacks would be needed. No cooling towers would be needed, assuming use of the existing once-through cooling system.

Noise from operation of a replacement nuclear power plant would potentially be audible offsite in calm wind conditions or when the wind is blowing in the direction of the listener. Mitigation measures, such as reduced or no use of outside loudspeakers, can be employed to reduce noise level and keep the impact SMALL to MODERATE.

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 were 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. Overall, the aesthetic impacts associated with locating at an alternative site can be categorized as SMALL to MODERATE; however, the impact could be LARGE if a new transmission line is needed to connect the plant to the power grid.

- **Historic and Archaeological Resources**

  At both the McGuire site and an alternate site, a cultural resources 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 McGuire 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 corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such 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 McGuire site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. 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 minority and low-income populations. Overall, however, impacts are expected to be SMALL.

  Impacts at an alternate greenfield site would depend upon the site chosen and the nearby population distribution. If a replacement nuclear plant were constructed at an alternate site, Mecklenburg County and the town of Huntersville would experience a loss of property tax revenue, which could affect their ability to provide services and programs. However, because the tax revenue attributable to McGuire is a relatively small percentage of total tax revenue for each jurisdiction, the impacts to minority and low-income populations are expected to be SMALL to MODERATE.

8.2.3.2 Closed-Cycle Cooling System

The environmental impacts of constructing a nuclear power plant at an alternate greenfield site using closed cycle cooling with cooling towers are essentially the same as the impacts for a

nuclear power plant using once-through cooling. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences. Although minor differences exist for closed-cycle cooling systems, the staff's findings regarding the environmental impacts of a nuclear power plant with once-through cooling remain bounding.

Table 8-7. Summary of Environmental Impacts of a New Nuclear Power Plant Sited at an Alternate Greenfield Site with Closed-Cycle Cooling

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 to 12 additional ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated by the state of North Carolina. Decreased water withdrawal and less thermal load on receiving body of water. Consumptive use of water due to evaporation from cooling towers.
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plume. Natural draft towers could be up to 158 m (520 ft) high. Mechanical draft towers could be up to 30 m (100 ft) high and also have an associated noise impact.
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 McGuire Units 1 and 2 OLs. Duke currently purchases power from other generators, and overall, North Carolina is a net importer of electricity.

Duke includes future power purchases in its Annual Plan (Duke 2001b). 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 2001 Plan shows power purchases of 1144 MW for the summer of 2002, gradually decreasing to 121 MW in the summer of 2007 (Duke 2001b). Duke purchases additional capacity in the short-term power market as necessary.

Imported power from Canada or Mexico is unlikely to be available for replacement of McGuire 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). The 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 gradually decrease to 47.4 billion kWh in year 2020 (DOE/EIA 2001b). On balance, it is unlikely that electricity imported from Canada or Mexico would be able to replace the McGuire capacity.

If power to replace McGuire capacity were to be purchased from sources within the United States or a foreign country, the generating technology likely would 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 environmental impacts associated with purchased electrical power alternative to renewal of the McGuire OLs. Under the purchased power alternative, the environmental impacts of imported power would still occur, but would be located elsewhere within the region, 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

The EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Oil-fired operation is more expensive than nuclear or coal-fired operation. In addition, 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 48 ha (120 ac) (NRC 1996).

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 North 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 [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 25 to 35 percent capacity factor compared to 80 to 95 percent for a baseload plant (NWPPC 2000). Nine offshore wind power projects are currently operating in Europe, but such projects have not been developed in the United States. The European plants together provide approximately 90 MW, which is far less than the electrical output of McGuire (British Wind Energy Association 2002). For the preceding reasons, the staff concludes that locating a wind-energy facility on or near the McGuire site or offshore as replacement for McGuire's generating capacity 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, cannot currently 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, land requirements are high—14,000 ha (35,000 ac) per 1000 MW(e) for photovoltaic (NRC 1996) and approximately 5700 ha (14,000 ac) per 1000 MW(e) for solar thermal systems (NRC 1996). Neither type of solar electric system would fit at the McGuire site, and both would have large environmental impacts at a greenfield site.

The McGuire 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 high cost, solar power is not deemed a feasible base-load alternative to renewal of McGuire 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 McGuire's generating capacity would likely result in LARGE environmental impacts.

8.2.5.4 Hydropower

North Carolina has an estimated 1458 MW of undeveloped hydroelectric resource (INEEL 1997). This amount is less than needed to replace the 2258 MW(e) capacity of McGuire. 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, the staff estimated that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac) per 1000 MW(e) (NRC 1996). Replacement of McGuire generating capacity would require flooding more than this amount of land. Due to the relatively low amount of undeveloped hydropower resource in North Carolina and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace McGuire's generating capacity the staff concludes that local hydropower is not a feasible alternative to renewal of the McGuire Unit 1 and 2 OLs. Any attempts to site hydroelectric facilities large enough to replace McGuire's generating capacity 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 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 McGuire Units 1 and 2. The staff concludes that geothermal energy is not a feasible alternative to renewal of the McGuire Units 1 and 2 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 suggest 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 base-load 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 McGuire Units 1 and 2 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. The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities. This is due to the need for specialized waste-separation and waste-handling equipment for municipal solid waste (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 alternative 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 McGuire and, consequently, would not be a feasible alternative to renewal of the McGuire Units 1 and 2 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 McGuire (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewal of the McGuire Units 1 and 2 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. Natural gas is typically used as the source of hydrogen.

Phosphoric acid fuel cells are generally considered first-generation technology. These are commercially available today at a cost of approximately $4500 per kW of installed capacity (DOE 2002). 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 has a performance target 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 approximately 3 MW at a cost of $1000 to $1500 per kW of installed capacity (DOE 2002). For comparison, the installed capacity cost for a natural-gas-fired combined-cycle plant is approximately $450 per kW (DOE/EIA 2001a). 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 2002). At the present time, however, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Fuel cells are, consequently, not a feasible alternative to renewal of the McGuire OLs.

8.2.5.10 Delayed Retirement

Duke Power's 2001 Annual Plan includes a list of Duke generating facilities projected to be retired (Duke 2001b). Through the year 2008, Duke projects that 23 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 McGuire. For this reason, delayed retirement of Duke generating units would not be a feasible alternative to renewal of the McGuire 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). These DSM savings are part Duke's long-range plan for meeting projected demand, and thus are not available offsets of McGuire capacity.

Duke currently has two residential DSM programs (Duke 2001b). The effects of the DSM programs are captured in the customer load forecast in the Duke Annual Plan (Duke 2001b). 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 air conditioning control program allows customers to receive billing credits during July through October in return for allowing Duke to interrupt electric service to their central air conditioners. The special needs energy product loan program provides loans to low-income customers 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 2001b).

Duke also operates two programs for commercial and industrial customers to provide a source of interruptible capacity (Duke 2001b). 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 generating units. 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 2001b).

The staff concludes that additional DSM, by itself, would not be sufficient to replace the 2258 MW(e) capacity of McGuire; therefore it is not a reasonable replacement for renewing the McGuire OLs.

8.2.6 Combination of Alternatives

Even though individual alternatives to renewing the McGuire OLs might not be sufficient on their own to replace McGuire'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, McGuire Units 1 and 2 have a combined average net capacity of 2258 MW(e). For the natural gas combined-cycle alternative, Duke assumed five 482-MW units in its ER as potential replacements for the two McGuire units.

There are many possible combinations of alternatives. Table 8-8 contains a summary of the environmental impacts of an assumed combination of alternatives consisting of 1928 MW(e) of combined-cycle natural-gas-fired generation at the McGuire site using the existing once-through cooling system and at an alternate greenfield location using closed-cycle cooling, 165 MW(e) purchased from other generators, and 165 MW(e) gained from additional DSM measures. The impacts associated with the combined-cycle 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 McGuire OLs.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, renewal of the McGuire OLs, are SMALL for all impact categories (except collective offsite radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal, for which a single significance level was not assigned). Alternative actions (i.e., the no-action alternative [discussed in Section 8.1], new generation alternatives [from coal, 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]) were considered.

The no-action alternative would require replacing electrical generating capacity by (1) DSM and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than McGuire Units 1 and 2, or (4) some combination of these options that

Table 8-8. Summary of Environmental Impacts for an Assumed Combination of Generating and Acquisition Alternatives

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE to LARGE	24 ha (40 ac) for powerblock, roads, and parking areas. Possible additional impact for construction of an underground gas pipeline.	MODERATE to LARGE	58 ha (144 ac) for power-block, offices, roads, and parking areas. Additional impact for construction of an underground natural gas pipeline and a transmission line.
Ecology	MODERATE to LARGE	Uses undeveloped areas at McGuire site plus land for a new gas pipeline.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission and pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity; impacts to terrestrial ecology from cooling tower drift.
Water Use and Quality	SMALL	Uses existing once-through cooling system.	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body. Discharge of cooling tower blowdown will have impacts.
Air Quality	MODERATE	Sulfur oxides • 25 MT/yr (28 tons/yr) Nitrogen oxides • 375 MT/yr (414 tons/yr) Carbon monoxide • 350 MT/yr (386 tons/yr) PM_{10} particulates • 208 MT/yr (230 tons/yr) Some hazardous air pollutants	MODERATE	Same as siting at McGuire.
Waste	SMALL	Small amount of ash produced.	SMALL	Small amount of ash produced.

Table 8-8 (contd)

	McGuire Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.
Socioeconomics	MODERATE	During construction, impacts would be MODERATE. Up to 1200 additional workers during the peak of the 3-year construction period, followed by reduction from current McGuire Units 1 and 2 workforce of 1345 to approximately 120; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	MODERATE	Construction impacts depend on location, but could be significant if location is in a rural area. Mecklenburg County and the town of Huntersville would experience loss of tax base and employment with potentially MODERATE impacts. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE	MODERATE aesthetic impact from plant and stacks.	MODERATE to LARGE	MODERATE impact from plant, stacks, and cooling towers and associated plumes. Additional impact that could be LARGE if a new transmission line is needed.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely 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 approximately 1225 operating jobs at McGuire could reduce employment prospects for minority and low-income populations.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup at site. Mecklenburg County and the town of Huntersville would lose tax revenue which could have SMALL to MODERATE impacts on minority and low-income populations.

would result in decommissioning McGuire 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 McGuire 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 McGuire 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 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National Primary and Secondary Ambient Air Quality Standards."

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 March 5, 2002).

C & A Carbone, Inc. v. Town of Clarkstown, 511 U.S. 383, (U.S. Supreme Court 1994).

Clean Air Act (CAA). 42 USC. 7491, et seq.

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

Duke Energy Corporation (Duke). 2001b. *The Duke Power Annual Plan*. September 1, 2001. Charlotte, North Carolina.

Elliott, D.L., G.G. Holladay, W.R. Barchet, H.P. Foote, and W.F. Sandusky. 1986. *Wind Energy Atlas of the United States*. DOE/CH 10093-4. <http://rredc.nrel.gov/wind/pubs/atlas/titlepg.html> (accessed March 25, 2002)

Gabbard, A. 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 December 10, 2001).

Idaho National Engineering and Environmental Laboratory (INEEL). 1997. *U.S. Hydropower Resource Assessment for North Carolina*. DOE/ID-10430(NC). Idaho Falls, Idaho. October 1997. <http://hydropower.inel.gov/state/nc/nc.pdf> (accessed December 10, 2001).

Integrated Waste Services Association. 2001. "About Waste to Energy." <http://www.wte.org/waste.html> (accessed February 20, 2002).

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

Northwest Power Planning Council (NWPPC). 2000. "Northwest Power Supply Adequecy/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://www.eia.doe.gov/bookshelf/renew.html> (accessed February 19, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2001a. *Annual Energy Outlook 2002 With Projections to 2020*. DOE/EIA-0383(2002). Washington, D.C. <http://www.eia.doe.gov/oiaf/fore_pub.html> (accessed February 19, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2001b. *International Energy Outlook 2001*. DOE/EIA-0484(2001). Washington, D.C. <http://www.eia.doe.gov/oiaf/fore_pub.html> (accessed February 19, 2002).

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2001c. *Renewable Energy 2000: Issues and Trends*. DOE/EIA-0628(2000). Washington, D.C. <http://tonto.eia.doe.gov/FTPROOT/renewables/06282000.pdf> (accessed February 19, 2002).

U.S. Department of Energy (DOE). 2001a. "U.S. Wind Energy Resource Map." <http://www.eren.doe.gov/wind/we_map.html> (accessed March 25, 2002).

U.S. Department of Energy (DOE). 2002. "Fuel Cell Technology." <http://www.fe.doe.gov/coal_power/fuelcells/index.shtml> (accessed March 27, 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 49422. 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. "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels." 65 FR 32214. May 22, 2000.

U.S. Environmental Protection Agency (EPA). 2000b. "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). 2001. "Municipal Solid Waste Disposal." <http://www.epa.gov/epaoswer/non-hw/muncpl/disposal.htm> (accessed February 19, 2002).

U.S. Federal Aviation Administration (FAA). 2000. "Obstruction Marking and Lighting." Advisory Circular AC 70/7460-1K.

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. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. Draft Supplement Dealing with Decommissioning of Nuclear Power 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 McGuire Nuclear Station, Units 1 and 2 (McGuire) up to an additional 20-year period (Duke 2001b). 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 of the current OLs, which expire June 12, 2021, for Unit 1, and March 3, 2023, 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 Plant*s (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)]

Upon acceptance of the McGuire 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 (66 FR 44386 [NRC 2001]) on August 23, 2001. The staff visited the McGuire site in September 2001 and held public scoping meetings on September 25, 2001, in Huntersville, North Carolina (NRC 2001). The staff reviewed the Duke Environmental Report (ER; Duke 2001a) 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 McGuire. 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 10, 2002, the NRC published the Notice of Availability of the draft SEIS in 67 FR 31846 (NRC 2002). A 75-day comment period began on the date of publication of the U.S. Environmental Protection Agency (EPA) Notice of Filing of the draft SEIS, to allow members of the public to comment on the preliminary results of the NRC staff's review. During 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.

comment period, the staff held two public meetings in Huntersville, North Carolina, on June 12, 2002, to describe the preliminary results of the NRC SEIS, to answer questions, and to provide members of the public with information to assist them in formulating their comments. At the end of the comment period, the staff considered and dispositioned all of the comments received. 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 OL) 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 a licensee continues to operate a nuclear power plant beyond the period of the OL.

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

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

> need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) and in accordance with § 51.23(b).[(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. In the GEIS, the NRC staff evaluated 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 staff made the following findings:

(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 [HLW] and spent fuel disposal).

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

These 69 issues were identified by the staff in the GEIS as Category 1 issues. In the absence of new and significant information, the staff relied on conclusions as amplified by supporting

---

(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."

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 McGuire OLs) and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's (DOE's) Energy Information Administration (EIA), natural-gas- and coal-fired generation appear to be the most likely power-generation alternatives if the power from McGuire is replaced. These alternatives were evaluated assuming that the replacement power generation plant is located at either the McGuire site or some other unspecified location.

9.1 Environmental Impacts of the Proposed Action—License Renewal

Duke and the NRC staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Duke nor the staff has identified any 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 McGuire 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 McGuire.

Duke's license renewal application presents analyses of the Category 2 issues that are applicable to McGuire 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. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at McGuire. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Duke (2001a) 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 McGuire for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to the Proposed William B. McGuire Nuclear Station Units 1 & 2, Duke Power Company* (AEC 1972).

Eleven 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 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. Although one of the SAMAs related to hydrogen control in station blackout sequences is cost beneficial and offers a level of risk reduction, 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, although it is being pursued as a Generic Safety Issue for the current operating license.

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 McGuire 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 McGuire during its current license period was made when the plant was built. The resource commitments to be considered in this SEIS are associated with continued operation of the plant for 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 63 fuel assemblies in each of the two units during every refueling outage, which occurs on an 18-to 24-month cycle. Assuming no change in use rate, about 1638 spent fuel assemblies would be required for operation during a 20-year license renewal period (Duke 2001a).

The likely power generation alternatives if McGuire 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 McGuire site was set when the plants were approved and construction began. That balance is now well-established. Renewal of the OLs for McGuire 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 McGuire 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 McGuire. 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 McGuire. 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- or gas-fired generation of power at the McGuire site and an unspecified "greenfield site," and a combination of alternatives are compared in Table 9-1. Continued use of a once-through cooling system for McGuire is assumed for Table 9-1.

Substitution of a cooling tower for the once-through cooling system in the evaluation of the nuclear and gas- and coal-fired generation alternatives would result in some greater environmental impact differences in some impact categories. For example, use of cooling towers would have a greater aesthetic impact than once-through cooling.

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 Recommendation

Based on (1) the analysis and findings in the GEIS (NRC 1996, 1999), (2) the ER submitted by Duke (Duke 2001a), (3) consultation with other Federal, State, and local agencies, (4) the staff's own independent review, and (5) the staff's consideration of public comments, the recommendation of the staff is that the Commission determined that the adverse environmental impacts of license renewal for McGuire 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

Impact Category	Proposed Action–License Renewal	No Action Alternative–Denial of Renewal	Coal-Fired Generation		Natural-Gas-Fired Generation		New Nuclear Generation		Combination of Alternatives	
			McGuire Site	Greenfield Site[a]	McGuire Site	Greenfield Site[a]	McGuire Site	Greenfield Site[a]	McGuire Site	Greenfield Site[a]
Land Use	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE
Ecology	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE	SMALL	SMALL	MODERATE	MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health[b]	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socio-economics	SMALL	SMALL to MODERATE	MODERATE to LARGE	MODERATE to LARGE	MODERATE	MODERATE	MODERATE to LARGE	MODERATE to LARGE	MODERATE	MODERATE
Aesthetics	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE
Historic and Archaeo-logical Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environ-mental Justice	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE

(a) A greenfield site is assumed, for the purpose of bounding potential impacts, to be an undeveloped site with no previous construction.
(b) Excludes 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."

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

Duke Energy Corporation (Duke). 2001b. *Application to Renew the Operating Licenses of McGuire Nuclear Station, Units 1 and 2 and Catwba Nuclear Station, Units 1 and 2*. Charlotte, North Carolina.

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

U.S. Atomic Energy Commission (AEC). 1972. *Final Environmental Statement Related to the Proposed William B. McGuire Nuclear Station Units 1 & 2, Duke Power Company*. Docket Nos. 50-369 and 50-370, 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). 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, McGuire Nuclear Station, Units 1 and 2; Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." 66 FR 44386. August 23, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2002. "Duke Energy Corporation, McGuire Nuclear Station, Units 1 and 2; Notice of Availability of the Draft Supplement 8 to the Generic Environmental Impact Statement and Public Meetings for the License Renewal of McGuire Units 1 and 2." 67 FR 31846. May 10, 2002.

Appendix A

Comments Received on the Environmental Review

Appendix A

Comments Received on the Environmental Review

Part I - Comments Received During Scoping

On August 23, 2001, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the *Federal Register* (66 FR 44386), 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 McGuire Nuclear Station, Units 1 and 2 (McGuire) 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), Council on Environmental Quality (CEQ) guidelines, and 10 CFR Part 51. As outlined by NEPA, the NRC initiated the scoping process by issuing the Notice of Intent. 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 October 21, 2001.

The scoping process included two public scoping meetings, which were held at the Central Piedmont Community College in Huntersville, North Carolina, on September 25, 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-six attendees (five 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 October 12, 2001. In addition to the comments provided during the public meetings, five e-mail messages 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 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, (McGuire Scoping Summary Report, dated March 27, 2002), the unique identifier used in that report for each set of comments is retained in this report.

Table A-1. Individuals Providing Comments During Scoping Comment Period

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
A	James Harrill	Mayor, Stanley, NC	Afternoon Scoping Meeting
B	Wayne Broome	Director, Charlotte-Mecklenburg Emergency Management	Afternoon Scoping Meeting
C	Larry Dickerson	Iredell County Emergency Management	Afternoon Scoping Meeting
D	Thurman Ross	Cornelius, NC	Afternoon Scoping Meeting
E	Brew Barron	Site Vice President, McGuire Nuclear Station	Afternoon Scoping Meeting
F	Dayna Herrick	Engineering Supervisor, McGuire Nuclear Station	Afternoon Scoping Meeting
G	Melanie O'Connell-Underwood	Mooresville-South Iredell Chamber of Commerce	Afternoon Scoping Meeting
H	John Gibb		Afternoon Scoping Meeting
I	Rosemary Hubbard	Charlotte Women for Environmental Justice/Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
J	Allen Hubbard		Afternoon Scoping Meeting
K	Scott Hinkle	Executive Director, Lake Norman Times	Afternoon Scoping Meeting
L	Sally Ashworth	Chairwoman, Lake Norman Convention and Visitors Bureau	Afternoon Scoping Meeting
M	Constance Kolpitcke		Afternoon Scoping Meeting
N	Catherine Mitchell	Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
O	Joan Bodonheimer	Teacher, Long Creek Elementary School	Afternoon Scoping Meeting
P	Don Moniak	Organizer, Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
Q	Lou Zeller	Community Organizer, Blue Ridge Environmental Defense League	Afternoon Scoping Meeting
R	Don Moniak	Organizer, Blue Ridge Environmental Defense League	Evening Scoping Meeting
S	Tommy Almond	Deputy Fire Marshall, Gaston County Emergency Management	Evening Scoping Meeting
T	Brew Barron	Site Vice President, McGuire Nuclear Station	Evening Scoping Meeting

Table A-1 (contd)

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
U	Dayna Herrick	Engineering Supervisor, McGuire Nuclear Station	Evening Scoping Meeting
V	Tim Gestwicki	North Carolina Wildlife Federation	Evening Scoping Meeting
W	Lou Zeller	Community Organizer, Blue Ridge Environmental Defense League	Evening Scoping Meeting
X	Donna Lizenby	Catawba Riverkeeeper	Evening Scoping Meeting
Y	Bill Russell	President, Lake Norman Chamber of Commerce	Evening Scoping Meeting
Z	Paul Smith	President, Mooresville-South Iredell Chamber of Commerce	Evening Scoping Meeting
AA	Mitch Eisner	Principal, Catawba Springs Elementary School	Evening Scoping Meeting
AB	Catherine Mitchell	Blue Ridge Environmental Defense League	Evening Scoping Meeting
AC	Jim Gilpin	Private Environmental Consultant	Evening Scoping Meeting
AD	Bob Mahood		Evening Scoping Meeting
AE	Dan Faris		Evening Scoping Meeting
AF	Alton Beasley		Electronic mail
AG	Dottie Toney		Electronic mail
AH	Mark Gilliss	Mechanical Engineer	Electronic mail
AI	Jim Matthews		Electronic mail
AJ	Hager		Electronic mail

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 McGuire license renewal application.

- Questions that do not provide new information.

- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations. 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 McGuire 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 McGuire 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 ML020870574.

These accession numbers are 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 Surface Water Quality, Hydrology, and Use Issues

A.1.2 Comments Concerning Aquatic Ecology Issues

A.1.3 Comments Concerning Terrestrial Resource Issues

A.1.4 Comments Concerning Threatened and Endangered Species Issues

A.1.5 Comments Concerning Air Quality 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 Comments Received during Scoping Process that are Applicable to this Environmental Review

A.1.1 Comments Concerning Surface Water Quality, Hydrology, and Use Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 water quality issues include:

- Impacts of refurbishment on surface water quality
- Impacts of refurbishment on surface water use
- Altered current patterns at intake and discharge structures
- Altered salinity gradients
- Altered thermal stratification of lakes
- Temperature effects on sediment transport capacity
- Scouring caused by discharged cooling water
- Eutrophication
- Discharge of chlorine or other biocides
- Discharge of sanitary wastes and minor chemical spills
- Discharge of other metals in waste water
- Water use conflicts (plants with once-through cooling systems)

Comment: Duke Energy has conducted water quality and aquatic ecology testing on Lake Norman since the early 1970s. The areas that we study include water quality, water flow at the intake and discharge structures, and aquatic ecology. (F-2)

Comment: We had clean water and clean air. Over these many years, however, we have seen a tremendous degradation of our groundwater, our rivers, our streams, and our air. And Duke Energy has been a great contributor to that. (I-3)

Comment: In terms of the environmental impact of the plant, which is incredibly, and remarkably negligible, Lake Norman is among the most cleanest, it is among the most cleanest and environmentally sound bodies of water in the eastern United States. It is a wonderful resource for thousands of people, if not hundreds of thousands of people use each and every day. It is an incredibly clean source of drinking water for our communities. (K-2)

Comment: The areas that we routinely study include water quality, water flow at the intake and discharge structures, and aquatic ecology. (U-2)

Response: *The comments are noted. Surface water quality is a Category 1 issue and will be discussed in Chapter 2 of the SEIS. The comments provide no new information; therefore, the comments will not be evaluated further.*

A.1.2 Comments Concerning Aquatic Ecology Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 and 2 aquatic ecology issues include:

Category 1

- Accumulation of contaminants in sediments or biota
- Entrainment of phytoplankton and zooplankton
- Cold shock
- Thermal plume barrier to migrating fish
- Distribution of aquatic organisms
- Premature emergence of aquatic insects
- Gas supersaturation (gas bubble disease)

- Low dissolved oxygen in the discharge
- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses
- Stimulation of nuisance organisms

Category 2

- Entrainment of fish and shellfish in early life stages
- Impingement of fish and shellfish
- Heat shock

Comment: Our evaluation of the historical data has indicated that we have made no changes to the aquatic resources on Lake Norman. And our continued operation will not have an adverse impact on the lake or the river. (F-3)

Comment: Our evaluation of this data has shown that we have made no changes to Lake Norman's aquatic resources, and our continued operations will continue that. We will not adversely impact the lake or the river. (U-3)

Comment: The second point I would like to address is the protection of the water resources. Duke has taken several steps to preserve this resource through continuing biological studies of the lakes. (AC-3)

Response: *The comments are noted and are supportive of license renewal at McGuire. Aquatic ecology will be discussed in Chapters 2 and 4 of the SEIS. The comments provide no new information; therefore, they will not be evaluated further.*

Comment: First of all, McGuire Nuclear does not have cooling water structures of any kind. It was built several years before Catawba. Catawba has cooling water structures. And so some kind of cooling water structure on McGuire would profoundly decrease the thermal shock, and the chronic thermal temperature impacts on Lake Norman. Finally, I wanted to bring to your attention that I believe the failure to have any kind of cooling water intake, a cooling water structure on McGuire is an inequitable application of the law in the United States. Many other nuclear facilities are required to have cooling water structures. Catawba has them, and particularly in the southeast where our temperatures are high in the summertime, we need some kind of cooling water structure on McGuire Nuclear. A substantial component of the -- it

should revolve around, not if cooling structures are needed, but should be required as a condition of the relicense. (X-1)

Comment: Duke Energy, Duke Power also has an NPDES, which is national pollution discharge elimination system permit variance for their delta T above state standards for hot water discharge. And also above EPA recommended levels for hot water discharges. McGuire has, I believe, and you all correct me if I'm wrong, but you all have, the NPDES permit provides an unlimited discharge of non-contact cooling water for North Carolina, is that right? No, I'm talking volume, not temperature. I'm pretty sure it is an unlimited discharge volume metrically. I just wanted to say that there are profound environmental impacts on aquatic life due to chronic effects of thermal impact from hot water into the aquatic environment. And I will give everyone here three brief examples that are well noted in the literature. Let's take, for example, the zooplankton *Ceriodaphnia*. *Ceriodaphnia* can survive about 108 days when water temperature is approximately 45 degrees. However, they only typically survive about 26 days when water temperature is about 82 degrees. I take the Riverkeeper patrol boat into the discharge areas of all of McGuire's plants, and we call them hot holes, here locally. And there are a lot of fishermen there, typically. And it is not uncommon for me to see water coming out of those hot water discharges at 95 degrees. And that is a profound environmental impact. Not only does it affect zooplankton, and provide lethal thermal shock, as well as chronic lethal effects, it also affects reproduction, and has lethal impacts for other aquatic species. For example, the upper lethal limit for bass is about 85 degrees Fahrenheit. And, typically, as I've said in the summertime it is not uncommon, and even in the winter, for me to find the water coming out of many of Duke's plants above 90 degrees. Hot water discharges also affects reproductivities of aquatic life. For example, the release of glocchidia from *Corbicula*. And for those non- science people, the release of immature young from clams relies on environmental cues. Specifically they rely on water temperature cues, as they rise in the spring, it triggers reproduction. And so hot water discharges, like the one from McGuire, can create a profound environmental impact. Additionally cooling water structures provide for recycling of water. The intake structures are huge, and the outflow structures are huge. And when there is a cooling water intake structure, a cooling water structure of some kind that cools the non-contact water, what happens is that the water, because it is non-contact, can be recirculated, rather than having to continuously withdraw water from the Catawba river, run it through the system once, and discharge it. And so some kind of cooling water structure on McGuire would profoundly decrease the thermal shock, and the chronic thermal temperature impacts on Lake Norman. (X-2)

Comment: When we also look at McGuire nuclear in relation to its cumulative impact on Lake Norman, we find that Marshall steam station has a very large hot water discharge above McGuire. And so the EIS, and the relicensing process, should take into account the impact of Marshall. It should take into account the cumulative impact to all of Lake Norman, considering the other thermal impacts from other discharges in the Lake Norman reservoir. Finally I would also like to ask the Nuclear Regulatory Commission to do a detailed analysis for the thermal

impacts, and the need for cooling structure at McGuire, including the cumulative impacts of Marshall upstream. (X-3)

Comment: In talking with the gentlemen from Duke, they indicated that the proper venue for this discussion of thermal impacts was through the NPDES permitting process. I respectfully disagree with the gentlemen, and I believe it should be included in the relicensing discussions and documentation, and the environmental scoping documents, the impact statements, and would like to see that included. (X-4)

Comment: I think Donna's comments were pretty much on mark, of looking at the possibility of cooling water, and cooling towers. (AC-4)

Comment: The high temperature of the water discharged into Lake Norman is a negative effect that cannot be ignored. Instead of fixing the problem, Duke merely lobbied for an exemption from the law. Skirting the law is becoming all to common for Duke Energy. (AI-4)

Response: *The comments are noted. The comments pertain to heat shock, which is a Category 2 issue and will be addressed in Chapter 4 of the SEIS.*

A.1.3 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: And I can tell you that they are very viable, and apparently very healthy members of the accipiter family, buteo family, as well as the osprey, along Lake Norman, along Lake Wiley. So from my personal observations, at least as far as the birds of prey are concerned, not only are they viable, but they are healthy. (C-2)

Comment: However, McGuire has a thriving population of osprey, wild turkey, deer, and numerous other species. And we have many ongoing environmental initiatives that we manage in cooperation with the North Carolina Wildlife Resources Commission, the Wildlife Federation, Mecklenburg County Parks and Rec, and the Wild Turkey Federation. We are also wildlife and industry, together, certified by the North Carolina Wildlife Federation. We have a certified backyard habitat. We have a wood duck pond, a blue bird trail, an herbivore pond, a fish friendly pier, and numerous other wildlife areas on-site. Based on our review of our operating history, and a look at our continued operation, we have concluded that we will not adversely impact the plants and animals on-site. (F-5)

Comment: However, we do have a thriving population of wild turkey, osprey, deer, and numerous other species. We have many ongoing environmental initiatives that we manage in cooperation with the North Carolina Wildlife Resources Commission, the Wildlife Federation, Mecklenburg County Parks and Rec, and Wild Turkey Federation. We are wildlife and industry together certified by the North Carolina Wildlife Federation. We have a certified backyard habitat, bluebird trails, wildlife food plots, a herbivore pond, a fish friendly pier, and I can go on, the wildlife areas that we maintain on the McGuire site. Based on our review of our operating history, and a look at continued operation, again, we conclude that we will not adversely impact plants and animals at McGuire. (U-5)

Comment: McGuire Nuclear Station is the second corporate site in North Carolina to be certified as a Wildlife and Industry Together Site. This unique program recognizes companies across our state that exhibit wildlife stewardship on their properties. For example at McGuire instead of excess parking lots, there are planted food plots for turkey and deer. Instead of underutilized fescue acreage, there are butterfly gardens, songbird meadows, and bluebird, owl and hawk nesting boxes. An osprey platform has also been erected down by the lake. (V-1)

Comment: Most importantly McGuire has fostered relationships with the communities in the area. McGuire allows public wildlife viewing, and educational opportunities in the areas throughout their site. Just one example is McGuire's nature trail, which coincidentally goes through one of the first areas ever designated by the National Audubon Society as a very important bird designation area. I think that the signs at the front entrance of McGuire tell it all. They proudly proclaim, in big bold letters, wildlife habitat enhancement program, and wildlife and industry together. (V-3)

Comment: Simply put the folks at McGuire have embraced their surroundings. They have sought to enhance their property, and their community relations through wildlife enhancement and education. They have realized that these concerns serve not only the betterment of wildlife itself, but of the community as a whole. (V-4)

Response: *The comments are noted. The comments discuss the participation of Duke in programs to protect the environment. They provide no new information and will not be evaluated further. The appropriate descriptive information regarding the plant-specific ecology of the site will be addressed in Chapters 2 and 4 of the SEIS.*

A.1.4 Comments Concerning Threatened and Endangered Species Issues

As stated in 10 CFR Part 51, Table B-1, Category 2 threatened or endangered species issues are:

- Threatened or endangered species

Comment: As part of our study Duke Energy worked with Dr. L.L. "Chick" Gaddy, a well known environmental scientist, to conduct a survey of threatened and endangered species around the McGuire site. And the results of that study showed that there are no endangered or threatened species at the McGuire site. (F-4)

Comment: The second category is plants and animals. As part of our study we worked with Dr. L. L. "Chick" Gaddy, a well-known environmental scientist, to do a survey of threatened and endangered species around McGuire. The results of that study is that there are no federally or state listed threatened or endangered species on the McGuire site. (U-4)

Response: *The comments are noted. They provide no new information and will not be evaluated further. The appropriate descriptive information regarding the plant-specific ecology of the site will be addressed in Chapters 2 and 4 of the SEIS.*

A.1.5 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: The third category we looked at was air quality. For the past 20 years McGuire has not adversely impacted the air quality in this region. And there is nothing associated with license renewal that would change that. (F-6)

Comment: We had clean water and clean air. Over these many years, however, we have seen a tremendous degradation of our groundwater, our rivers, our streams, and our air. And Duke Energy has been a great contributor to that. (I-3)

Comment: The third category we looked at was air quality. You may not know, but nuclear power provides almost 50 percent of Duke Energy's total electric generation in the Piedmont Carolinas, and because of that overall emissions from that generation system are well below the national average. For the past 20 years McGuire has not adversely impacted the air quality in this region, and there is nothing about continued operations, or license renewal that will change that. (U-6)

Comment: And then this happens. Going and lobbying and saying, let's not have these stringent regulations, we don't have to have air that clean. So that shakes me. (AD-3)

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 the State. 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; 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:

Category 1

- Public services: public safety, social services, and tourism and recreation
- Public services, education (license renewal term)
- Aesthetics impacts (refurbishment)
- Aesthetics impacts (license renewal)
- Aesthetics impacts of transmission lines (license renewal term)

Category 2

- 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: So from a personal point I think they are good neighbors. We have even been out to their grounds for gatherings, family gatherings, and church gatherings. (D-1)

Comment: We do a number, they participate in a number of community support activities. Catawba Spring School, Long Creek Elementary School, clean cast fishing events for local children, Boy Scouts and Girl Scouts events, United Way and Arts and Science Council campaigns. Supporting the community is a priority for them. (E-4)

Comment: As Brew mentioned earlier, our employees spend thousand of hours, every year, volunteering for school, and civic, and church programs, and groups. We are proud to be part of this community. (F-9)

Comment: I cannot tell you the impact, as far as economic impact, that Duke Power does, and represents with our hospitality industry. We are looking at exit 36 to exit 18. (L-1)

Comment: And the economic impact that they do on our hospitality industry, and as Scott Hinkle has just said, with the tragedy that happened two weeks ago, it still remains, we have to have somebody like that, that keeps our hotels running as well as they have. (L-4)

Comment: About five years ago Duke Power adopted our school and initiated a Pony Express writing program, where the students have a pen pal. As you can see, Duke Power is very actively involved I our community, and it is a very important part of our school at Long Creek Elementary. (O-1)

Comment: At Christmas time the pen pals come to our school bringing gifts for each child. They also have expanded their program to help needy families at our school. (O-2)

Comment: We do a lot of things in the community. Our employees give a lot of their time to the betterment of their communities and their neighbors. We have had an 11-year partnership with the Catawba Springs Elementary School providing help in math and reading and computer skills; a pen pal partnership with the Long Creek Elementary School; we hold clean cast fishing

events for local children; we hold Boy Scouts and Girl Scouts events; we hold annual United Way and Arts and Science Council drives. Last year the McGuire employees contributed 160,000 dollars to their communities through United Way agencies, and the United Way campaign. (T-4)

Comment: As Brew mentioned earlier, our employees spend thousands of hours every year volunteering for church, community, school, civic groups, and programs. We are proud to be part of this community. (U-9)

Comment: McGuire has been instrumental in creating many of these learning opportunities. Opportunities such as learning about wildlife habitat, and then actually putting that knowledge to use, like the students at East Lincoln High School, who created a backyard wildlife habitat at McGuire, and were subsequently recognized by the National Wildlife Federation for this honor. And all the kids that get to learn about water quality and fishing do collaborative family fishing days that McGuire hosts. And the kids that are introduced to safe, ethical sportsmen activities through the nationally recognized JAKES, juniors acquiring knowledge, ethics, and sportsmanship, also hosted and sponsored by McGuire. These wildlife education programs require a commitment and rely on enduring partnerships. That is why McGuire is recognized as a Wildlife and Industry Together Site. McGuire has developed and sustained partnerships that allow continuing wildlife projects, such as the annual butterfly and bird inventories with Mecklenburg Parks, hosting composting workshops with county waste reduction, hosting environmental workshops for our state's educators, in conjunction with the state, through project WILD. (V-2)

Comment: In addition to assisting with the business and industry recruitment, McGuire has been an annual sponsor of the Chamber's leadership program by inviting participants to spend a day on-site learning about electric supply and the McGuire station. (Z-3)

Comment: Furthermore, Duke Energy, McGuire, we've had a partnership for 11 years now, with our school. We have seen many individuals come to our school from McGuire in many capacities, helping the children. They have provided assistance with grant opportunities for the school systems. They have provided assistance in developing a computer lab, provided coats for children, assisted in grading our land. They've assisted with volunteers in our school. (AA-2)

Response: *The comments are noted. The comments are supportive of license renewal at McGuire. Public services were evaluated in the GEIS and determined to be a Category 1 issue. Information regarding the impact on education will be discussed in Chapter 4 of the SEIS. Socioeconomic issues will be addressed in Chapters 2 and 4 of the SEIS. The comments provide no new information; therefore, the comments will not be evaluated further.*

Comment: It (McGuire) is a great impact on our economy. It brings in a lot of money, a lot of good employees in this area. (A-2)

Comment: As far as the economic around here, I have a lot of friends that work at Duke Power. They have been at Duke for a while, and it is a huge impact on the economy. (D-3)

Comment: Over the last five years we've paid nine million annually in property taxes to Mecklenburg County. We have 1,100 employees that helped maintain a strong economy in the area. And our annual payroll of over 77 million, helps to support local business and industry. (F-8)

Comment: The McGuire nuclear plant employs over 1,000 employees. And I'm a little off in the statistics you just gave, but approximately 80 percent of these employees live within a 30 mile drive of the facility. Their payroll alone, which is close to 80 million, only multiplies as it is spent in our community. (G-2)

Comment: The property taxes to our neighboring county, Mecklenburg, of now eight million, are paying significant contributions in our schools, roads, libraries, police, fire, and it just keeps going. (G-3)

Comment: In addition to being safely operated we provide many benefits to the community. Over the last five years we've paid nine million, annually in property taxes to Mecklenburg county. We have 1,100 employees who help to maintain a strong economy in this area. And our annual payroll of over 77 million helps to support local business and industry. (U-8)

Comment: As President of the Chamber I'm very interested in attracting new business to our area. Reliable and affordable electricity is always a major factor for business who are considering a location. Duke Power has attractive rates, and the power has been reliable for Lake Norman Regional. My understanding from Duke is that 20 percent of their generation comes from McGuire. It makes good business sense to keep that supply source around for an additional 20 years. (Z-2)

Response: *The comments are noted. The comments are supportive of license renewal at McGuire. Socioeconomic issues specific to the plant are Category 2 issues and will be addressed in Chapter 4 of the SEIS. The comments provide no new information; therefore, the comments 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: In the event of a severe accident, when the reactor fuel melts, the risk that reactor containment will rupture, and large releases of radioactive material get into the environment, will occur at significantly greater at Catawba and McGuire than at other pressured water reactors with other types of containment. There is no backup system for reactor containment. The steel containment vessel is the only one. Other plant systems may have backups. (Q-7)

Response: *The comment is noted. Severe accidents were evaluated in the GEIS and the impacts were determined to be small for all plants. A site-specific analysis of Severe Accident Mitigation Alternatives will be performed by the NRC staff in the SEIS for McGuire. The comment provides no new information; therefore, the comment 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: I don't think we should renew any of our nuclear plants licenses across the country until there has been a solution of what to do with the nuclear radioactive waste that is accumulating. There is nothing to be done with it. So if you don't have a solution to a problem, why keep adding to the problem and keep creating more waste, with nobody knowing what to do with it? (M-1)

Comment: It (spent fuel) is a potential fire bomb if a terrorist comes in with a plane and just suicides, kamikaze-like, into these ceramic, whatever enclosures are housing this waste, that as I understand is sitting outdoors on concrete pads. But let's don't sacrifice the lives of our posterity. Maybe it won't happen for another 100, 200, 300 years, but do we want to be responsible for letting some disaster happen, when we don't have to? (M-2)

Comment: Spent fuel, is that within the scope of the EIS, or outside? (R-15)

Comment: The first is the long-term handling and storage of the radioactive waste, particularly the high level radioactive waste generated with the spent fuel rod assemblies. I have asked the question, and you have heard from others here, how open Duke Power is on asking questions, and their answering them. I asked the question, I said, how good is your long term storage? And here is the reply I got. Approximately 50 fuel rod assemblies are replaced each year, although not every 365 days, but on a different schedule. And they are currently permitted at the McGuire site for on-site storage for up to about 2,200 fuel rod assemblies. If one does a quick math, you can figure out that they've got just about a 40 year permitted area for the spent fuel rods on-site. And that does not include the possible disposal of central facility, that we have already talked about, with Yucca Mountain. (AC-2)

Comment: Is the waste stored inside the reactor shell which is so strong, and all that, or is it in another building, or is it in fact sitting around outdoors, the way it is at some nuclear plants? (AD-6)

Comment: The spent fuel storage problem is reason enough to decline the license renewal request. The Nitrogen-16 EMF radiation detectors at McGuire are picking up gamma rays from the spent fuel dry casks. This was not supposed to happen. What other little surprises will develop from storing spent fueling dry casks? The problem is not getting better; it is getting worse. (AI-8)

Response: *The comments are noted. 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 comments provide no new information; therefore, the comments will not be evaluated further.*

A.1.9 Comments Concerning Alternative Energy Sources

Comment: And part of this analysis we reviewed various alternatives to license renewal. We looked at solar, wind, conventional fossil generation, as methods to be able to replace McGuire. But none of those alternatives were selected. We didn't select them because of their high cost, relatively low electrical output, land use impacts, and other environmental impacts. (E-7)

Comment: I believe in nuclear generation, I believe it is the environmentally responsible way to create electricity. It is obviously, cleaner than fossil. And it is, obviously, an economical way to create electricity. (K-7)

Comment: I think we need to concentrate on developing alternative energy sources. A gentleman spoke that they had eliminated, they had looked at solar, and other forms of energy, and had discounted it. Maybe it will cost us more, maybe we will have to pay more for our energy. Maybe we will have to conserve, maybe we will have to share rides, maybe we will have to walk, maybe we will have to move closer to our jobs. Let's put our resources into developing the sustainable energy resources. (M-3)

Comment: Duke says that they believe that combined cycle technology is the most economically attractive baseload technology. I think that this is -- I don't know what economically attractive means to anyone in the room here, but I don't think that Duke did a sufficient analysis to be able to tell us if their comparison with other forms of renewable energy, including wind power, and solar power, had been compared alongside of the continued use of the Catawba or the McGuire reactors, in this case. (Q-1)

Comment: I might point out, as a dramatic point, that the consideration of safety issues in terrorism with regards to wind powered generators almost seems ridiculous, because there are no issues with regard to safety and terrorism, with regard to wind energy generators. This is a significant omission in their application process. (Q-2)

Comment: As for alternative sources of energy, Duke did not conduct an analysis that looked into the future. They looked at existing sources of energy and the current technologies. But just as the United States essentially subsidized the entire nuclear energy industry with its research and development, now they are sinking tens of millions of dollars into this thing called clean coal. Well, what does clean coal mean, and what would a clean coal plant mean? And that needs to be in this EIS, what would be the environmental impacts of a clean coal plant, because I'm really dying to find out what they are. I've only seen it kind of talked about in vague terms by the labs. (R-14)

Comment: We evaluated alternatives, we evaluated replacing McGuire's economical baseload electric generation with other sources of power. We looked at wind, we looked at solar, we looked at other forms of conventional fossil generation. We did not select those alternatives. We did not select them based on their cost, based on their limited electrical output, and relative basis, on their land use requirements, and on other environmental impacts. (T-7)

Comment: Okay, now to the questions. If the license is not renewed, would the nuclear plants be total write-offs, or could they be converted to operation by gas as a fuel, or some other form of energy? (AD-4)

Comment: This point is one I already made, so I won't make it again. The final point is, I think we are reaching a new era. A power plant that works on wave power. Solar power suggestions as well. (AD-11)

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 McGuire Nuclear Station, Units 1 and 2, will be discussed in Chapter 8 of the SEIS.*

A.1.10 Comments Concerning Environmental Justice

Comment: But nonetheless there are tens, and tens of thousands of families who are very poor, not as well educated as we would like Americans to be, living in this most polluted part of town. We are also home, mostly, to poor whites, blacks, and Latinos. The NRC begged you to consider all this, because you will further burden these many scores of thousands of families, unless you rein in Duke Power's ability to carry out their plans for using this plutonium. (I-4)

Response: *The comment is noted. Environmental Justice is an issue specific to the plant and will be addressed in Chapter 4 of the SEIS.*

A.1.11 Comments Concerning Related Federal Projects

Comment: And my understanding was the license originally was that Duke Energy had the right to dam the Catawba River at Lake Wiley, and Lake Norman, to produce energy. And since this was given by the federal government, the citizens gave them that right to do that, they had certain responsibilities about the water, and the land surrounding those lakes that they created, and where they were creating power. And I'm not sure, in today's nuclear age, how that original license fits into what this process is talking about today, about these two units. Because my concerns are about the environmental impact. So this is talking about two units, I'm talking about the whole picture for relicensing, which involves Duke Energy's responsibility to the citizens that gave them the right to dam the rivers and produce energy. (AE-1)

Comment: When I was growing up I had friends who had a lease on property on Lake Wiley, we loved to go out there, had a great time growing up as a child. We were known as river rats. Some of you have heard that expression before. And we just had a wonderful time. My understanding is the license doesn't just apply to these plants on the lakes. When the original license was given Duke had the responsibility of helping maintain the water, and the land adjacent to the lakes. And this is a question. It seems to me they lost that power to control the quality of the water, and maybe some of the air, too. When instead of having these leases they started selling off the land to private owners. And so now you heard the people talking about all the wonderful things they are doing at the sites, the sites, the sites. Well, yes, because I guess they don't have control of the property right on the lakes, and so the local governments are trying to get buffers now, get people to agree to buffers. So my question is, has Duke inadvertently abandoned what the federal government licensed them to do by giving up this buffer of leasing? If someone is not doing what they should be doing as far as protecting the water and so forth in their lease, it seems to me Duke could have some say so, I don't know, I'm just asking that question. (AE-2)

Response: *The comments are noted. These comments relate to Duke Energy Corporation (Duke) hydro power operations that fall under the authority of the Federal Energy Regulatory Commission (FERC). Related Federal projects such as the FERC license will be discussed in Chapter 2 of the SEIS.*

A.1.12 Comments Concerning Safety Issues Within the Scope of License Renewal

Comment: Neutron bombardment, silting from fission reaction degrades the metal parts of the reactor, the metal becomes brittle. Reactor embrittlement increases with age. And an embrittled reactor may look unchanged, but it will not perform as well under extreme conditions. In the event of a drop in the level of reactor coolant, the heated water is replaced by cold water from outside the reactor. The cold water can cause embrittled reactor parts to fail, and minor

reactor failure becomes a major one. Embrittlement of reactor parts is a well known phenomenon, and has caused premature closing of commercial power reactors. (W-5)

Comment: Having directly been involved with the design and installation of nuclear power plants I can testify that the original design was never intended to operate beyond a 40 year life. Operating these plants beyond the design life is clearly an experiment in stress and corrosion analysis, cycling fatigue and resulting fatigue failure. The granting of operating licenses to extend the life of a nuclear power plant within close proximity of densely populated area is analogous to playing Russian roulette with the health and safety of the public. (AH-1)

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 analysis 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 this 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.*

A.1.13 Questions

The following comment was presented in the form of a question during the scoping process. The staff will take note of the questions to the extent that the question applies to the issues discussed in the SEIS. However, the question did not provide new information and will not be evaluated further.

Cumulative Impacts

Comment: Are you going to consider the cumulative impacts as if all four reactors were running at once? (R-6)

Response: *The SEIS will include a consideration of cumulative impacts considering both the two-unit McGuire plant and the two-unit Catawba plant.*

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 McGuire Nuclear Station, Units 1 and 2, Draft Report for Comment* (NUREG-1437, Supplement 8, 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 into the NRC's electronic Public Document Room, its license renewal Website, and at the J. Murrey Atkins Library at the University of North Carolina – Charlotte in Charlotte, North 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 10, 2002 (67 FR 31846)
- 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 Huntersville, North Carolina, on June 12, 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 12, 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 eight speakers at the meetings are listed in speaking order along with the page of the transcript excerpts in this report on which the comment appears. These comments are identified by the letters A through H 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 I through L. 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 for McGuire) 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 safety issues pertaining to 10 CFR Part 54.

(3) A comment that raised an environmental issue that was not addressed in the GEIS or the DSEIS.

(4) A comment regarding the 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 references, and a summary description of the comment 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 to the reader to the appropriate section of the Supplement where the change was made. Revisions to the text of the draft report are designated by vertical lines beside the text.

Table A-2 Comments Received on the Draft SEIS

Comment No.	Commenter	Comment Source	Page of Comment	Section(s) Where Addressed
A-1	L. Zeller	Afternoon Meeting Transcript (06/12/02) ML021780452	A-43	A.2.1
A-2	L. Zeller	Afternoon Meeting Transcript (06/12/02)	A-45	A.2.11
A-3	L. Zeller	Afternoon Meeting Transcript (06/12/02)	A-51	A.2.13
A-4	L. Zeller	Afternoon Meeting Transcript (06/12/02)	A-51	A.2.11
B-1	B. Anderson	Afternoon Meeting Transcript (06/12/02)	A-47	A.2.12
C-1	J. Peel	Afternoon Meeting Transcript (06/12/02)	A-50	A.2.2
C-2	J. Peel	Afternoon Meeting Transcript (06/12/02)	A-50	A.2.2
C-3	J. Peel	Afternoon Meeting Transcript (06/12/02)	A-50	A.2.2
D-1	B. Mahood	Afternoon Meeting Transcript (06/12/02)	A-52	A.2.1
D-2	B. Mahood	Afternoon Meeting Transcript (06/12/02)	A-52	A.2.13
D-3	B. Mahood	Afternoon Meeting Transcript (06/12/02)	A-53	A.2.13
D-4	B. Mahood	Afternoon Meeting Transcript (06/12/02)	A-54	A.2.13
E-1	J. Collins	Evening Meeting Transcript (06/12/02) ML021780452	A-55	A.2.6
F-1	B. Mahood	Evening Meeting Transcript (06/12/02)	A-56	A.2.10
F-2	B. Mahood	Evening Meeting Transcript (06/12/02)	A-57	A.2.10
F-3	B. Mahood	Evening Meeting Transcript (06/12/02)	A-61	A.2.13
F-4	B. Mahood	Evening Meeting Transcript (06/12/02)	A-63	A.2.13
F-5	B. Mahood	Evening Meeting Transcript (06/12/02)	A-64	A.2.13
F-6	B. Mahood	Evening Meeting Transcript (06/12/02)	A-64	A.2.13
F-7	B. Mahood	Evening Meeting Transcript (06/12/02)	A-64	A.2.13
F-8	B. Mahood	Evening Meeting Transcript (06/12/02)	A-64	A.2.13
G-1	G. Knox	Evening Meeting Transcript (06/12/02)	A-59	A.2.13
G-2	G. Knox	Evening Meeting Transcript (06/12/02)	A-61	A.2.13
H-1	B. Barron	Evening Meeting Transcript (06/12/02)	A-62	A.2.2
H-2	B. Barron	Evening Meeting Transcript (06/12/02)	A-62	A.2.2
I-1	G. Hogue	Letter (07/26/02) ML022560053	A-66	A.2.2
I-2	G. Hogue	Letter (07/26/02)	A-66	A.2.4
I-3	G. Hogue	Letter (07/26/02)	A-66	A.2.5
I-4	G. Hogue	Letter (07/26/02)	A-66	A.2.6

Table A-2 (contd)

Comment No.	Commenter	Comment Source	Page of Comment	Section(s) Where Addressed
J-1	M. Tuckman	Letter (08/02/02) ML022210223	A-68	A.2.4
J-2	M. Tuckman	Letter (08/02/02)	A-68	A.2.4
J-3	M. Tuckman	Letter (08/02/02)	A-69	A.2.4
J-4	M. Tuckman	Letter (08/02/02)	A-69	A.2.4
J-5	M. Tuckman	Letter (08/02/02)	A-70	A.2.7
J-6	M. Tuckman	Letter (08/02/02)	A-70	A.2.7
J-7	M. Tuckman	Letter (08/02/02)	A-70	A.2.7
J-8	M. Tuckman	Letter (08/02/02)	A-70	A.2.7
J-9	M. Tuckman	Letter (08/02/02)	A-70	A.2.7
J-10	M. Tuckman	Letter (08/02/02)	A-70	A.2.10
J-11	M. Tuckman	Letter (08/02/02)	A-70	A.2.10
J-12	M. Tuckman	Letter (08/02/02)	A-70	A.2.10
J-13	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-14	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-15	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-16	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-17	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-18	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-19	M. Tuckman	Letter (08/02/02)	A-71	A.2.10
J-20	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-21	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-22	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-23	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-24	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-25	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-26	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-27	M. Tuckman	Letter (08/02/02)	A-72	A.2.10
J-28	M. Tuckman	Letter (08/02/02)	A-73	A.2.11
J-29	M. Tuckman	Letter (08/02/02)	A-73	A.2.3
K-1	H. Mueller	Letter (08/02/02) ML022270355	A-73	A.2.9

Table A-2 (contd)

Comment No.	Commenter	Comment Source	Page of Comment	Section(s) Where Addressed
K-2	H. Mueller	Letter (08/02/02)	A-73	A.2.2
K-3	H. Mueller	Letter (08/02/02)	A-73	A.2.13
K-4	H. Mueller	Letter (08/02/02)	A-74	A.2.13
K-5	H. Mueller	Letter (08/02/02)	A-74	A.2.3
K-6	H. Mueller	Letter (08/02/02)	A-74	A.2.8
L-1	B. Barron	Letter (08/19/02) ML022470024	A-75	A.2.10
L-2	B. Barron	Letter (08/19/02)	A-75	A.2.10

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 the License Renewal Process

A.2.2 Comments in Support of McGuire Nuclear Station, Units 1 and 2

A.2.3 Comments Concerning Groundwater Use and Quality

A.2.4 Comments Concerning Aquatic Ecology Issues

A.2.5 Comment Concerning Terrestrial Resource Issues

A.2.6 Comments Concerning Threatened and Endangered Species Issues

A.2.7 Comments Concerning Land Use Issues

A.2.8 Comments Concerning Historic and Archaeological Resources

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 of the Scope of the Environmental Review for License Renewal: Emergency Response and Planning; Need For Power; and Safeguards and Security

A.2.1 General Comments Concerning the License Renewal Process

Comment: I thought of this question, just before you stood up Jim. It actually maybe refers to the previous presentation, but before we got too far along here I wanted to ask about the Commission's decision on April the 12th to change, reverse, or alter the findings of the Atomic Safety Licensing Board. How often does something like that happen, and where has it happened? I'm just curious to find out, the procedure, or the process, or perhaps there is a citation within the rules and regulations which outline how a sitting Atomic Safety Licensing Board, or actually any other board of that nature, would have a process underway as was described here shortly, a while ago. And the Commission, which set up that panel, to essentially reverse, or alter, or have any saying before the procedure, before the process had been completed. (A-1)

Comment: The whole strange thing about this process is that you are still completely bound by regulations, the original regulations from about 1954, I suppose with some revisions. (D-1)

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 these comments.*

A.2.2 Comments in Support of McGuire Nuclear Station, Units 1 and 2

Comment: I assure you that we strongly believe that the McGuire plant is a worthy candidate for license renewal. (C-1)

Comment: I want to thank the Nuclear Regulatory Commission for having developed a process which is thorough and effective. That process has been described by at least two of the speakers before me. (C-2)

Comment: After reviewing the draft statement, and I'm referring specifically to Supplement 8, Duke Power agrees with the conclusions of that draft. (C-3)

Comment: Reading through the results of the draft environmental impact statement, the thoroughness, the completeness with which the Staff and the contractors have performed their work is very apparent. (H-1)

Comment: We are still reviewing the draft EIS. Initially it looks like we very much agree with the conclusions that have been reached. We do have our technical experts continuing to go through the report. (H-2)

Comment: We are pleased with the level of detail provided in the Draft Supplemental Environmental Impact Statement (DSEIS) and are glad the proposal includes regular monitoring following relicensing. (I-1)

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). (K-2)

Response: *The comments were supportive of license renewal at McGuire Nuclear Station Units 1 and 2, and are general in nature. 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 these comments.*

A.2.3 Comments Concerning Groundwater Use and Quality

Comment: Page 4-35 discusses groundwater use and quality. The document mentions that the facility uses <100 gpm from six existing groundwater wells (page 2-8). However, Appendix E does not list information pertaining to the regulatory status of these groundwater wells. (K-5)

Response: *This is a Category 1 issue as discussed in Section 4.5 of this SEIS. These wells are regulated by the State of South Carolina and draw at total of less than 0.068 m^3/S 100 gpm. The regulatory status of these wells is not included in Appendix E due to the small amount of water drawn and the infrequency of use. 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 this comment.*

Comment: Page E-2, line 11: Draft permit was issued May 30, 2002. Comments have been submitted to NCDENR for final approval. (J-29)

Response: *The comment addresses groundwater use and quality. The Supplement has been revised as appropriate.*

A.2.4 Comments Concerning Aquatic Ecology Issues

Comment: Impingement and Entrainment of Aquatic Organisms. One of several issues identified at McGuire includes impingement and entrainment of aquatic organisms at the cooling water intake. Previous studies at the site by Duke found impingement of some fishes, mostly threadfin shad, some bluegill, and alewife, particularly during periods of cold water. Although the DSEIS concludes that the impacts were SMALL, we recommend that the licensee establish a regular monitoring program and develop a strategy to reduce impingement and entrainment. These periodic reports of findings should be forwarded to the U.S. Fish and Wildlife Service (FWS). (I-2)

Response: *The comment relates to impingement and entrainment of aquatic organisms at the cooling water intake. The staff reviewed the licensee's most recent impingement and entrainment data for McGuire; this issue is addressed in Sections 4.1.1 and 4.1.2 of the 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 the Supplement as a result of this comment.*

Comment: Page 2-19 line 19: Line reads: "The primary fish caught in the nearshore littoral zone include sunfish (*Lepomis spp.*), carp (*Cyprinus carpio*), and catfish including the blue catfish (*Ictalurus furcatus*), snail bullhead (*Ameiurus brunneus*), white catfish (*I. catus*), and flat bullhead (*I. platycephalus*). "The inclusion of blue catfish as inhabitants of the nearshore littoral zone is incorrect as these fish are considered largely pelagic in nature and are only occasionally caught inshore. Additionally snail bullhead, white catfish, and flat bullhead are no longer found in significant numbers due in large part we believe by blue catfish and flathead catfish predation.

Correct the sentence to read, "The primary fish caught in the nearshore littoral zone include sunfish (*Lepomis spp*.), largemouth bass, crappie, and carp (*Cyprinus carpio*). Numbers of previously abundant catfish species like snail bullhead (*Ameiurus brunneus*), white catfish (*I. catus*), and flat bullhead (*I. platycephalus*) have dwindled significantly due to suspected predation by blue catfish (*Ictalurus furcatus*), and flathead catfish (*Pylodictis olivaris*)." (J-1)

Comment: Page 2-19, line 27-29: Lines read. "In 1999, 135 species of phytoplankton were collected, the dominant types being cryptophytes and diatoms (Duke 2001a)."

It is more accurate to use the words 'varieties and forms' instead of species. Correct the sentence to read "In 1999, 135 varieties and forms of phytoplankton were collected, the dominant types being cryptophytes and diatoms (Duke 2001a)." (J-2)

Comment: Page 2-20 line 5-8: Lines read: "….--and three mussel species- Carolina heelsplitter (*Lasmigona decorata*), dwarf threetooth (*Triodopsis fulciden*), and Carolina

creekshell (*Villosa vaughnaniana*)- could inhabit the region around McGuire (Table 2-1). "Although the word 'could' is used in this sentence, it creates the impression these mussels might be found in the area. This likelihood is extremely remote due to the lack of flowing water habitats around McGuire. Concurrence with this professional judgment is even stated in the SEIS on page 4-36, lines 25-28, "As described in Section 2.2.5, the only Federally or State-listed threatened or endangered aquatic species with the potential to inhabit waters near McGuire, the Carolina heelsplitter (*Lasmigona decorata*), is not present in the vicinity of the plant (Fridell 2001) and does not occur in impounded water."

Revise sentence to read "…. --and three mussel species- Carolina heelsplitter (*Lasmigona decorata*), dwarf threetooth (*Triodopsis fulciden*), and Carolina creekshell (*Villosa vaughnaniana*)- could inhabit the region around McGuire (Table 2-1), but practically speaking the probability is extremely unlikely because of lack of lotic environments." (J-3)

Comment: Page 2-20, line 32-34: Lines read: "Menhinick (1991) lists the highfin carpsucker from Lake Norman considerably north of the study area and lists only historic records for the Santee chub in Lake Norman, but north of the study area (Gaddy 2001). "Although the above sentence is not factually incorrect, it leaves the impression that perhaps the highfin carpsucker and maybe even the Santee chub may exist in Lake Norman. It is well worth noting however that in the NC Heritage Program records the highfin carpsucker documentation is extremely sketchy and the EORANK (Element Occurrence Rank) designation is O (Obscure-date, location, and/or quality of the occurrence is unknown) and the survey date is listed only as pre-1991. The same paucity of rigorous documentation and species records is also true for the Santee Chub."

Revise sentence to read "Menhinick (1991) lists the highfin carpsucker from Lake Norman considerably north of the study area and lists only historic records for the Santee chub in Lake Norman, but north of the study area (Gaddy 2001). However, detailed and thorough historical documentation on both species in the NC Natural Heritage Program records is incomplete or non-existent and there have been no citings of these species at all in the recent past." (J-4)

Response: *The comments address aquatic ecology. The Supplement has been revised as appropriate.*

A.2.5 Comment Concerning Terrestrial Resource Issues

Comment: Migratory birds and raptors. We do not agree that there is enough information to conclude that the impacts of potential bird collisions, or electrocution, are small in significance. We believe that a monitoring program should be developed consistent with the draft Memorandum of Agreement between the U.S. Fish and Wildlife Service and NRC for migratory birds. Since bald eagles, osprey, black and turkey vultures, and herons frequent the project vicinity, we recommend lines crossing wetlands and large bodies of water should be maintained

to maximize visibility of the line to raptors by one of the following design modifications: (1) remove the static line; (2) enlarge the static line to improve visibility to raptors; or (3) mount aviation balls or similar markers on the static line. (I-3)

Response: *This is a Category 1 issue as discussed in Section 4.2 of this SEIS. The GEIS determined that "mortality resulting from bird collisions with transmission lines associated with license renewal and up to an additional 20 years of operation will not cause long-term reduction in bird populations and thus will be of small significance. Further, little potential for significance due to cumulative impacts is indicated." The licensee is required to report any migratory bird that has been found dead around the plant. Maintenance crews report on bird-related outages and that report is printed quarterly and sent to the U.S. Fish and Wildlife Service in Atlanta. Licensee employees have a 24-hour Migratory Bird Hot Line to report bird encounters occurring during their work. The transmission lines addressed in this action are relatively short (an average length of 1.2 km [4000 ft]), and they do not span high quality waterfowl or aquatic raptor habitat. 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 this comment.*

A.2.6 Comments Concerning Threatened and Endangered Species Issues

Comment: Talking with a curator at the NC State University, I understand that the sunflowers are very a man-friendly plant that likes to seed environments. And it does very well in and around transmission lines, because of all the upheaval in the soils. I also understand that most energy utility companies are using herbicides now along their transmission lines to keep back growth, rather than cut it. How does that affect any possibility for the growth of Schweinitz's sunflower? (E-1)

Response: *Most herbicide application on transmission line rights-of-way is targeted to specific plants that will interfere with transmission lines such as trees rather than broadcast use. The appropriate descriptive information regarding transmission lines and the plant-specific ecology of the site was addressed in Sections 4.2 and 4.6.2 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 this comment.*

Comment: Endangered species. We have reviewed our records and visited the site, and notwithstanding the above comments, we concur with the determination that the proposed project is not likely to affect endangered species. Therefore, we believe the requirements under Section 7 of the Act are fulfilled. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is

subsequently modified in a manner that was not considered in this review; or (3) a new species is listed or critical habitat is determined that may be affected by the identified action. (I-4)

Response: *The staff is aware of the provisions on Section 7 of the Endangered Species Act. The appropriate descriptive information regarding Threatened and Endangered Species is addressed in Section 4.6.2 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 this comment.*

A.2.7 Comments Concerning Land Use Issues

Comment: Page 2-31 line 37: Cowan's Ford Wildlife Refuge should be Cowan's Ford Waterfowl Refuge. (J-5)

Comment: Page 2-33 line 1: Cowan's Ford Wildfowl Refuge should be Cowan's Ford Wildlife Refuge. (J-6)

Comment: Page 2-33, line 2: Line should read: "… within an oxbow bend in the riverine section of Mountain Island Lake." (J-7)

Comment: Page 2-33, line 1-6: Section does not mention Crowder's Mountain State Park. Crowder's Mountain State Park is located approximately 24 miles south-west of McGuire. (J-8)

Comment: Page 4-29, line 19-25: McGuire's main entrance (west entrance) has been closed as a result of the events of Sept.11, 2001. This will probably be a permanent closure. All entrance and exit traffic must use the east entrance with the traffic light. (J-9)

Response: *The comments address land use issues. The Supplement has been revised as appropriate.*

A.2.8 Comments Concerning Historic and Archaeological Resources

Comment: We note that the licensee should take care that historic properties are not inadvertently impacted during normal operational and maintenance activities. (K-6)

Response: *Historic and archaeological issues are addressed in Section 2.2.9 of this Supplement. The comment did not provide significant, new information relevant to this Supplement and, therefore, it will not be evaluated further. There was no change made in this Supplement as a result of this comment.*

A.2.9 Comments Concerning Human Health/Radiological Issues

Comment: EPA Region 4's review of this Draft GEIS [SIC] 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. (K-1)

Response: *This is a Category 1 issue and is discussed in Section 4.3 of this SEIS. The comment did not provide significant, new information relevant to this Supplement and, therefore, it will not be evaluated further. There was no change made in this Supplement as a result of this comment.*

A.2.10 Comments Concerning Severe Accident Mitigation Alternatives Analysis

Comment: I was a little bit puzzled by the definition of benefit. Reading over it, it seemed that if you want to be totally cynical about it, benefit would be the protection of the public's health and safety, whereas the cost would be what it would cost Duke if the balance to the public health and safety exceeded a certain point. And since Duke is ensured by the Price-Anderson Act, and has a cap on its liabilities, that definitely lowers Duke's cost a great deal, although the impact on the public health and safety might be considerable. And so that if you look at it as sort of a suspicious way, which is the way I think that the informed public should look at just about everything, it seems to be saying that as long as the damages that the power company would have to pay don't exceed the cost of preventing any damage to the public, then it is better to avoid, well, it is better for the bottom line, simply not to spend the extra money to protect the public. That is one impression one could gain from this, and correct me if I'm wrong. (F-1)

Comment: I'm sorry, but we seem to be in a little bit of a semantic muddle here, because I'm speaking of the cost, I thought that in the document cost referred to the cost to the nuclear industry to do what is necessary to protect the public. And the benefit is the protection of the public, and you are speaking of the cost to the public, so we are getting a little -- muddled here, because I'm talking about the cost of protecting the public, the cost of...(F-2)

Response: *The costs refer to the cost for a utility to implement a potential design enhancement that could reduce the risk of a severe accident and associated offsite property damage. The benefit is the averted public exposure, occupational exposure, cleanup and decontamination costs and power replacement costs associated with preventing or mitigating a major accident. 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 these comments.*

Comment: Page 5-6, line 23: Line reads: "... comments received during the McGuire peer review process, ..." Including the above phrase in this location may lead a reader to assume that the peer review comments were incorporated into Revision 2 of the PRA which was used for the SAMA analysis. This is not the case; the peer review occurred after Revision 2 was complete. Suggest that the reference to the peer review be deleted here. (J-10)

Response: *Section 5.2.2.1 has been revised, as suggested by the comment.*

Comment: Page 5-8, line 22: 0.006 should be 0.06. (J-11)

Comment: Page 5-8, line 23: 0.0075 should be 0.07. (J-12)

Response: *Section 5.2.2.1 has been revised; the decimal has been corrected.*

Comment: Page 5-10, line 22: The Revision 3 results provided at the time of the RAI response were preliminary and somewhat changed in the final approved version of Revision 3. Values from the final approved version of Revision 3 are provided in the following comment. (J-13)

Comment: Page 5-11, Table 5-5: The Revision 3 results provided by Duke at the time of the RAI were preliminary and somewhat changed in the final approved version of Revision 3. Values from the final approved version of Revision 3 are provided below. The format for these values is the same as provided in the RAI response dated January 31, 2002. (J-14)

Response: *Section 5.2.2.2 and Table 5-5 have been revised to include the CDFs from the final approved version of Revision 3 of the McGuire PRA.*

Comment: Page 5-11, Table 5-5 line 18: The seismic CDF listed under the column heading PRA, Rev. 1 (IPE) is given as 1.1E-05. This is the value from the IPEEE not the IPE (1.4E-05). This should be more clearly identified in the table. (J-15)

Response: *Table 5-5 has been annotated to show that the CDFs under PRA, Rev. 1, for external initiators came from the IPEEE, as suggested by the comment.*

Comment: Page 5-11, Table 5-5, line 20: Table 8.1-1 of Revision 1 of the McGuire PRA (IPE), lists the fire CDF as 8.1E-08, not 2.3E-07. The IPEEE estimate of the fire CDF is 2.3E-07. Clarify which value and reference are intended. (J-16)

Response: *Table 5-5 has been annotated to show that the CDFs under PRA, Rev. 1, for external initiators came from the IPEEE, as suggested by the comment.*

Comment: Page 5-16, Table 5-6: Line in Table 5-6 reads: "align reactor vessel (RV) cooling/other Unit RN"...The Duke table used RV cooling. In this case RV is not an acronym for reactor vessel. RV is the shorthand notation for the Containment Ventilation Cooling Water System. This description should be added to the RV entry on page xxiii Abbreviations/Acronyms. (J-17)

Comment: Page 5-16, Table 5-6: The zeros in the CDF column should be replaced with the CDF values from Table 4-2, found in Attachment K of the McGuire ER. (J-18)

Response: *Table 5-6 and the abbreviations/acronyms have been revised as suggested by the comments.*

Comment: Page 5-19, line 27: The Revision 3 results provided at the time of the RAI response were preliminary and somewhat changed in the final approved version of Revision 3. Values from the final approved version of Revision 3 are provided Comment Number 14. (J-19)

Response: *Section 5.2.4 has been revised to show that the reference for final Revision 3 of the PRA is the August 2, 2002, letter.*

Comment: Page 5-17, Tabel 5-7 and Page 5-21, line 28: The cost estimate provided by Duke ($205,000) 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. (J-20)

Response: *Sections 5.2.5 and 5.2.6.2 and Tables 5-7 and 5-8 have been revised as suggested by the comment.*

Comment: Page 5-21, line 29: Note that the pre-staged option was selected in order to provide confidence that the alignment could be established within a time frame that would allow mitigation for fast as well as slow station blackouts. Without pre-staging, the time needed to power the igniters would be long and may not be effective for all sequences. The estimated benefit would be reduced by some amount if a pre-staged diesel was not assumed. (J-21)

Response: *This comment provided additional information but did not result in changes to Section 5.2.5.*

Comment: Page 5-21, line 39: The cost estimate provided by Duke ($540,000) is a per unit cost and should not be divided by 2. (J-22)

Comment: Page 5-22, line 9: replace “reactor vessel cooling” with “the Containment Ventilation Cooling Water System” (J-24)

Comment: Page 5-22, line 15-16: The two cost estimates, $275,000 and $291,000, are in the reverse order of the 2 SAMAs, (1) and (2), discussed earlier in the same paragraph. This may lead a reader to associate the costs incorrectly with the SAMAs. (J-25)

Response: *Section 5.2.5 has been revised as suggested by the comments.*

Comment: Page 5-22, line 3-5: 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. (J-23)

Response: *Section 5.2.5 has been revised as suggested by the comment. The sentence in question now only addresses igniters and was moved to the preceding paragraph.*

Comment: Page 5-25, line 4: 3.81E+08 should be 3.1E+08. See page 12 of Attachment K, McGuire ER. (J-26)

Response: *Section 5.2.6.1 has been revised as suggested by the comment.*

Comment: Page 5-27, line 17: Update CDF discussion based on final Revision 3 results provided in Comment Number 14. (J-27)

Response: *Section 5.2.6.2 has been revised as suggested by the comment*

Comment: Section 5.2.7 of Reference 1 identifies one Severe Accident Mitigation Alternative (SAMA) that would provide back-up power to the hydrogen igniters for Station Blackout (SBO) event...McGuire concurs with the NRC that this SAMA is not within the scope of license renewal and should be addressed separate from any license renewal proceedings. (L-1)

Comment: McGuire concurs with the NRC staff that there may be a cost-beneficial plant design modification that can provide alternative power to the hydrogen ignition system during a SBO event. (L-2)

Response: *The comments concur with the staff’s analysis. 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 these comments.*

A.2.11 Comment Concerning Uranium Fuel Cycle and Waste Management Issues

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]." (J-28)

Response: *The comment addresses uranium fuel cycle and waste management issues. The Supplement has been revised as appropriate.*

Comment: I have a question about the impacts which have to do with the collective off-site radiological impacts from the fuel cycle high level waste, and spent fuel. It says here, in the document, within the Category 1 issues, that they are not assigned a significance level, and it also says back in Section 8, under the Category 2 analysis for the draft statement, that they are not assigned a significance level there, either. Where are they considered, and why not? (A-2)

Comment: The other issue has to do with the one that I raised during the presentations, and it has to do with high level waste. On advice of the staff I did go back to reread Chapter 6 here about single significance levels, which are not assigned to high level waste. In that the Commission, and this is again from Page 6-5 in supplement, in Supplement 8 to the draft of today, it says: The Commission concludes these impacts are acceptable, and that the impacts would not be sufficiently large. I would submit that the lack of a single significance level at this point, and this is a lone exception, so far as I can tell, every other impact in this document is considered small. The impacts here are not small, they are not moderate, they are large. And there seems to be a reluctance to say large impacts in this case, particularly in the case before us, which is license renewal extension. The high level waste would increase, the impacts would increase for an additional 20 years. I think that before this process can move forward there must be a better analysis of the impacts from high level waste. It is not reassuring to me that the staff does not consider a change in its position necessary with regards to high level waste disposal, and consideration of the Category 1 issue. I wonder what it would take, considering that the document here mentions the possibility of 1,000 premature cancer deaths world-wide, for a 100,000 metric ton repository. (A-4)

Response: *Environmental impacts of the uranium fuel cycle are discussed in detail in Section 6.1 of this Supplement. 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 these comments.

A.2.12 Comment Concerning Alternatives To License Renewal

Comment: I just have a question concerning the definitions of small, moderate and large. As far as your take on if the effect is to be large, is it your -- are you wanting to make a change so that it goes down to the small level? Because that goes to your last slide, but on alternatives it said that some of the alternatives also include no-action. And some of the no-action are currently in the moderate or large significance. And if they are currently in the large then are you taking a look at those issues? There again maybe I'm reading this wrong. But when it says including no- action alternatives, no-action to me means that it stays the same. (B-1)

Response: *Environmental impacts associated with various reasonable alternatives to renewal of the operating licenses for McGuire were discussed in Chapter 8 of the Supplement. In this case, "no-action" alternative refers to not renewing the applicant's operating license and decommissioning the plant when the current license expires. The staff does not evaluate the potential for mitigation of impacts for the alternative actions including the no-action alternative. Mitigation is only considered for the action being evaluated (renewal of the operating licenses for McGuire for a period of up to an additional 20 years). The comment did not provide significant, new information relevant to this Supplement and, therefore, it will not be evaluated further. There was no change made in this Supplement as a result of this comment.*

A.2.13 Comments Concerning Issues Outside of the Scope of the Environmental Review for License Renewal: Emergency Response and Planning; Need For Power; and Safeguards and Security

<u>Emergency Response and Planning</u>

Comment: It is noted here, in the draft report for comment, Supplement 8, that Duke completed a comprehensive effort to identify and evaluate the potential cost benefit plans enhancements to reduce the risk associated with severe accidents at McGuire. As a result, Duke concluded no additional mitigation alternatives are cost-beneficial. Among these analysis are averted public exposure costs. Recently there has been a lot of concern about off-site exposures from accidents. And, of course, the provision of such tablets as these here, the potassium iodide tablets to the public. That licensees have the obligation to confirm that off-site authorities have considered the use of potassium iodide as supplemental protective action for the general public. It also makes a supplemental point here, and I'm reading from the NRC, it will also require the

licensees to use this information in developing protective action recommendations for off-site agencies. I have two questions for the record. One, has Duke Energy fulfilled the Nuclear Regulatory Commission requirement with regard to off-site authorities? And, two, how has Duke used this information in protective action recommendations? I see nothing to that effect in the document before us today. (A-3)

Comment: But what I would submit to you is that while there may be no new information, there are a couple of new circumstances that I don't think can be ignored when the time comes to consider whether to go on with the nuclear industry. One of these, which is specific to McGuire, and also to Catawba plant, is that we have had an enormous population explosion here, and it is not stopping, it is continuing to go on. Whereas we have not had anything like an enormous improvement in the evacuation routes. And hardly anyone in this region believes that they could actually get out. And FEMA doesn't seem, which is the agency that is most responsible, or supposed to be responsible for this, seems to be thinking entirely in pre-9/11 terms. (D-2)

Comment: So you can see that this region is just not prepared for an eventuality like that. And the change in circumstances as to the population density, this is going to keep on changing. So here this renewal comes up 20 years from now. What do you think it is going to look like around these plants 20 years from now? It seems to me that it would be the responsible thing to do, to make some recommendations to the communities around here, to the governments around here, to put a moratorium on any further building in your evacuation zone, until the roads can be improved to the point where a quick evacuation is possible. And it seems to me that somebody needs to take this responsibility, whether it is Duke Power, whether it is the NRC, or whether it is FEMA, somebody needs to be advising local governments that they can't go on just packing people around these plants indefinitely, if you want to go on operating for another 40 years. (D-4)

Comment: And although your document says repeatedly there is no new information about most of the issues here, about safety, and these are mostly about the operational requirements, and that sort of thing, I do feel that there are now new circumstances. One of the new circumstances is the enormous population explosion that is taking place around here, and which is ongoing. So that instead of a few thousand people around the plant, living around the plant when the plant was first licensed, we now have hundreds of thousands of people living around both the McGuire and Catawba plants. And the evacuation possibilities have increased enormously because there has been much improvement in the roads around here. And I expect that some of our visitors from Washington may have been caught in a traffic jam or two between this afternoon's meeting and this evening's, so you know what I'm talking about. (F-4)

Comment: And it turned out, well, he was only thinking in terms of evacuating a 10-mile radius. Well, if a plane is driven into the spent fuel containment areas, there isn't going to be hours and hours to evacuate. We are going to have to get out immediately, the sooner the better, 5 minutes would be ideal. (F-5)

Comment: But I think that communities need to start passing ordinances that say you can't build any more houses, and bring any more people into harm's way, if you can't get out in at least 2 hours from the evacuation zone, whether it be a 10-mile radius, or a 25-mile radius, or 50-mile radius...Right now we are making this area into a better and juicier, and juicier, and juicier target, by selling more and more subdivisions to people, crowding them into the areas around here. And we are talking about a license renewal 20 years from now, to go on for another 20 years. What do you think it is going to look like around here 20 years from now, if we just go on building, and building, and building? And what is it going to look like 30 years from now, when there is still 10 years to go? We need to do something visible, and tangible, to avert a tragedy in this area. Thank you very much. (F-6)

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. (K-3)

Response: *The staff evaluated impacts under current population conditions. Emergency preparedness is an ongoing process at all plants, including McGuire. 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 comments did not provide new information relevant to this Supplement and they do not pertain to the scope of license renewal as set in 10 CFR Part 51 and Part 54, therefore, they will not be evaluated further. There were no changes made in this Supplement as a result of these comments.*

Need For Power

Comment: The document does not mention whether power demands on the McGuire 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. The anticipated growth rate of the service area during the renewal period should be taken into consideration. (K-4)

Response: *The need for power is specifically directed to be outside the scope of license renewal (10 CFR 51.95 (c)(2)). The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than NRC) 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 was no change made in this Supplement as a result of this comment.

Safeguards and Security

Comment: But if a plane is driven into your spent fuel deposits, whether they are in dry casks, or in pools of water, they are outside the containment domes. So all the things that you've been saying about how strong the domes are, and how -- what great safeguards you have against operational failures, become completely irrelevant in the case of an attack by even a fairly small plane, a moderately small plane on the spent fuel containment. And it seems to me that that would have, if that happened, it would have something of an environmental impact, in that there is about 20 or 30 times as much fissionable material outside of your highly fortified domes, as there is inside of them...And he said, yes, but we only need to evacuate a ten mile radius. Well, you know, that would be totally inadequate in such an accident. Well, not accident, but such an attack. (D-3)

Comment: Suppose the week after next, or the month after next, the new National Security Agency, or whatever they call themselves, were to impose new NRC regulations taking post-9/11 into account. Would this process go on just as before, or on the same schedule, or would the whole thing sort of start over again? (F-3)

Comment: That is something that we haven't heard about, really. If a plane crashed into the spent fuel pools and casks which contain 20, or 30, or 40, or 50 times as much radioactive material as is actually contained inside these domes, which are highly touted for being so well fortified. The other point I would like to make is that it may well not be any funny looking guy with a beard, and a big nose, and a strange name like Kai Al Hicby, or something like that, who does the job. There have already been precedents. An Egyptian pilot probably deliberately drove a plane full of passengers into the ocean. A Chinese pilot probably deliberately drove his plane into the ground with all passengers on board. There are 800 people, about five, who are seriously disturbed. And some of them can be airline pilots, or Air Force pilots, Coast Guard pilots, and so on. So the person who actually does this thing may well be American, is not suspected by anybody, with an ordinary name like John Wayne. And everyone will say, afterwards, he seemed like such a nice, straight-forward, reliable guy, with a good work record, and everything. (F-7)

Comment: We need to be prepared against that type of thing. And I would like to see some visible preparation. I would like to see them starting to lay down very thick concrete above all of the spent fuel depositories, as soon as possible. I would also like to see something visible in the way of protection of the nuclear plants, such as the balloons that we used in World War II to protect London against the Nazi planes, only these will have to be anchored at 9000 feet, and 5000, and 12,000, they only need to be anchored at maybe 500 feet or less, 300 feet, maybe. So it shouldn't be expensive at all, and it would be a visible sign to the public that something,

something is being done against this threat. It would also be a sign to the crazy guy in the airplane, that this is not such a good target. (F-8)

Comment: Looking at the application, the CFR Part 54, or Section 10, whatever, the renewal application process began prior to September 11th. Is there a supplement to this report as it relates to new findings, new information?... I would not ever dramatize that element, as much as I would if you look at the conclusion, and read it verbatim, it says that additional plant improvements to further mitigate severe accidents are not required at McGuire units, etcetera, as part of the license renewal pursuant to. I'm assuming those guidelines were written prior to September 11th, the application process started since then, I think we live in a new world. My question is, is this conclusion, or its draft, been amended or changed since that day?...There are additional findings, and the request for additional information will not be, I'm assuming that supplement, whenever it is going to appear, would be available to the public, as part of the application?...I think you did answer my question, the events of September 11th are not part of the renewal license application? (G-1)

Comment: My question is, I would like to separate – the security issues I believe, are separate and prudent from relative to whether or not improvements for security and severe accident mitigation need to be addressed. Apparently you are saying that because we have the current regulations they don't need to be addressed? Security needs to be addressed, but I think it would be my opinion that we should be leery as opposed to – (G-2)

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, 2001, 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 do not provide new information relevant to this Supplement, and they do not pertain to the scope of license renewals set forth in 10 CFR Part 51 and Part 54, therefore they will not be evaluated further. There were no changes made in this Supplement as a result of these comments.*

A.3 Public Meeting Transcript Excerpts and Comment Letters

Transcript of the Afternoon Public Meeting on June 12, 2002, in Huntersville, North Carolina

[Introduction, Mr. Cameron]
[Presentation by Mr. Tappert]
[Presentation by Ms. Franovich]
[Presentation by Mr. Wilson]

Mr. Zeller: My name is Lou Zeller, I'm with the Blue Ridge Environmental Defense League.

A-1 I thought of this question, just before you stood up Jim. It actually maybe refers to the previous presentation, but before we got too far along here I wanted to ask about the Commission's decision on April the 12th to change, reverse, or alter the findings of the Atomic Safety Licensing Board.

How often does something like that happen, and where has it happened?

Mr. Cameron: I'm not sure that either Jim or Rani are prepared to answer that. And we do have a representative here from our Office of the General Counsel, Susan Uttal.

And she may not have those statistics for you, Lou, but let me see if Susan has anything she can offer on that. And if there is further discussion you need to have, you may need to do it offline.

But, Susan, can you give us some information on Lou's questions?

Ms. Uttal: I don't know the answer to that question.

Mr. Cameron: The answer to the -- there were two questions, right, Lou?

Mr. Zeller: Yes.

Mr. Cameron: The second one was how often does it happen. And I take it you are saying that you really don't have any information on that?

Ms. Uttal: I don't have any information on that.

Mr. Cameron: The first part of that, Lou, was just to make sure that Susan knows what it was, can you just -- you don't have to repeat the whole thing, but just what the question part was.

A-1 cont

Mr. Zeller: I'm just curious to find out, the procedure, or the process, or perhaps there is a citation within the rules and regulations which outline how a sitting Atomic Safety Licensing Board, or actually any other board of that nature, would have a process underway as was described here shortly, a while ago.

And the Commission, which set up that panel, to essentially reverse, or alter, or have any saying before the procedure, before the process had been completed.

Mr. Cameron: I think that that is a fairly simple answer from a procedural point of view, relating to the authority of the Commission to step into a proceeding and rule on something before the whole thing is over.

Can you say anything about that, Susan? And, again, I don't want to get us down into a big legal discussion, but so that you can do this with Lou afterwards.

But perhaps you could just tell us some of the basics on that?

Ms. Uttal: Well, first of all I'm not sure of the relevance to this particular meeting, to this information. Mr. Zeller's a party in the proceeding, and in the requirements of Part 2 of 10 CFR, there is a specific section that permits interlocutory appeals from decisions allowing the admission of contentions, and that appeal be made to the Commission.

I don't happen to have the section in my mind at this time, but it is provided under the regulations. So I would refer you to Part 2 of the regulations, or perhaps you can ask your counsel about it.

Mr. Cameron: Okay. We always want to try to provide some information on questions like that. And I think from what Susan said, Lou, it is something called an interlocutory appeal, and there is basis in the Commission's regulations for that, and we can explore that in more detail later on.

[Presentation by Ms. Harty]

A-2

Mr. Zeller: I have a question about the impacts which have to do with the collective off-site radiological impacts from the fuel cycle high level waste, and spent fuel.

It says here, in the document, within the Category 1 issues, that they are not assigned a significance level, and it also says back in Section 8, under the Category 2 analysis for the draft statement, that they are not assigned a significance level there, either.

Where are they considered, and why not? In a coal plant an analogy might be, you know, what comes out of the smoke stack is certainly part of the environmental impact as waste material.

Mr. Cameron: And, Becky, do you understand the question? This is, maybe, a Category 1 issue that was not assigned an impact. Do you understand the question?

Ms. Harty: Yes, these are Category 1 issues that were discussed in the generic environmental impact statement, and they weren't assigned a significance level there.

Mr. Cameron: So, in other words, if no significant new information was found to cause us to alter the Category 1 finding, then there would be no --

Ms. Harty: Then there is no further analysis. If there was information that we discovered during our analysis at McGuire that caused us to say, yes, that is new information, significant information, then we would have re-analyzed that issue and looked at further depth. And at that point we may have assigned it a significance level.

Mr. Zeller: I understand, but maybe I didn't make myself clear, for neither Category 1 nor Category 2, for generic or site-specific impacts were significant levels attached to high level waste and spent fuel impacts. It says it right here.

Ms. Harty: Right. But this is only a Category 1 issue. Where are you reading, exactly?

Mr. Zeller: I'm inside of this book.

Ms. Harty: Can you give me a page?

Mr. Zeller: Yes, it is on Page iii, in the beginning, and then also on Page 8-49, under the summary of alternatives considered.

Mr. Cameron: It may be a question of how the particular sentence was written, but let's see if we can get to the bottom of that.

Ms. Harty: Let me take a stab at this, and if somebody from the NRC is more familiar with this, then you may ask them the basis for this.

For Category 1 issues, they usually assign a single significance level for all the issues across all the plants it is always small, moderate, or large. And this particular disposal may be a case, from my understanding of this, where they did not assign the small, moderate, or large, but they still said it was generic across all the plants.

Now, I don't know if I'm quite answering your question or not. It is something that you don't really get into unless you decide there is new and significant information at that plant, which throws it out of -- which takes it from the Category 1 where it can just stay generic, to where you have to

do a site-specific analysis, and then you would assign a specific, or a significance level at that point.

Mr. Cameron: I guess that, let me ask Jim Wilson if he has any further explanation of this, because I gather from Lou's question that it was not just the Category 1 issue, because I think that is understandable.

There is a reference, though, to Category 2, and no specific finding be attached. And --

Ms. Harty: Well, I don't see that it referenced the Category 2, and maybe that is in the abstract.

Mr. Cameron: Because I think that is the heart of Lou's point. Let's go to Barry and see. This is Barry Zalcman, NRC staff.

Mr. Zalcman: Let me try and put this in perspective. When Becky laid out the Commission's structure for determining Category 1 issues, we established certain criteria that may be common for all plants, that may be common for plants of a specific design, or that have certain attributes.

It turns out for the cases that you are identifying the conditions are as discretion determined, even though it may not be the same at all plants, it was still going to categorize it as a Category 1 issue.

I think that is the complexity that you are struggling with right now, we are trying to eliminate that in the executive summary. And if you go into Chapter 6 I think you probably are going to have the best representation where we bring together the findings within the guidance, or we actually talk to the issues where the condition, even though it didn't meet the initial criteria for Category 1 determination, elected to make it a Category 1 for that issue.

Mr. Cameron: Let me just, at a minimum, suggest that the NRC take that as a comment on this draft EIS to, at minimum, make it clear exactly what is going on so that the reader can understand it, okay?

Ms. Harty: Sounds good.

Mr. Cameron: All right. Other questions before we go to the severe accident aspect of it? Yes, sir.

B-1 Mr. Anderson: My name is Bob Anderson. I just have a question concerning the definitions of small, moderate and large. As far as your take on if the effect is to be large, is it your -- are you wanting to make a change so that it goes down to the small level?

Ms. Harty: I guess the best way of saying that is if it is large, you look at possibilities for mitigation. And in the case that we were in (license renewal), we only had small impacts.

So we didn't find any areas where we needed to suggest any mitigation.

B-1 cont

Mr. Anderson: Because that goes to your last slide, but on alternatives it said that some of the alternatives also include no-action. And some of the no-action are currently in the moderate or large significance.

And if they are currently in the large then are you taking a look at those issues?

Ms. Harty: That is a very good question. Let me actually run down the -- I have a nice list here.

In Chapter 9, actually there is a table in 9-1 where we look at the proposed action versus the no-action alternative, and then there are four other alternatives, coal fired generation, natural gas fired, new nuclear, and then a combination of alternatives.

And to give you something specific we said, okay, for example if we -- if they decided not to renew the license at McGuire, but they needed to replace the energy anyway, and they decided let's put in a coal fired generation plant; when you get to issues such as land use, the land mass that is there for McGuire, they would end up having to take out some trees, maybe buy some additional land, or something like that.

And, actually, the footprint of the plant will be larger than what it is now. So that is going to impact the land use, it is going to impact the ecology, and those impacts would be moderate or large.

And at that time, if they did come in and say, we are going to use a coal fired plant instead of a nuclear power plant, the same EIS process would start all over.

Pardon? Oh, you are right, that wouldn't be a federal action.

Mr. Wilson: We looked at the -- we laid out the alternatives and we found significance levels that, for some issues, reached moderate or large impact. We didn't look at mitigation to reduce the impacts of the alternatives. We looked at the impacts of McGuire operation, which were found to be small for all issues, and no mitigation is required.

We didn't go through the same process for each of the alternatives to the McGuire continuing-operation option. Is that clear?

We look at mitigation for the proposed action. We don't look at mitigation for alternatives. We look at mitigation if it happened as an operating impact at McGuire.

B-1 cont

Mr. Anderson: There again maybe I'm reading this wrong. But when it says including no- action alternatives, no-action to me means that it stays the same.

Ms. Harty: No-action means that they don't renew the licenses, and that the plant has been decommissioned.

Mr. Cameron: So that is the key, I guess, is how you define a no-action alternative?

Ms. Harty: And for that, for the no-action alternative, I will just tell you that on the impacts that were small or moderate on socioeconomics, because the plant is no longer going to be here, and the influence of the economics of the area, on an environmental justice.

[Presentation by Mr. Palla]

[Presentation by Mr. Wilson]

Mr. Cameron: So it all gets married up, okay.

We did, I think we have a clarification, or an answer for Lou Zeller's question from before. I'm going to ask Barry to help us with that.

Mr. Zalcman: Thanks, Chip. Again, this is Barry Zalcman, with the Staff.

I just wanted to add, for the record, so that others that may have heard the question raised by Mr. Zeller have some frame of reference, so that they can draw a conclusion regarding this.

In no way it diminishes our obligation to make sure that our environmental impact statement is written in plain and clear language, so we are taking back that issue.

But I would refer the readers to the generic environmental impact statement, which is a base document, on which site-specific supplements are created.

The base document provided the basis for the license renewal rule that was made part of Part 51 in 1996, the generic environmental impact statement is a support document to that.

If I could refer users of the GEIS to Section 6.2.4, which deals with conclusions associated with uranium fuel cycle and solid waste management issues. The radiological, and I am going to read this from the document, “radiological and nonradiological environmental impacts of the uranium fuel cycle have been reviewed.”

Later in that section it goes on with: "The doses are very small fractions of regulatory units, and even small fractions of natural background exposure to the same population. Thus standards exist that can be used to reach a conclusion as to the significance of the magnitude of the collective radiological effects.

"Nevertheless, a judgement as to the regulatory NEPA implication of this issue should be made, and it makes no sense to repeat the same judgement in every case.

"The Commission concludes that these impacts were acceptable, and that these impacts would not be sufficiently large to require the NEPA conclusion for any plant. that the option of extended operations under 10CFR54 should be eliminated.

"Accordingly, while the Commission has allowed a site a single level of significance for collective effects of the fuel cycle, this issue is considered Category 1." That is as far as I'm going to read into the record.

More importantly, the issue that you had raised deals with categorization, meaning is it a Category 1 or Category 2, non-significance, the Staff has, in fact, considered the significance. Thank you.

Mr. Cameron: Thanks, Barry. And can you make sure that Lou has those specific page citations so that, and context on --

All right, thank you all very much for listening. And now we want to listen to you. And I'm going to ask Jack Peel, who is the manager of engineering at the McGuire station 2 for Duke Energy Corporation, to talk to us about Duke's vision and rationale in proceeding with the license renewal application. Jack?

Mr. Peel: Thank you very much, Mr. Cameron. My name is Jack Peel, and I'm manager of engineering at the McGuire site.

On behalf of Duke Power I would like to express public thanks and admiration for our employees. And I'm referring to the employees not only located at McGuire site, but also elsewhere in our company, for their excellent efforts, over the years, to make McGuire successful for an operating period of 21 years to date.

And I would be remiss in not also recognizing our license renewal project team, some of those members are here listening today. I appreciate the work they have done to create our application, and to squire it along in the review cycle.

C-1 I assure you that we strongly believe that the McGuire plant is a worthy candidate for license renewal.

C-2 I want to thank the Nuclear Regulatory Commission for having developed a process which is thorough and effective. That process has been described by at least two of the speakers before me.

After reviewing, really just a cursory review of the draft supplemental environmental impact statement would reveal the thoroughness of the work that the NRC and the National Labs have done.

C-3 After reviewing the draft statement, and I'm referring specifically to Supplement 8, Duke Power agrees with the conclusions of that draft. Now, we intend to do more detailed technical reviews in the weeks ahead, and we will fulfill, if we have any comments, we will provide them in writing, and fulfill the schedule date that Mr. Cameron mentioned, which is August 2nd of this year.

Most importantly I want to express thanks to our neighbors here in the local community who have been so supportive of our operations over the years. We, at McGuire, have made a sincere effort to be a good neighbor.

We take public safety very seriously. Public health and safety is our number one priority, and that is our unwavering commitment.

So we are glad to have the opportunity to go through this license renewal process; we are proud of our employees, proud of our plant, and proud of our operating history, and I thank you for your attention.

Mr. Cameron: Thank you very much, Jack. Now we will go to Lou Zeller of the Blue Ridge Environmental Defense League, and then we will go to Mr. Robert Mahood.

Mr. Zeller: Thank you. My name is Lou Zeller, I'm on the staff of the Blue Ridge Environmental Defense League.

I have just two brief overviews that I would like to present here today, with regards to this license renewal.

A-3 One has to do with the provision of potassium iodide to residents living within the ten mile exclusion zone. It is noted here, in the draft report for comment, Supplement 8, that Duke completed a comprehensive effort to identify and evaluate the potential cost benefit plans enhancements to reduce the risk associated with severe accidents at McGuire.

As a result, Duke concluded no additional mitigation alternatives are cost-beneficial. Among these analysis are averted public exposure costs.

Recently there has been a lot of concern about off-site exposures from accidents. And, of course, the provision of such tablets as these here, the potassium iodide tablets to the public.

Of course these are available, actually the Nuclear Regulatory Commission has stockpiled several million doses of these, and an 800,000 appropriation, which I think would make the cost of this virtually zero.

The radioactive iodine-131 isotope contributes a major constituent in nuclear plant accidents. We could look back to Chernobyl, for example, 150 miles from the site iodine-131 was detected.

In that case, the Food and Drug Administration decades ago, and continues to say that it is a safe and effective method. Oak Ridge National Laboratory Paul Zann saying that provision of iodine prevents 99 percent of the damage to the thyroid.

In recent Nuclear Regulatory Commission publications it does talk about a rule regarding potassium iodide in emergency planning. This is from May the 13th of this year.

A-3 cont That licensees have the obligation to confirm that off-site authorities have considered the use of potassium iodide as supplemental protective action for the general public.

It also makes a supplemental point here, and I'm reading from the NRC, it will also require the licensees to use this information in developing protective action recommendations for off-site agencies.

I have two questions for the record. One, has Duke Energy fulfilled the Nuclear Regulatory Commission requirement with regard to off-site authorities?

And, two, how has Duke used this information in protective action recommendations? I see nothing to that effect in the document before us today.

A-4 The other issue has to do with the one that I raised during the presentations, and it has to do with high level waste. On advice of the staff I did go back to reread Chapter 6 here about single significance levels, which are not assigned to high level waste.

Within Chapter 6 it merely, I think, begs the question, because there is no analysis, and only a recapitulation of the regulatory limits. And I think Barry Zalcman read something read something from the generic environmental impact statement which essentially says the very same thing.

A-4 cont In that the Commission, and this is again from Page 6-5 in supplement, in Supplement 8 to the draft of today, it says: The Commission concludes these impacts are acceptable, and that the impacts would not be sufficiently large.

I would submit that the lack of a single significance level at this point, and this is a lone exception, so far as I can tell, every other impact in this document is considered small.

The impacts here are not small, they are not moderate, they are large. And there seems to be a reluctance to say large impacts in this case, particularly in the case before us, which is license renewal extension.

The high level waste would increase, the impacts would increase for an additional 20 years. I think that before this process can move forward there must be a better analysis of the impacts from high level waste.

It is not reassuring to me that the staff does not consider a change in its position necessary with regards to high level waste disposal, and consideration of the Category 1 issue.

I wonder what it would take, considering that the document here mentions the possibility of 1,000 premature cancer deaths world-wide, for a 100,000 metric ton repository.

Thank you very much.

Mr. Cameron: Thank you, Lou. Let's go to Mr. Mahood. And I hope I've pronounced your name correctly.

Mr. Mahood: You certainly have. It is a rare pleasure, thank you.

D-1 The whole strange thing about this process is that you are still completely bound by regulations, the original regulations from about 1954, I suppose with some revisions.

And you talk about there being no new information, no new information, and for the most part I think that is perfectly true within the sort of frame of reference.

D-2 But what I would submit to you is that while there may be no new information, there are a couple of new circumstances that I don't think can be ignored when the time comes to consider whether to go on with the nuclear industry.

One of these, which is specific to McGuire, and also to Catawba plant, is that we have had an enormous population explosion here, and it is not stopping, it is continuing to go on. Whereas we have not had anything like an enormous improvement in the evacuation routes.

And hardly anyone in this region believes that they could actually get out. And FEMA doesn't seem, which is the agency that is most responsible, or supposed to be responsible for this, seems to be thinking entirely in pre-9/11 terms.

Because when you have a meltdown, if you start with a problem with the plant, and then you try to correct it, and then you find you are not succeeding, and so you send out the first warning, and then you are still not succeeding, and you send out a secondary, tertiary, quaternary warnings, and so on, you've got hours, and hours, and hours of this to start evacuating some things first, and all that.

D-3 But if a plane is driven into your spent fuel deposits, whether they are in dry casks, or in pools of water, they are outside the containment domes.

So all the things that you've been saying about how strong the domes are, and how -- what great safeguards you have against operational failures, become completely irrelevant in the case of an attack by even a fairly small plane, a moderately small plane on the spent fuel containment.

And it seems to me that that would have, if that happened, it would have something of an environmental impact, in that there is about 20 or 30 times as much fissionable material outside of your highly fortified domes, as there is inside of them.

I also note, just to back up what I said about evacuation, that Mr. Wayne Broome, I believe the name is, who is the local official that would do the evacuating, or take charge of evacuation here, talks entirely in pre-9/11 terms.

He says, well, we figure we can get everybody out in under six hours, provided that first we had cleared the lakes, we had cleared the schools, and we cleared all the businesses.

Well, that is kind of sort of a leisurely scenario that you have in a meltdown, but you don't have that in an instant attack on a plant, on the spent fuel depositories.

I called the Charlotte Mecklenburg schools, and I found that they thought it would take them about an hour, or an hour and a half to evacuate. When I pinned them down I found out, because this is sort of unbelievable, to get everybody in the region out of the schools in an hour and a half, or something like that, when it takes buses many, many hours on the roads to get the kids to and from school every day, in three shifts.

D-3 cont And he said, yes, but we only need to evacuate a ten mile radius. Well, you know, that would be totally inadequate in such an accident. Well, not accident, but such an attack.

He also said that the private schools, of which there are many around here, were not included in the plans, they all have plans of their own. I called one of the private schools, got the secretary, and asked what their plan was.

And she said, their safety man wasn't there, so I would have to wait for him to get back. And I said, well, what if the attack happened right now and your safety man isn't here? You must have the plan, it must be there.

And so she looked for it, and she couldn't find it. She said it was in her drawer, but she couldn't find it. The principal wasn't there, either. And then she got mad and pretty much hung up on me.

D-4 So you can see that this region is just not prepared for an eventuality like that. And the change in circumstances as to the population density, this is going to keep on changing.

So here this renewal comes up 20 years from now. What do you think it is going to look like around these plants 20 years from now?

It seems to me that it would be the responsible thing to do, to make some recommendations to the communities around here, to the governments around here, to put a moratorium on any further building in your evacuation zone, until the roads can be improved to the point where a quick evacuation is possible.

And it seems to me that somebody needs to take this responsibility, whether it is Duke Power, whether it is the NRC, or whether it is FEMA, somebody needs to be advising local governments that they can't go on just packing people around these plants indefinitely, if you want to go on operating for another 40 years.

Thank you.

Mr. Cameron: Thank you very much for that information and those recommendations, Mr. Mahood.

And I think that is all that we have in terms of formal comments for this afternoon session. We will be back tonight for a 7 o'clock meeting, and a 6 o'clock open house.

And, for your information, we are going to be doing a similar set of meetings on the Catawba Nuclear Power Plant on June 27th at the Rock Hill, South Carolina City Hall.

And thank you all for being here, and send us your written comments if you so desire. There are copies of this document out on the desk, and we are adjourned. Thank you.

(Whereupon, at 3:12 p.m. the above-entitled matter was concluded.)

Transcript of the Evening Public Meeting on June 12, 2002, in Huntersville, North Carolina

[Introduction, Mr. Cameron]
[Presentation by Mr. Tappert]
[Presentation by Ms. Franovich]
[Presentation by Mr. Wilson]
[Presentation by Ms. Harty]

E-1 Mr. Collins: My name is John Collins, I'm from the local paper here. I wanted to ask you why you skipped any presentation about the transmission lines, the Section 1.5?

Ms. Harty: Well, I was just trying to hit some of the highlights. We have, in the past, done the full thing, and it takes quite a while.

But let me, did you have specific questions on that?

E-1 cont Mr. Collins: I do, yes. It has come up recently in Huntersville Board considerations because of an extension, a thoroughfare. Talking with a curator at the NC State University, I understand that the sunflowers are very a man-friendly plant that likes to seed environments.

And it does very well in and around transmission lines, because of all the upheaval in the soils. I also understand that most energy utility companies are using herbicides now along their transmission lines to keep back growth, rather than cut it.

How does that affect any possibility for the growth of Schweinitz's sunflower?

Ms. Harty: For this site the line is a very short transmission line area. It just goes across the road to the 525 and 230 KV switchyards. So in this case, for this plant, we were able to actually look at what was there. I mean, it was very easy to do, we are not talking hundreds of miles of right-of-way that we had to look at.

So that was examined in depth. Now, these transmission lines do hook up to other lines that were, in one case we covered a lot of those lines for the Oconee plant.

I'm not sure that is getting exactly at the answer to your question.

Mr. Collins: Is there anybody else from the --

Ms. Harty: Actually, maybe Charlie, do you want to handle that one?

Mr. Cameron: Charlie, do you have the --

Ms. Harty: This is Charlie Brandt, he is our terrestrial ecologist. So he was actually out there on the team, looking for sunflowers.

Mr. Brandt: Well, it kind of depends on the different levels of the question that you want answered.

First off, just for this plant what Becky said is correct, that the only aspect of the transmission line that is involved in this proposed action is that chunk between the plant itself and the switchyard. It is real short, and Chic Gaddy did a walk-through survey on that area, and did not identify any of those sunflowers, or any of the other sensitive plants in that zone.

You are correct that Schweinitz's sunflower does seem to favor, or at least maybe that is where people look for it, it seems to favor transmission lines.

And I can't speak in general for the transmission line maintenance practices throughout the Duke Power system. But, generally, the us of herbicide is going more and more into restricted use, rather than broadcast use.

So, in other words, it is focused right on specific plants that are targeted, the trees that are going to grow too tall, rather than a broadcast herbicide.

That is another reason why a lot of these plants are found in right of ways, because of the maintenance program.

[Presentation by Mr. Palla]

Mr. Cameron: Thank you, Bob. Any questions on the severe accident portion? Mr. Mahood, here you are.

F-1 Mr. Mahood: Thank you. In reading the bits about cost benefits, which are dispersed throughout the paper that I received, the document here, I was a little bit puzzled by the definition of benefit.

Reading over it, it seemed that if you want to be totally cynical about it, benefit would be the protection of the public's health and safety, whereas the cost would be what it would cost Duke if the balance to the public health and safety exceeded a certain point.

And since Duke is ensured by the Price-Anderson Act, and has a cap on its liabilities, that definitely lowers Duke's cost a great deal, although the impact on the public health and safety might be considerable.

And so that if you look at it as sort of a suspicious way, which is the way I think that the informed public should look at just about everything, it seems to be saying that as long as the damages that the power company would have to pay don't exceed the cost of preventing any damage to the public, then it is better to avoid, well, it is better for the bottom line, simply not to spend the extra money to protect the public.

That is one impression one could gain from this, and correct me if I'm wrong.

Mr. Palla: Well, let me try to clarify that. To begin with the methodology is a well-developed and -reviewed methodology, and it has been in use for many years.

Now, I can understand being skeptical about what assumptions go into this. My understanding of it is that insurance, even though Duke has insurance against accidents, do not come into play in this analysis.

So they do not get credit for insurance. The cost of an accident is treated as a societal cost, that society has to pay. Even if they were insured, someone has to pay that. That is the concept there.

So insurance is not a factor. And, similarly, damage to the public, the health effects, these are all, if you can avert them, these are all benefits.

So if you can keep the plant online you actually don't need replacement power, so replacement power comes into play. That would be, you can avert an accident. That is another thing in your favor.

But the insurance doesn't get any weight in this analysis, it can't be used as far as doing this analysis.

Mr. Mahood: I'm sorry, but we are in kind of --

Mr. Cameron: Let's get you in the transcript, Mr. Mahood.

Mr. Mahood: I'm sorry, but we seem to be in a little bit of a semantic muddle here, because I'm
F-2 speaking of the cost, I thought that in the document cost referred to the cost to the nuclear industry to do what is necessary to protect the public.

And the benefit is the protection of the public, and you are speaking of the cost to the public, so we are getting a little --

Mr. Palla: Well, let me try to --

Mr. Mahood: -- muddled here, because I'm talking about the cost of protecting the public, the cost of --

Mr. Palla: The cost in this analysis is the cost to implement the fix, the improvement. The benefit is all of these risk elements that you can avert.

So we are weighing the cost to implement this thing against the savings you get by not exposing the public to risk, by not losing the plant, and having to have replacement power. All of these outside costs related to cleaning up, there are off-site costs related to property damage.

These all, I know it may be confusing, but all of these costs get counted, you add them up and you compare them to the cost of implementing this thing.

So all of these different things that you avert are all collected on the same side of the equation, and then summed up and compared to the cost of the enhancement.

Mr. Cameron: So when we use the term cost benefit either specifically in the SAMA evaluation, or cost benefit generally in the environmental impact statement context, it may have a very specific and narrower meaning than some of the broader costs and benefits that Mr. Mahood is referring to?

Mr. Palla: Yes. Maybe the confusion comes from the fact that we basically add up these other costs, and then we label them as benefits. But we compare the cost of the fix to make this improvement, and then here are all these other averted costs which we count as a benefit of putting the fix in.

And we basically look at that balance between the cost of making the improvement versus all of the benefits that you would reap from reducing the risk.

Mr. Cameron: Does anybody else from -- thank you, Bob, for that. I think that helps. I just wondered if anybody else from the NRC team wanted to talk to how the term cost benefit is used in the environmental impact statement process?

(No response.)

Mr. Cameron: I would just say that after we are done tonight perhaps we could talk a little bit more with Mr. Mahood, in person, about that.

Are there any other questions on this particular aspect? Yes, sir?

Mr. Knox: Good evening, my name is Gary Knox, I'm a resident of Cornelius, and have been fortunate enough to be part of this community for a long, long time.

G-1 Looking at the application, the CFR Part 54, or Section 10, whatever, the renewal application process began prior to September 11th. Is there a supplement to this report as it relates to new findings, new information?

I see in here request for additional information subsequent to September 11th. And that would be my question.

Mr. Palla: I am probably not the best person to answer this. I think it goes to the scope of what is included in this, but I don't know if --

Mr. Cameron: Let me just see if we can get a little bit of clarification. Are you specifically concerned about security terrorism considerations?

G-1 cont Mr. Knox: I would not ever dramatize that element, as much as I would if you look at the conclusion, and read it verbatim, it says that additional plant improvements to further mitigate severe accidents are not required at McGuire units, etcetera, as part of the license renewal pursuant to.

I'm assuming those guidelines were written prior to September 11th, the application process started since then, I think we live in a new world. My question is, is this conclusion, or its draft, been amended or changed since that day?

Mr. Palla: It has not been. This conclusion is based on existing regulations. And these other security concerns are being addressed in a separate action, and haven't been brought back into this process.

G-1 cont Mr. Knox: There are additional findings, and the request for additional information will not be, I'm assuming that supplement, whenever it is going to appear, would be available to the public, as part of the application?

Mr. Cameron: This is Rani Franovich.

Ms. Franovich: Let me try to address your question. You are concerned about the implications of the events of September 11th. And what the Staff is looking at is the same concern you have, which is really a current issue, it is not unique to the extended operation.

So the Staff is evaluating actions that need to be taken by the industry to address those concerns right now. So this is not a license renewal issue, it is a current issue that we are addressing via a separate process, under 10CFR Part 50.

Mr. Cameron: So, in other words, like any plant, whether they are under license renewal or not, is going to have to meet whatever comes out of the new evaluation?

Ms. Franovich: Precisely.

G-1 cont

Mr. Knox: I think you did answer my question, the events of September 11th are not part of the renewal license application?

Ms. Franovich: Correct. And as Jim indicated, the concern you have applies to all nuclear power plants, regardless of whether they are pursuing renewal, or not. So that is why we are pursuing it now.

Mr. Knox: I understand. I may not be satisfied with the answer, but I understand.

Ms. Franovich: I think we are still trying to get our arms around the answer.

Mr. Knox: I understand.

Mr. Cameron: And, again, that may be one of those issues that perhaps we could talk to this gentleman after the meeting.

But, John, do you want to add anything?

Mr. Tappert: Yes, just a couple of things. I don't want you to have the impression that the absence of us addressing this as part of license renewal process means we are not looking at safeguard issues in general.

The Commission, and the whole federal government, has been mobilized since September 11th to address homeland security issues, and the Commission has done a number of things to address that issue.

We've created a whole new organization in our agency just to look at safeguards issues. The Commission has ordered a top-to-bottom review, a complete look at all the safety requirements.

And while we are performing that assessment we've also issued orders to each and every power plant, including McGuire, to implement interim compensatory measures to address security concerns.

So the fact that it is not a license renewal issue means that we don't want to wait 20 years to address it. It doesn't mean that the Commission doesn't take these issues seriously, and has taken serious steps to take them on.

G-2

Mr. Knox: My question is, I would like to separate -- the security issues I believe, are separate and prudent from relative to whether or not improvements for security and severe accident mitigation need to be addressed.

Apparently you are saying that because we have the current regulations they don't need to be addressed? Security needs to be addressed, but I think it would be my opinion that we should be leery as opposed to --

Ms. Franovich: I think what the answer to your question is, is that severe accidents, within the context of license renewal, do not involve terrorist threats.

However, there are, of course, those implications outside of license renewal. That as John Tappert indicated, the Staff, the Commission, and the federal government, is in the process of addressing this. Does that answer your question?

Mr. Knox: It does.

Mr. Cameron: Thank you.

Mr. Knox: Thank you very much.

[Presentation by Mr. Wilson]

F-3 Mr. Mahood: Sorry, but I do have one. Suppose the week after next, or the month after next, the new National Security Agency, or whatever they call themselves, were to impose new NRC regulations taking post-9/11 into account.

Would this process go on just as before, or on the same schedule, or would the whole thing sort of start over again?

Mr. Cameron: John, do you want to try that?

Mr. Tappert: Yes. If the Commission may very well issue additional regulations addressing security issues in response to the 9/11 attacks, those will be taken on a plant by plant basis, for all 103 operating reactors, irrespective of which ones are at license renewal, or not.

So the short answer is that this process will continue as it is, because this is addressing an extension issue, and an additional 20 years. The safeguards issues are today issues, and will be addressed today by all the operating reactors.

Mr. Cameron: I think it is probably hard to speculate on what exactly the result would be. I suppose it is conceivable that new regulations would say, well, let's take a look back, a careful look at license renewal, or something like that.

I mean, it is hard to say what would happen. But thank you, John.

Okay. Let's go to you for some more formal comment at this point. And we are going to hear first from Duke Energy Corporation, hear about the rationale for license renewal process, some of the vision behind that, and we are going to ask Mr. Brew Barron, who is the site vice president for the McGuire station, to come up and say a few words to us.

Mr. Barron: Thank you, Chip, thank you for the opportunity. I just have a few short remarks, if I may.

I really want to start off by giving some recognition to the hard working employees at McGuire, and throughout Duke Energy, that do work at McGuire. Over the past 21 years, it is their hard work, dedication, and contributions, that have made McGuire the safe, reliable, and world-class operating nuclear power plant that it is today.

They are the folks that have done the hard work, that have achieved the great results, and really deserve all the credit. I would also like to thank the NRC, the Agency has defined and codified, and implemented a license renewal process which is both thorough and predictable.

H-1 Reading through the results of the draft environmental impact statement, the thoroughness, the completeness with which the Staff and the contractors have performed their work is very apparent.

But, just as importantly, they've completed that work on or ahead of their initial estimated schedule on that. And from a business standpoint, our ability to make timely and informed business decisions, that is also very important to us.

And the Agency, both the Commission themselves, and the Staff, are to be commended on their very good work in that area.

H-2 We are still reviewing the draft EIS. Initially it looks like we very much agree with the conclusions that have been reached. We do have our technical experts continuing to go through the report.

And any comments that we have we will provide in writing, and we will provide them on or before the requested date of August 2nd.

I guess the last group I would like to address is our neighbors, the community. We appreciate the support that we've gotten at the facility over the past 21 years of operation.

Being a good neighbor is very important to us at McGuire. The actions that we take to ensure that the plant is operated safely, that it is a reliable source of economical power to our customers is extremely important to us, and every decision we make, day in and day out, takes into account whatever we can do to minimize the environmental impact, any impact that we would have on the safety of the community around us.

I thank the community for their support, and again thanks for the opportunity to get up and speak.

Mr. Cameron: Thank you, Brew. Next I'm going to ask Mr. Robert Mahood to come up. Mr. Mahood, would you like to say a few words to us?

Mr. Mahood: Thank you. I feel that both the people at Duke Power, and the people that work at NRC are in a very difficult position right now, because they are still having to deal with all these questions on the pre-9/11 regulations.

F-4 And although your document says repeatedly there is no new information about most of the issues here, about safety, and these are mostly about the operational requirements, and that sort of thing, I do feel that there are now new circumstances.

One of the new circumstances is the enormous population explosion that is taking place around here, and which is ongoing. So that instead of a few thousand people around the plant, living around the plant when the plant was first licensed, we now have hundreds of thousands of people living around both the McGuire and Catawba plants.

And the evacuation possibilities have increased enormously because there has been much improvement in the roads around here. And I expect that some of our visitors from Washington may have been caught in a traffic jam or two between this afternoon's meeting and this evening's, so you know what I'm talking about.

If I were an Al Qaeda operative I would make sure that there were a couple of accidents on I77, just to ensure that nobody got away expeditiously.

The thinking of local branch of FEMA, which is the Mecklenburg emergency management office, is clearly, I have quotations on this from Mr. Broome, who is in charge of the office, via the television, that they are thinking in pre-9/11 terms.

He says that, yes, we could probably evacuate everybody in less than six hours, assuming that we already cleared the lakes, we've already cleared the schools, we've already cleared all the business offices.

Well, now you are talking about a long time. After hearing that I called the Charlotte Mecklenburg schools, and asked them how long, they gave me their safety officer, and he said, it would take about an hour and a half, an hour to an hour and a half to get all the kids evacuated.

I couldn't understand that, because it takes hours, and hours, and hours, to get the kids to school, in three different shifts on the buses, plus parents driving them, and so on.

F-5 And it turned out, well, he was only thinking in terms of evacuating a ten-mile radius. Well, if a plane is driven into the spent fuel containment areas, there isn't going to be hours and hours to evacuate. We are going to have to get out immediately, the sooner the better, five minutes would be ideal.

F-6 But I think that communities need to start passing ordinances that say you can't build any more houses, and bring any more people into harm's way, if you can't get out in at least two hours from the evacuation zone, whether it be a ten-mile radius, or a 25-mile radius, or 50-mile radius.

F-7 That is something that we haven't heard about, really. If a plane crashed into the spent fuel pools and casks which contain 20, or 30, or 40, or 50 times as much radioactive material as is actually contained inside these domes, which are highly touted for being so well fortified.

The other point I would like to make is that it may well not be any funny looking guy with a beard, and a big nose, and a strange name like Kai Al Hicby, or something like that, who does the job.

There have already been precedents. An Egyptian pilot probably deliberately drove a plane full of passengers into the ocean. A Chinese pilot probably deliberately drove his plane into the ground with all passengers on board.

There are 800 people, about five, who are seriously disturbed. And some of them can be airline pilots, or Air Force pilots, Coast Guard pilots, and so on. So the person who actually does this thing may well be American, is not suspected by anybody, with an ordinary name like John Wayne.

And everyone will say, afterwards, he seemed like such a nice, straight-forward, reliable guy, with a good work record, and everything.

F-8 We need to be prepared against that type of thing. And I would like to see some visible preparation. I would like to see them starting to lay down very thick concrete above all of the spent fuel depositories, as soon as possible.

I would also like to see something visible in the way of protection of the nuclear plants, such as the balloons that we used in World War II to protect London against the Nazi planes, only these will have to be anchored at 9,000 feet, and 5,000, and 12,000, they only need to be anchored at maybe 500 feet or less, 300 feet, maybe.

So it shouldn't be expensive at all, and it would be a visible sign to the public that something, something is being done against this threat. It would also be a sign to the crazy guy in the airplane, that this is not such a good target.

F-6 cont Right now we are making this area into a better and juicier, and juicier, and juicier target, by selling more and more subdivisions to people, crowding them into the areas around here.

And we are talking about a license renewal 20 years from now, to go on for another 20 years. What do you think it is going to look like around here 20 years from now, if we just go on building, and building, and building?

And what is it going to look like 30 years from now, when there is still ten years to go? We need to do something visible, and tangible, to avert a tragedy in this area. Thank you very much.

Mr. Cameron: Thank you, Mr. Mahood.

And anybody else, comment, any questions, before we break up tonight? Again, the NRC staff and our experts will be here. I was glad that we had a chance, at least, for one of them to expound on their area of expertise. But we do have others here.

I would just thank all of you for taking the time out of your evening to come down and to share your comments, and concerns with us.

And John, do you have anything you want to add at this point? Well, then we are adjourned for the evening, thank you all.

(Whereupon, at 8:30 p.m., the above-entitled matter was concluded.)

ER 02/406

July 26, 2002

5/10/02
67FR31946
(2)

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Wahington, DC 20555

RE: Draft Supplemental Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 8, McGuire Nuclear Station, Units 1 & 2, Mecklenburg County, NC (NUREG-1437)

Dear Sir:

The Department of the Interior has reviewed the above referenced document, and we have the following comments for consideration by the NRC staff.

I-1 We are pleased with the level of detail provided in the Draft Supplemental Environmental Impact Statement (DSEIS) and are glad the proposal includes regular monitoring following relicensing.

The proposed Federal action by the U.S. Nuclear Regulatory Commission (NRC) is renewal of the operating license for McGuire Nuclear Station. McGuire Nuclear Station is located on the shore of Lake Norman, approximately 17 miles north of Charlotte, Mecklenburg County, North Carolina. The plant has two Westinghouse-designed, pressurized, light-water reactors, each with a design rating for a net electrical output of 1129 megawatts. The DSEIS considers the environmental impacts of renewing the operating license in the NRC's Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), NUREG-1437. The draft supplement reviews 23 site-specific issues, in addition to those considered in the GEIS. The current operating licenses expire in 2021 (Unit 1) and 2023 (Unit 2).

General Comments

I-2 **Impingement and Entrainment of Aquatic Organisms**. One of several issues identified at McGuire includes impingement and entrainment of aquatic organisms at the cooling water intake. Previous studies at the site by Duke found impingement of some fishes, mostly threadfin shad, some bluegill, and alewife, particularly during periods of cold water. Although the DSEIS concludes that the impacts were SMALL, we recommend that the licensee establish a regular monitoring program and develop a strategy to reduce impingement and entrainment. These periodic reports of findings should be forwarded to the U.S. Fish and Wildlife Service (FWS).

I-3 **Migratory birds and raptors.** We do not agree that there is enough information to conclude that the impacts of potential bird collisions, or electrocution, are small in significance. We believe that a monitoring program should be developed consistent with the draft Memorandum of

Template = ADM-013

E-RIDS = ADM-03
Add = J.H. Wilson (JHW1)
H. Bernek (HFB)

Agreement between the U.S. Fish and Wildlife Service and NRC for migratory birds. Since bald eagles, osprey, black and turkey vultures, and herons frequent the project vicinity, we recommend lines crossing wetlands and large bodies of water should be maintained to maximize visibility of the line to raptors by one of the following design modifications: (1) remove the static line; (2) enlarge the static line to improve visibility to raptors; or (3) mount aviation balls or similar markers on the static line.

I-4 **Endangered species**. We have reviewed our records and visited the site, and notwithstanding the above comments, we concur with the determination that the proposed project is not likely to affect endangered species. Therefore, we believe the requirements under Section 7 of the Act are fulfilled. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

For further coordination and additional information concerning these comments, please contact Mr. Mark Cantrell of the Asheville Field Office, U.S. Fish and Wildlife Service, 160 Zillicoa Street, Asheville, North Carolina 28801; telephone number 828/258-3939, Ext. 227.

I can be reached at 404-331-4524 if I can be of further assistance to you.

Sincerely,

Gregory Hogue
Region Environmental Officer

cc:
OEPC, WASO
MCantrell, FWS, Asheville
AValenta, FWS, R-4

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 2, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Comments on draft plant-specific Supplement 8 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants" McGuire Nuclear Station, Docket Nos. 50-369 and 50-370

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 January 17 and 31, 2002. By letter dated May 6, 2002, the staff forwarded a copy of the draft plant-specific Supplement 8 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 8 to NUREG-1437.

In addition to providing comments on the draft Supplement 8, Duke is also in the process of reviewing the conclusions contained in Section 5.2.7 of the draft Supplement 8. In this section, the staff concluded that one of the severe accident mitigation alternatives (SAMAs) 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." Duke is in the process of reviewing this SAMA and plans to provide its position by a separate letter.

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

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 2ND day of August 2002.

Mary P. Nelms

Notary Public

My Commission Expires:

JAN 22, 2006

Attachment 1

Comments on Draft Plant-specific Supplement 8 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants"

McGuire Nuclear Station, Units 1 and 2

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.5 Aquatic Resources

Comment Number	Page	Line	Comment
J-1 1	2-19	19	Line reads: "The primary fish caught in the nearshore littoral zone include sunfish (Lepomis spp.), carp (Cyprinus carpio), and catfish including the blue catfish (Ictalurus furcatus), snail bullhead (Ameiurus brunneus), white catfish (I. catus), and flat bullhead (I. platycephalus). " The inclusion of blue catfish as inhabitants of the nearshore littoral zone is incorrect as these fish are considered largely pelagic in nature and are only occasionally caught inshore. Additionally snail bullhead, white catfish, and flat bullhead are no longer found in significant numbers due in large part we believe by blue catfish and flathead catfish predation. Correct the sentence to read, "The primary fish caught in the nearshore littoral zone include sunfish (Lepomis spp.), largemouth bass, crappie, and carp (Cyprinus carpio). Numbers of previously abundant catfish species like snail bullhead (Ameiurus brunneus), white catfish (I. catus), and flat bullhead (I. platycephalus) have dwindled significantly due to suspected predation by blue catfish (Ictalurus furcatus), and flathead catfish (Pylodictis olivaris)."
J-2 2	2-19	27-29	Lines read: "In 1999, 135 species of phytoplankton were collected, the dominant types being cryptophytes and diatoms (Duke 2001a)." It is more accurate to use the words 'varieties and forms' instead of species. Correct the sentence to read "In 1999, 135 varieties and forms of phytoplankton were collected, the dominant types being cryptophytes and diatoms (Duke 2001a)."

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.5 Aquatic Resources

J-3

Comment Number	Page	Line	Comment
3	2-20	5-8	Lines read: "....--and three mussel species- Carolina heelsplitter (Lasmigona decorata), dwarf threetooth (Triodopsis fulciden), and Carolina creekshell (Villosa vaughnaniana)- could inhabit the region around McGuire (Table 2-1)." Although the word 'could' is used in this sentence, it creates the impression these mussels might be found in the area. This likelihood is extremely remote due to the lack of flowing water habitats around McGuire. Concurrence with this professional judgment is even stated in the SEIS on page 4-36, lines 25-28, "As described in Section 2.2.5, the only Federally or State-listed threatened or endangered aquatic species with the potential to inhabit waters near McGuire, the Carolina heelsplitter (Lasmigona decorata), is not present in the vicinity of the plant (Fridell 2001) and does not occur in impounded water." Revise sentence to read "....--and three mussel species- Carolina heelsplitter (Lasmigona decorata), dwarf threetooth (Triodopsis fulciden), and Carolina creekshell (Villosa vaughnaniana)- could inhabit the region around McGuire (Table 2-1), but practically speaking the probability is extremely unlikely because of lack of lotic environments."

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment
Section 2.2.5 Aquatic Resources

J-4

Comment Number	Page	Line	Comment
4	2-20	32-34	Lines read: "Menhinick (1991) lists the highfin carpsucker from Lake Norman considerably north of the study area and lists only historic records for the Santee chub in Lake Norman, but north of the study area (Gaddy 2001)." Although the above sentence is not factually incorrect, it leaves the impression that perhaps the highfin carpsucker and maybe even the Santee chub may exist in Lake Norman. It is well worth noting however that in the NC Heritage Program records the highfin carpsucker documentation is extremely sketchy and the EORANK (Element Occurrence Rank) designation is O (Obscure-date, location, and/or quality of the occurrence is unknown) and the survey date is listed only as pre-1991. The same paucity of rigorous documentation and species records is also true for the Santee Chub. Revise sentence to read "Menhinick (1991) lists the highfin carpsucker from Lake Norman considerably north of the study area and lists only historic records for the Santee chub in Lake Norman, but north of the study area (Gaddy 2001). However, detailed and thorough historical documentation on both species in the NC Natural Heritage Program records is incomplete or non-existent and there have been no citings of these species at all in the recent past."

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter Offsite Land Use
Section 2.2.8.3

Comment Number	Page	Line	Comment
J-5 5	2-31	37	Cowan's Ford Wildlife Refuge should be Cowan's Ford Waterfowl Refuge.
J-6 6	2-33	1	Cowan's Ford Wildfowl Refuge should be Cowan's Ford Wildlife Refuge.
J-7 7	2-33	2	Line should read: "... within an oxbow bend in the riverine section of Mountain Island Lake."
J-8 8	2-33	1-6	Section does not mention Crowder's Mountain State Park. Crowder's Mountain State Park is located approximately 24 miles south-west of McGuire.

Chapter 4.0 Environmental Impacts of Operation
Section 4.4.4 Public Services: Transportation Impacts During Operations

Comment Number	Page	Line	Comment
J-9 9	4-29	19-25	McGuire's main entrance (west entrance) has been closed as a result of the events of Sept.11, 2001. This will probably be a permanent closure. All entrance and exit traffic must use the east entrance with the traffic light.

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire 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
J-10 10	5-6	23	Line reads: "... comments received during the McGuire peer review process, ..." Including the above phrase in this location may lead a reader to assume that the peer review comments were incorporated into Revision 2 of the PRA which was used for the SAMA analysis. This is not the case; the peer review occurred after Revision 2 was complete. Suggest that the reference to the peer review be deleted here.
J-11 11	5-8	22	0.006 should be 0.06.
J-12 12	5-8	23	0.0075 should be 0.07.

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.2.2 Review of Duke's Risk Estimates

Comment Number	Page	Line	Comment
13	5-10	22	The Revision 3 results provided at the time of the RAI response were preliminary and somewhat changed in the final approved version of Revision 3. Values from the final approved version of Revision 3 are provided in the following comment.
14	5-11	Table 5-5	The Revision 3 results provided by Duke at the time of the RAI were preliminary and somewhat changed in the final approved version of Revision 3. Values from the final approved version of Revision 3 are provided below. The format for these values is the same as provided in the RAI response dated January 31, 2002.

Initiator	Core Damage Frequency Contribution
SEISMIC	8.9E-06
TORNSW	1.6E-06
FIRES	6.3E-06
Total External	**1.7E-05**
Internal Floods	5.4E-06
Transients	2.9E-06
LOCAs	8.8E-06
RPV Rupture	1.0E-06
SGTR	5.2E-07
ATWS	5.3E-07
ISLOCA	9.8E-07
Total Internal	**2.0E-05**
Total CDF	**3.7E-05**
	SBO Frequency Contribution
Total SBO Frequency	1.0E-05
Seismic	7.4E-06
Tornado	1.5E-06

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.2.2 Review of Duke's Risk Estimates

Comment Number	Page	Line	Comment
15	5-11	Table 5-5, line 18	The seismic CDF listed under the column heading PRA, Rev. 1 (IPE) is given as 1.1E-05. This is the value from the IPEEE not the IPE (1.4E-05). This should be more clearly identified in the table.
16	5-11	Table 5-5, line 20	Table 8.1-1 of Revision 1 of the McGuire PRA (IPE), lists the fire CDF as 8.1E-08, not 2.3E-07. The IPEEE estimate of the fire CDF is 2.3E-07. Clarify which value and reference are intended.

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.3.1 Potential Design Improvements

Comment Number	Page	Line	Comment
17	5-16	Table 5-6	Line in Table 5-6 reads: "align reactor vessel (RV) cooling/other Unit RN"... The Duke table used RV cooling. In this case RV is not an acronym for reactor vessel. RV is the shorthand notation for the Containment Ventilation Cooling Water System. This description should be added to the RV entry on page xxiii Abbreviations/Acronyms.
18	5-16	Table 5-6	The zeros in the CDF column should be replaced with the CDF values from Table 4-2, found in Attachment K of the McGuire ER.

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.4 Risk Reduction Potential of Design Improvements

Comment Number	Page	Line	Comment
19	5-19	27	The Revision 3 results provided at the time of the RAI response were preliminary and somewhat changed in the final approved version of Revision 3. Values from the final approved version of Revision 3 are provided Comment Number 14.

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire 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
J-20	20	5-21 5-17	28 Table 5-7	The cost estimate provided by Duke ($205,000) 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.
J-21	21	5-21	29	Note that the pre-staged option was selected in order to provide confidence that the alignment could be established within a time frame that would allow mitigation for fast as well as slow station blackouts. Without pre-staging, the time needed to power the igniters would be long and may not be effective for all sequences. The estimated benefit would be reduced by some amount if a pre-staged diesel was not assumed.
J-22	22	5-21	39	The cost estimate provided by Duke ($540,000) is a per unit cost and should not be divided by 2.
J-23	23	5-22	3-5	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.
J-24	24	5-22	9	replace "reactor vessel cooling" with "the Containment Ventilation Cooling Water System"
J-25	25	5-22	15-16	The two cost estimates, $275,000 and $291,000, are in the reverse order of the 2 SAMAs, (1) and (2), discussed earlier in the same paragraph. This may lead a reader to associate the costs incorrectly with the SAMAs.

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire Nuclear Station, Units 1 and 2

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.6.1 Duke Evaluation

	Comment Number	Page	Line	Comment
J-26	26	5-25	4	3.81E+08 should be 3.1E+08 See page 12 of Attachment K, McGuire ER.

Chapter 5.0 Environmental Impacts of Postulated Accidents
Section 5.2.6.2 Staff Evaluation

	Comment Number	Page	Line	Comment
J-27	27	5-27	17	Update CDF discussion based on final Revision 3 results provided in Comment Number 14.

Attachment 1
Comments on Draft NUREG-1437, Supplement 8
McGuire 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

Comment Number	Page	Line	Comment
28	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]."

J-28

Chapter Appendix E
Section Table E-1

Comment Number	Page	Line	Comment
29	E-2	11	Draft permit was issued May 30, 2002. Comments have been submitted to NCDENR for final approval.

J-29

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

5/10/02
67FR31846
(1)

August 2, 2002

4EAD

RECEIVED
2002 AUG 13 PM 2:46
Rules and Directives Branch USNRC

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 8 McGuire 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) has reviewed the document entitled, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding the McGuire Nuclear Station, Units 1 & 2," Draft Report for Comment, NUREG-1437 (Draft GEIS). The proposed federal action is the renewal of the Operating Licenses (OL) for McGuire Nuclear Station, Units 1 & 2. 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 Generic DEIS.

The Generic DEIS discusses the proposed action of renewing the OL for McGuire Nuclear Station, Units 1 & 2. Duke Energy Corporation submitted the application for renewal. The document also discusses the alternatives to renewal which were evaluated.

K-1

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 Draft GEIS 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.

K-2
K-3

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 impacts which should be avoided, in order to fully protect the environment. Specifically, the

Template = ADM-013
E-RIDS = ADM-03
cc = James H. Wilson (JHW1)

K-3 cont 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 Draft GEIS provides reasonable analysis of the proposed action and alternatives, we look forward to the inclusion of clarifying information in the Final GEIS. Our comments are attached.

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

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

K-4 **General:** The document does not mention whether power demands on the McGuire 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. The anticipated growth rate of the service area during the renewal period should be taken into consideration.

K-5 **Groundwater:** Page 4-35 discusses groundwater use and quality. The document mentions that the facility uses <100 gpm from six existing groundwater wells (page 2-8). However, Appendix E does not list information pertaining to the regulatory status of these groundwater wells.

K-6 **Cultural Resources:** We note that the licensee should take care that historic properties are not inadvertently impacted during normal operational and maintenance activities (Page 4-30).

Duke Energy.

H. B. Barron
Vice President

Duke Energy Corporation
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078-9340
(704) 875-4800 OFFICE
(704) 875-4809 FAX

August 19, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Duke Energy Corporation
McGuire Nuclear Station, Units 1 and 2
Docket Numbers 50-369 and 50-370
Severe Accident Mitigation Alternatives

REFERENCE: 1) Letter, U.S. Nuclear Regulatory Commission to Duke Energy Corporation Dated May 6, 2002, SUBJECT: Request for Comments on the Draft Plant-Specific Supplement 8 to the Generic Draft Environmental Impact Statement Regarding McGuire Nuclear Station, Units 1 and 2 (TAC NOS. MB2021 and MB2022).

L-1 Section 5.2.7 of Reference 1 identifies one Severe Accident Mitigation Alternative (SAMA) that would provide back-up power to the hydrogen igniters for Station Blackout (SBO) event. The NRC staff states that since this SAMA does not relate to adequately managing the effects of aging during the period of extended operation, it does not need to be implemented as part of license renewal pursuant to 10 CFR 54. The NRC staff intends to pursue this SAMA as a current operating license issue. McGuire concurs with the NRC that this SAMA is not within the scope of license renewal and should be addressed separate from any license renewal proceedings.

L-1 cont

L-2 McGuire concurs with the NRC staff that there may be a cost-beneficial plant design modification that can provide alternative power to the hydrogen ignition system during a SBO event. The NRC staff has determined that the hydrogen control 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. McGuire has begun evaluating possible plant design and procedure changes to find a cost-beneficial resolution for this SAMA issue.

A085

Duke Energy has performed plant-specific probabilistic risk assessments (PRA), individual plant examinations, and system/component reliability studies to evaluate severe accidents at McGuire. Various design and procedure changes have been identified and implemented as a result of the above efforts. These changes have reduced the risk associated with major contributors identified by the McGuire PRA and have enhanced overall plant safety. Resolution of the SAMA issue identified in Reference 1 is consistent with the effort by Duke Energy to use risk insights to continuously improve the safety of McGuire Nuclear Station. McGuire is cooperating with the NRC in resolving GSI-189 as a current operating license issue.

If you have any questions regarding this submittal, please contact P.T. Vu at 704-875-4302.

Very Truly Yours,

H.B. Barron

HBB/PTV/s

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. 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, and Los Alamos National Laboratory.

Name	Affiliation	Function or Expertise
NUCLEAR REGULATORY COMMISSION		
James Wilson	Nuclear Reactor Regulation	Project Manager
John Tappert	Nuclear Reactor Regulation	Section Chief
Duke Wheeler	Nuclear Reactor Regulation	Project Management
Jack Cushing	Nuclear Reactor Regulation	Project Management
Thomas Kenyon	Nuclear Reactor Regulation	Project Management
Barry Zalcman	Nuclear Reactor Regulation	Technical Monitor
Gregory Suber	Nuclear Reactor Regulation	Environmental Engineer
Robert Schaaf	Nuclear Reactor Regulation	Project Management
Michael Masnik	Nuclear Reactor Regulation	Aquatic Ecology
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Richard Emch, Jr.	Nuclear Reactor Regulation	Radiological Safety
Stacey Fox	Nuclear Reactor Regulation	Environmental Engineer
PACIFIC NORTHWEST NATIONAL LABORATORY[a]		
Rebekah Harty		Task Leader, Decommissioning
Daniel K. Tano		Deputy Task Leader
James V. Ramsdell, Jr.		Air Quality
Gregory A. Stoetzel		Radiation Protection
Charles A. Brandt		Terrestrial Ecology
Susan L. Sargeant		Aquatic Ecology
Paul L. Hendrickson		Land Use, Alternatives
Lance Vail		Water Use, Hydrology
Andrea J. Currie/Cary Counts		Technical Editor
Lisa Smith, Colleen Warnecke, and Debbie Schulz		Document Production
LAWRENCE LIVERMORE NATIONAL LABORATORY[b]		
Charles Hall		Socioeconomics

Name	Affiliation	Function or Expertise
	LOS ALAMOS NATIONAL LABORATORY[c]	
W. Bruce Masse		Cultural Resources
	ENERGY RESEARCH INCORPORATED	
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 by Battelle Memorial Institute.
(b) Lawrence Livermore National Laboratory is operated for the U.S. Department of Energy by the University of California.
(c) Los Alamos National Laboratory is operated for the U.S. Department of Energy by the University of California.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Duke Energy Corporation's Application for License Renewal of McGuire 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 McGuire 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 McGuire Nuclear Station, Units 1 and 2 operating 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, 11555 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.

June 12, 2001	Letter from NRC to Mrs. Tia Gozzi, J. Murrey Atkins Library, regarding Maintenance of Documents Related to License Renewal of McGuire Nuclear Station, Units 1 and 2 . (Accession No. ML011640049)
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. ML01160138)
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)
August 16, 2001	Letter from NRC to Duke forwarding Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process For McGuire. (Accession No. ML012280471)
August 31, 2001	Letter from NRC to Catawba Indian Nation inviting participation in scoping process for McGuire license renewal. (Accession No. ML012430278)

August 31, 2001	Letter from NRC to Eastern Band of Cherokee inviting participation in scoping process for McGuire license renewal. (Accession No. ML12430126)
August 31, 2001	Letter from NRC to Metrolina Native American Association inviting participation in scoping process for McGuire license renewal. (Accession No. ML012430197)
September 7, 2001	Notice of public meeting to discuss environmental scoping process for the McGuire Units 1 and 2 license renewal application. (Accession No. ML012500389)
October 10, 2001	Summary of public meeting held on September 25, 2001, on environmental scoping for McGuire Units 1 and 2 license renewal. (Accession No. ML012850194)
October 15, 2001	Letter to Mark Cantrell, U.S. Fish and Wildlife Service, regarding preparation for informal consultation on McGuire Nuclear Station, Units 1 and 2, license renewal environmental impact statement. (Accession No. ML012850245)
November 1, 2001	Letter from U.S. Fish and Wildlife Service State Supervisor, Asheville Field Office, Asheville, North Carolina, to NRC regarding informal consultation on McGuire Nuclear Station, Units 1 and 2. (Accession No. ML013550331)
November 19, 2001	Request for additional information related to the staff's review of the severe accident mitigation alternatives analysis for license renewal at McGuire Nuclear Station, Units 1 and 2. (Accession No. ML013250535)
November 19, 2001	Request for additional information related to the staff's review of the license renewal environmental report for McGuire Nuclear Station, Units 1 and 2. (Accession No. ML013300544)
December 6, 2001	Telecommunication with Duke to discuss request for additional information (RAIs) regarding severe accident mitigation alternatives (SAMAs) for McGuire license renewal. (Accession No. ML013420001)
January 17, 2002	Duke's response to request for additional information dated November 19, 2001, related to the staff's review of the environmental report for license renewal at McGuire Nuclear Station, Units 1 and 2. (Accession No. ML020440709)

January 31, 2002	Duke's response to request for additional information dated November 19, 2001, related to the staff's review of severe accident mitigation alternatives for license renewal at McGuire Nuclear Station, Units 1 and 2. (Accession No. ML020450466)
March 14, 2002	Note to files: Information provided by Duke related to severe accident mitigation alternatives in its license renewal application for the McGuire Nuclear Station, Units 1 and 2. (Accession No. ML020740318)
March 27, 2002	Issuance of scoping summary report associated with the staff's review of the application by Duke for renewal of the operating licenses for McGuire Nuclear Station, Units 1 and 2. (Accession No. ML020870574)
May 6, 2002	Letter from NRC to Duke, requesting comments on draft plant-specific Supplement 8 to the Generic Environmental Impact Statement regarding McGuire Nuclear Station, Units 1 and 2. (Accession No. ML021280559)
May 6, 2002	Letter from NRC to U.S. Environmental Protection Agency, filing draft Supplement 8 to the Generic Environmental Impact Statement regarding McGuire Nuclear Station, Units 1 and 2. (Accession No. ML021280667)
May 7, 2002	Letter from NRC to Duke, transmitting Notice of Availability of the Draft Plant-Specific Supplement to the Generic Environmental Impact Statement regarding McGuire Nuclear Station, Units 1 and 2. (Accession No. ML021280687)
May 28, 2002	Notice of public meeting to discuss the draft supplemental environmental impact statement (DSEIS) for license renewal at McGuire Nuclear Station, Units 1 and 2. (Accession No. ML021280687)
June 25, 2002	Summary of meeting held in support of the environmental review for the McGuire Units 1 and 2 license renewal application. (Accession No. ML021790742)
July 26, 2002	Letter from U.S. Department of the Interior to NRC, transmitting comments on Draft Supplemental Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 8, McGuire Nuclear Station, Units 1 and 2, Mecklenburg County, NC (NUREG-1437). (Accession No. ML022560053)

August 2, 2002	Letter from Duke to NRC, transmitting comments on draft plant-specific Supplement 8 to NUREG-1437, Generic Environmental Impact Statement of License Renewal of Nuclear Power Plants, McGuire Nuclear Station, Docket Nos. 50-369 and 50-370. (Accession No. ML022210223)
August 2, 2002	Letter from U.S. Environmental Protection Agency to NRC, transmitting comments regarding Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 8, McGuire Nuclear Station, Units 1 and 2. (Accession No. ML022270355)
August 19, 2002	Letter from Duke to NRC, transmitting Duke's position on the staff's SAMA evaluation contained in Supplement 8 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants, McGuire Nuclear Station, Units 1 and 2. (Accession No. ML022470024)

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:

Charlotte Area Transit System, Charlotte, North Carolina

Charlotte Chamber of Commerce, Charlotte, North Carolina

Charlotte Department of Transportation, Charlotte, North Carolina

Charlotte-Mecklenburg Schools, Charlotte, North Carolina

City of Gastonia Planning Department, Gastonia, North Carolina

Gaston County Community Development and Technology Department, Gastonia, North Carolina

Gaston County Economic Development Commission, Gastonia, North Carolina

Gaston County Manager, Gastonia, North Carolina

Gaston County Parks and Recreation Department, Gastonia, North Carolina

Gaston County Schools, Gastonia, North Carolina

Gaston Urban Area Metropolitan Planning Organization, Gastonia, North Carolina

Lincoln County Building and Land Development, Lincolnton, North Carolina

Lincoln County Manager, Lincolnton, North Carolina

Lincoln County GIS Land Records Manager, Lincolnton, North Carolina

Lincoln County GIS Mapping Division, Lincolnton, North Carolina

Lincoln County Public Works, Lincolnton, North Carolina

Mecklenburg County Administrator, Charlotte, North Carolina

Mecklenburg County Department of Social Services, Charlotte, North Carolina

Mecklenburg County Parks and Recreation, Charlotte, North Carolina

Mecklenburg County Planning Commission, Charlotte, North Carolina

Mecklenburg County Tax Office, Charlotte, North Carolina

Mecklenburg County Utilities Department, Charlotte, North Carolina

North Carolina Cooperative Extension Service, Gastonia, North Carolina

North Carolina Department of Cultural Resources/North Carolina State Historic Preservation Office, Raleigh, North Carolina

North Carolina Department of Revenue, Raleigh, North Carolina

North Carolina Wildlife Federation, Charlotte, North Carolina

Town of Huntersville Manager, Huntersville, North Carolina

Town of Huntersville Planning Department, Huntersville, North Carolina

U.S. Fish & Wildlife Service, Asheville, North Carolina

Appendix E

McGuire Compliance Status and Consultation Correspondence

Appendix E

McGuire Compliance Status and Consultation Correspondence

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for McGuire Nuclear Station, Units 1 and 2 (McGuire) are listed 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 McGuire.

Table E-1. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for McGuire Units 1 and 2

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	10 CFR Part 50	Operating license, McGuire Unit 1	NPF-9	06/13/81	06/12/21	Authorizes operation of Unit 1
NRC	10 CFR Part 50	Operating license, McGuire Unit 2	NPF-17	03/04/83	03/03/23	Authorizes operation of Unit 2
FWS	Migratory Bird Treaty Act (16 U.S.C. 703-712)	Permit	DPRD 757484			Depredation permit. Renewed annually.
FWS	Endangered Species Act	Consultation				FWS letter included in Appendix E
North Carolina Department of Cultural Resources	Section 106 of the National Historic Preservation Act (16 U.S.C. 470f)	Consultation	Letter from David Brook, Deputy State Historic Officer to Duke Power, 01/31/00			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 North Carolina Department of Cultural Resources determined that renewal of the McGuire OLs is not an undertaking that is likely to affect historic properties.
NCDENR	Clean Water Act, Section 402	NPDES stormwater permit	NCS000020	Pending NCDENR approval		Renewal of permit is in progress
NCDENR	Clean Water Act, Section 402	NPDES wastewater permit	NC0024392		02/28/05	

Table E-1. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NCDENR	RCRA, Section 3010	EPA identification number for generation and storage of hazardous waste	NCD 108 706 029	08/31/99		
NCDENR	RCRA Subtitle IX	Underground storage tank permits	0-031536, 0-013530			Renewed annually
NCDENR	RCRA Subtitle D	Landfill permit	60-04	07/30/92		Permit is renewed every five years
NCDENR	North Carolina Sedimentation Pollution Control Act	Permit for petroleum contaminated soil remediation site		06/04/99		
NCDHHS	40 CFR Part 61, Subpart M	Asbestos nonscheduled removal permit	NC11014			Renewed annually. Quarterly reporting.
Mecklenburg County Fire Marshall		Building standards hazardous materials permits	F0834994, F0834996, F0835036, F0835017, F0835012, F0835030, F0684265, F0835032			Renewed annually
Mecklenburg County Department of Environmental Protection	Clean Air Act, Section 501	Air quality permit to construct/operate	00-019-269	02/23/00		Renewed annually

CFR = Code of Federal Regulations
EPA = U.S. Environmental Protection Agency
FWS = U.S. Fish and Wildlife Service
NCDENR = North Carolina Department of Environment and Natural Resources
NCDHHS = North Carolina Department of Health and Human Services
NPDES = National Pollution Discharge Elimination System
NRC = U.S. Nuclear Regulatory Commission.
RCRA = Resource Conservation and Recovery Act
U.S.C. = United States Code

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

November 1, 2001

Ms. Cynthia A. Carpenter, Chief
Risk Informed Initiatives, Environmental,
Decommissioning, and Rulemaking Branch
Division of Nuclear Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Ms. Carpenter:

Subject: McGuire Nuclear Station, Units 1 and 2, License Renewal Project, Mecklenburg County, North Carolina (Docket Nos. 50-369 and 50-370)

We received your letter of October 15, 2001, requesting our comments relative to endangered and threatened species and the subject project. We are providing the following comments in accordance with the provisions of Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act); the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e); the Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d); and the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712).

According to your letter, the Nuclear Regulatory Commission (NRC) is evaluating an application for renewal of Duke Energy Corporation's license for operation of the McGuire Nuclear Station, Units 1 and 2. According to Duke Energy's application, Duke has not identified any major refurbishment activities; therefore, the license renewals would primarily involve an evaluation of the impacts of continued operation for another 20 years.

Endangered Species

Species in the Project Areas. Enclosed is a list of federally endangered, threatened, and candidate species; designated critical habitat; and Federal species of concern known from Gaston, Lincoln, and Mecklenburg Counties. Federal species of concern are not legally protected under the Act and are not subject to any of its provisions, including Section 7, unless they are formally proposed or listed as endangered or threatened. Since the term of the proposed license renewals may span 20 years, we are including these species in our response to give you advance notification. We do not have records of any listed species from the footprint of the project as depicted on your map.

We do have records of Schweinitz's sunflower (*Helianthus schweinitzii*), a federally endangered plant species, and Georgia aster (*Aster georgianus*), a plant species that is currently a candidate for listing as endangered. Both of these plants occur in areas that are likely to be affected, directly and indirectly, by this project. *Helianthus schweinitzii* occurs in relatively open habitats--road/power line rights-of-way, early successional fields, forest ecotonal margins, forest

clearings, etc. *Aster georgianus* is a perennial that occurs in dry open woods along roadsides, woodland borders, old fields, and pastures

We also have records of the threatened American bald eagle (*Halieetus leucocephalus*) from the Catawba River area, with nests at Lake Wylie (downstream of the project) and Lake James (upstream of the project). Additionally, foraging and migratory eagles are observed during many times of the year at Lake Norman, near the McGuire units.

Conservation Measures. Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. "Conservation recommendations" are discretionary agency activities to minimize or avoid the adverse effects of a proposed action to a listed species or critical habitat, to help implement recovery plans, or to develop information that will help better understand the species.

We request that the following conservation recommendations be considered for inclusion by NRC as part of the license renewals:

(1) Duke Power should develop and maintain a detailed map and description of listed species within its project boundaries and rights-of-way.

(2) Duke Power should develop a comprehensive management plan for listed species within its rights-of-way and on their land within the area of this project. Issues that should be addressed include protection, monitoring, and management. A complete map of all known locations of listed species on Duke Power's property should be provided. A regular monitoring plan should be developed and implemented. Appropriate management prescriptions should be developed with the assistance of species experts.

Other Concerns

Migratory Birds. We are concerned about the potential effects of this project on raptors; therefore, we recommend transmission line designs that prevent arcing and flight hazards to raptors. If the transmission lines and other facilities are not already outfitted to reduce potential impacts to raptors, three-phase lines should be "raptor-proofed" with one of the following design modifications:

(1) Separation of phases - This can be accomplished by either lowering the cross arm, using a longer cross arm, or raising the center phase on a pole-top extension. The objective is to separate the phases by at least 60 inches to prevent raptors from making skin-to-skin contact with any two phases.

(2) Insulation - An alternative to vertical separation of phases is to install conductor insulation (commonly, pvc tubing), extending a minimum of 36 inches on either side of the pole-top insulator. This alternative should also include the replacement of metal cross arm braces with wooden or other nonconductive braces.

River and other wetland crossings should be avoided whenever possible. Where unavoidable, lines crossing wetlands should be constructed to maximize visibility of the line to raptors by one of the following design modifications: (1) remove the static line, (2) enlarge the static line to improve visibility to raptors, or (3) mount aviation balls or similar markers on the static line.

What measures can NRC and the licensee incorporate in the project to enhance the project area for waterfowl, raptors, and other migratory birds? Does the licensee have other land that it could set aside for the purposes of enhancing the project area for migratory birds and to mitigate for continued impacts (direct, indirect, and cumulative) to migratory birds and other wildlife?

Aquatic Impacts. What are the impacts of the water intakes on fish entrainment and impingement? What measures can the licensee incorporate into the project to minimize, or mitigate for, these impacts? What measures can the licensee incorporate to minimize, or mitigate for, the impacts of the reservoir and thermal discharges to native aquatic assemblages?

Please keep Mr. Mark Cantrell of our staff apprised of the progress on this project (telephone 828/258-3939, Ext. 227). In any future correspondence pertaining to this matter, please reference our Log Number 4-2-00-120.

Sincerely,

Brian P. Cole
State Supervisor

Enclosure

ENDANGERED, THREATENED, AND CANDIDATE SPECIES AND FEDERAL SPECIES OF CONCERN, GASTON, LINCOLN AND MECKLENBURG COUNTIES, NORTH CAROLINA

This list was adapted from the North Carolina Natural Heritage Program's County Species List. It is a listing, for Gaston, Lincoln, and Mecklenburg Counties of North Carolina's federally listed and proposed endangered, threatened, and candidate species and Federal species of concern (for a complete list of rare species in the state, please contact the North Carolina Natural Heritage Program). The information in this list is compiled from a variety of sources, including field surveys, museums and herbariums, literature, and personal communications. The North Carolina Natural Heritage Program's database is dynamic, with new records being added and old records being revised as new information is received. Please note that this list cannot be considered a definitive record of listed species and Federal species of concern, and it should not be considered a substitute for field surveys.

Critical habitat: Critical habitat is noted, with a description, for the counties where it is designated or proposed.

Aquatic species: Fishes and aquatic invertebrates are noted for counties where they are known to occur. However, projects may have effects on downstream aquatic systems in adjacent counties.

COMMON NAME	SCIENTIFIC NAME	STATUS
GASTON COUNTY		
Vertebrates		
Bog turtle	*Clemmys muhlenbergii*	T(S/A)[1]
Bald eagle	*Haliaeetus leucocephalus*	Threatened (proposed for delisting)
Vascular Plants		
Georgia aster	*Aster georgianus*	C1
Schweinitz's sunflower	*Helianthus schweinitzii*	Endangered
LINCOLN COUNTY		
Vascular Plants		
Dwarf-flowered heartleaf	*Hexastylis naniflora*	Threatened
Michaux's sumac	*Rhus michauxii*	Endangered*
MECKLENBURG COUNTY		
Vertebrates		
Carolina darter	*Etheostoma collis collis*	FSC
Bald eagle	*Haliaeetus leucocephalus*	Threatened (proposed for delisting)
Invertebrates		
Carolina heelsplitter	*Lasmigona decorata*	Endangered
Carolina creekshell	*Villosa vaughaniana*	FSC
Vascular Plants		
Georgia aster	*Aster georgianus*	C1
Tall larkspur	*Delphinium exaltatum*	FSC*
Smooth coneflower	*Echinacea laevigata*	Endangered*

COMMON NAME	SCIENTIFIC NAME	STATUS
Schweinitz's sunflower	*Helianthus schweinitzii*	Endangered
Virginia quillwort	*Isoetes virginica*	FSC
Heller's trefoil	*Lotus helleri*	FSC
Michaux's sumac	*Rhus michauxii*	Endangered*

KEY:

Status	Definition
Endangered	A taxon "in danger of extinction throughout all or a significant portion of its range."
Threatened	A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
C1	A taxon under consideration for official listing for which there is sufficient information to support listing.
FSC	A Federal species of concern--a species that may or may not be listed in the future (formerly C2 candidate species or species under consideration for listing for which there is insufficient information to support listing).
T(S/A)	Threatened due to similarity of appearance (e.g., American alligator)--a species that is threatened due to similarity of appearance with other rare species and is listed for its protection. These species are not biologically endangered or threatened and are not subject to Section 7 consultation.

Species with 1, 2, 3, or 4 asterisks behind them indicate historic, obscure, or incidental records.

*Historic record - the species was last observed in the county more than 50 years ago.
**Obscure record - the date and/or location of observation is uncertain.
***Incidental/migrant record - the species was observed outside of its normal range or habitat.
****Historic record - obscure and incidental record.

[1]In the November 4, 1997, *Federal Register* (55822-55825), the northern population of the bog turtle (from New York south to Maryland) was listed as T (threatened), and the southern population (from Virginia south to Georgia) was listed as T(S/A) (threatened due to similarity of appearance). The T(S/A) designation bans the collection and interstate and international commercial trade of bog turtles from the southern population. The T(S/A) designation has no effect on land-management activities by private landowners in North Carolina, part of the southern population of the species. In addition to its official status as T(S/A), the U.S. Fish and Wildlife Service considers the southern population of the bog turtle as a Federal species of concern due to habitat loss.

Appendix F

GEIS Environmental Issues Not Applicable to McGuire Nuclear Station, Units 1 and 2

Appendix F

GEIS Environmental Issues Not Applicable to McGuire 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 McGuire Nuclear Station, Units 1 and 2 (McGuire) because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to McGuire

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	The McGuire cooling system does not discharge to an estuary. Lake Norman is fresh water.
Water-use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	2	4.3.2.1 4.4.2.1	This issue is related to heat dissipation systems that are not installed at McGuire.
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER BASED HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at McGuire.
Impingement of fish and shellfish	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at McGuire.
Heat shock	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at McGuire.

(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 4.8.2.1	McGuire uses < 100 gpm of groundwater.
Groundwater-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.8.1.3 4.4.2.1	This issue is related to heat dissipation systems that are not installed at McGuire or are operated on bodies of water that are much smaller than Lake Norman.
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	McGuire does not use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	McGuire does not use Ranney wells.
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	McGuire is located on Lake Norman, a freshwater lake.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	This issue is related to a heat dissipation system that is not installed at McGuire.
Groundwater quality degradation (cooling ponds at inland sites)	2	4.8.3	This issue is related to a heat dissipation system that is not installed at McGuire.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to heat-dissipation systems that are not installed at McGuire.
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to heat-dissipation systems that are not installed at McGuire.
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to heat-dissipation systems that are not installed at McGuire.
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to heat-dissipation systems that are not installed at McGuire.

F.1 References

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

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

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