

# Abstract

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

This draft Supplemental Environmental Impact Statement (SEIS) has been prepared in response to an application submitted to the NRC by Duke Energy Corporation (Duke) to renew the OLs for Catawba Nuclear Station, Units 1 and 2 (Catawba) for an additional 20 years under 10 CFR Part 54 (Duke 2001a). This draft SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

Neither Duke nor the staff has identified information that is both new and significant for any issues for which the GEIS reached generic conclusions and that apply to Catawba Units 1 and 2. The staff determined that information provided during the scoping process did not call into question the conclusions in the GEIS. Therefore, the staff concludes that the impacts of renewing the Catawba OLs will not be greater than impacts identified for these issues in the GEIS. For each of these issues, the GEIS conclusion is that the impact is of SMALL<sup>(a)</sup> significance (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and from spent fuel, which were not assigned a single significance level).

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

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

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

## Abstract

1 option of license renewal for energy-planning decisionmakers would be unreasonable. This  
2 recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental  
3 Report submitted by Duke; (3) consultation with Federal, State, and local agencies; (4) the  
4 staff's own independent review; and (5) the staff's consideration of public comments received  
5 during the scoping process.

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# Executive Summary

By letter dated June 13, 2001, Duke Energy Corporation (Duke) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Catawba Nuclear Station, Units 1 and 2 (Catawba) for an additional 20-year period. If the OLs are renewed, State regulatory agencies and Duke will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, the plant must be shut down at or before the expiration dates of the current OLs, which are December 6, 2024, for Unit 1, and February 24, 2026, for Unit 2.

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

Upon acceptance of the Duke application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping. The staff visited the Catawba site in October 2001 and held public scoping meetings on October 23, 2001, in Rock Hill, South Carolina. The staff reviewed the Duke Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1 (*Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*), and considered the public comments received during the scoping process in preparation of this draft Supplemental Environmental Impact Statement (SEIS) for Catawba. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part 1, of this SEIS.

The staff will hold two public meetings in Rock Hill, South Carolina, in June 2002 to describe the preliminary results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating their comments on this

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(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.

## Executive Summary

1 draft SEIS. When the comment period ends, the staff will consider and address all the  
2 comments received that are determined to be within the scope of this SEIS. These comments  
3 will be addressed in Appendix A, Part 2, of this SEIS.  
4

5 This draft SEIS includes the NRC staff's preliminary analysis that considers and weighs the  
6 environmental effects of the proposed action, the environmental impacts of alternatives to the  
7 proposed action, and mitigation measures available for reducing or avoiding adverse effects. It  
8 also includes the staff's preliminary recommendation regarding the proposed action.  
9

10 The Commission has adopted the following statement of purpose and need for license renewal  
11 from the GEIS:  
12

13 The purpose and need for the proposed action (renewal of an operating license) is  
14 to provide an option that allows for power generation capability beyond the term of  
15 a current nuclear power plant operating license to meet future system generating  
16 needs, as such needs may be determined by State, utility, and, where authorized,  
17 Federal (other than NRC) decisionmakers.  
18

19 The goal of the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is  
20 to determine  
21

22 ... whether or not the adverse environmental impacts of license renewal are so  
23 great that preserving the option of license renewal for energy planning decision-  
24 makers would be unreasonable.  
25

26 Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that  
27 there are factors, in addition to license renewal, that will ultimately determine whether an existing  
28 nuclear power plant continues to operate beyond the period of the current OLs.  
29

30 NRC regulations [10 CFR 51.95(c)(2)] contain the following statement regarding the content of  
31 SEISs prepared at the license renewal stage:  
32

33 The supplemental environmental impact statement for license renewal is not  
34 required to include discussion of need for power or the economic costs and  
35 economic benefits of the proposed action or of alternatives to the proposed action  
36 except insofar as such benefits and costs are either essential for a determination  
37 regarding the inclusion of an alternative in the range of alternatives considered or  
38 relevant to mitigation. In addition, the supplemental environmental impact state-  
39 ment prepared at the license renewal stage need not discuss other issues not  
40 related to the environmental effects of the proposed action and the alternatives, or

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

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

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

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

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

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

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

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

## Executive Summary

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

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

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



1 Eleven Category 2 issues related to operational impacts and postulated accidents during the  
2 renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are  
3 discussed in detail in this draft SEIS. Four of the Category 2 issues and environmental justice  
4 apply to both refurbishment and to operation during the renewal term and are discussed in this  
5 draft SEIS only in relation to operation during the renewal term. For all 12 Category 2 issues  
6 and environmental justice, the staff concludes that the potential environmental effects are of  
7 SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff  
8 determined that appropriate Federal health agencies have not reached a consensus on the  
9 existence of chronic adverse effects from electromagnetic fields. Therefore, no further  
10 evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the  
11 staff concludes that a reasonable, comprehensive effort was made to identify and evaluate  
12 SAMAs. Based on its review of the SAMAs for Catawba Units 1 and 2 and the plant  
13 improvements already made, the staff concludes that none of the candidate SAMAs is cost  
14 beneficial.

15  
16 Mitigation measures were considered for each Category 2 issue. Current measures to mitigate  
17 environmental impacts of plant operation were found to be adequate, and no additional mitiga-  
18 tion measures were deemed sufficiently beneficial to be warranted.

19  
20 If the current Catawba OLs are not renewed and the units cease operation on or before  
21 expiration of their OLs, the adverse impacts of likely alternatives will not be smaller than those  
22 associated with continued operation of Catawba. The impacts may, in fact, be greater in some  
23 areas.

24  
25 The preliminary recommendation of the NRC staff is that the Commission determine that the  
26 adverse environmental impacts of license renewal for Catawba are not so great that preserving  
27 the option of license renewal for energy-planning decisionmakers would be unreasonable. This  
28 recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by  
29 Duke; (3) consultation with other Federal, State, and local agencies; (4) the staff's own  
30 independent review; and (5) the staff's consideration of public comments received during the  
31 scoping process.

## Abbreviations/Acronyms

1		
2		
3		
4	μCi	microcurie(s)
5	μCi/mL	microcuries per milliliter
6	μGy	microgray(s)
7	μm	micrometer(s)
8	μSv	microsieverts
9		
10	AADT	annual average daily traffic (count)
11	ac	acre(s)
12	ACC	averted cleanup and decontamination costs
13	AEA	Atomic Energy Act of 1954
14	AEC	U.S. Atomic Energy Commission
15	AOC	averted offsite property damage costs
16	AOE	averted occupational exposure
17	AOSC	averted onsite costs
18	APE	averted public exposure
19	APRC	averted power replacement cost
20	ATWS	anticipated transient without SCRAM
21		
22	BEA	Bureau of Economic Analysis
23	Bq	becquerel(s)
24	Bq/ml	becquerels per milliliter
25	BMT	basemat melt-through
26	Btu	British thermal unit(s)
27		
28	°C	degrees Celsius
29	Catawba	Catawba Nuclear Station, Units 1 and 2
30	CCW	component cooling water
31	CDF	core damage frequency
32	CEQ	Council on Environmental Quality
33	CFR	Code of Federal Regulations
34	CFS	cubic feet per second or ft <sup>3</sup> /s
35	CHRS	containment heat removal system
36	Ci	curie(s)
37	cm	centimeter(s)
38	COE	cost of enhancement
39	COPC	chemicals of potential concern
40	CVCS	chemical and volume control system
41	CWA	Clean Water Act
42		

## Abbreviations/Acronyms

1	DG	diesel generator
2	DBA	design-basis accident
3	DCH	direct containment heating
4	DOE	U.S. Department of Energy
5	DPR	demonstration project reactor
6	DSM	demand-side management
7	Duke	Duke Energy Corporation
8		
9	ECCS	emergency core cooling system
10	EIA	Energy Information Administration (of DOE)
11	EIS	environmental impact statement
12	ELF-EMF	extremely low frequency-electromagnetic field
13	EOP	Emergency Operating Procedure
14	EPA	U.S. Environmental Protection Agency
15	EPZ	Emergency Planning Zone
16	EQ	equipment qualification
17	ER	Environmental Report
18	ESA	Endangered Species Act
19	ESRP	Standard Review Plans for Environmental Reviews for Nuclear Power Plants:
20		Operating License Renewal, NUREG-1555, Supplement 1
21	EWP	Environmental Work Plan
22		
23	°F	degrees Fahrenheit
24	FAA	Federal Aviation Administration
25	FERC	Federal Energy Regulatory Commission
26	FES	Final Environmental Statement
27	FR	Federal Register
28	FSAR	Final Safety Analysis Report
29	ft	foot/feet
30	ft <sup>3</sup> /yr	cubic feet per year
31	ft <sup>3</sup> /s	cubic feet per second
32	F-V	Fussell-Vesely (importance measures used in risk analysis)
33	FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
34	FWS	U.S. Fish and Wildlife Service
35		
36	gal	gallon
37	GDC	general design criteria
38	GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants,
39		NUREG-1437

## Abbreviations/Acronyms

1	GI-LLI	gastrointestinal tract-lower large intestine
2	gpm	gallons per minute
3		
4	ha	hectare(s)
5	HHSI	high head safety injection
6	HLW	high-level waste
7	hr	hour(s)
8	Hz	Hertz
9		
10	in.	inch(es)
11	IPE	Independent Plant Examination
12	IPEEE	Independent Plant Examination for External Event
13	ISFSI	independent spent fuel storage installation
14	ISLOCA	interfacing systems loss of coolant accident
15		
16	kg	kilogram(s)
17	km	kilometer(s)
18	kV	kilovolt(s)
19	kV/m	kilovolt per meter
20	kWh	kilowatt hour(s)
21		
22	L	liter(s)
23	lb	pound
24	LNG	liquefied natural gas
25	LOCA	loss-of-coolant accident
26	LOOP	loss of offsite power
27	L/s	liters per second
28	LWR	light-water reactor
29		
30	m	meter(s)
31	m/s	meter(s) per second
32	m <sup>3</sup> /d	cubic meters per day
33	m <sup>3</sup> /s	cubic meter(s) per second
34	mA	milliampere(s)
35	MACCS2	MELCOR Accident Consequence Code System 2
36	mi	mile(s)
37	mGy	milligray(s)
38	MGD	million gallons per day
39	mL	milliliter(s)
40	mph	miles per hour
41	mrads	millirad(s)

## Abbreviations/Acronyms

1	mrem	millirem(s)
2	mSv	millisievert(s)
3	MT	metric ton(s) (or tonne[s])
4	MTU	metric ton(s)-uranium
5	MW	megawatt(s)
6	MWd/MTU	megawatt-days per metric ton of uranium
7	MW(e)	megawatt(s) electric
8	MW(t)	megawatt(s) thermal
9	MWh	megawatt hour(s)
10		
11	NA	not applicable
12	NAS	National Academy of Sciences
13	NCDENR	North Carolina Department of Environmental and Natural Resources
14	NCI	National Cancer Institute
15	NEPA	National Environmental Policy Act of 1969
16	NESC	National Electric Safety Code
17	ng/J	nanogram per joule
18	NHPA	National Historic Preservation Act
19	NIEHS	National Institute of Environmental Health Sciences
20	NMFS	National Marine Fisheries Service
21	NO <sub>x</sub>	nitrogen oxide(s)
22	NPDES	National Pollutant Discharge Elimination System
23	NRC	U.S. Nuclear Regulatory Commission
24	NWPPC	Northwest Power Planning Council
25		
26	ODCM	Offsite Dose Calculation Manual
27	OL(s)	operating license(s)
28		
29	PAR	passive autocatalytic recombiners
30	PDS(s)	plant damage state(s)
31	PM <sub>10</sub>	particulate matter, 10 micrometers or less in diameter
32	ppt	parts per thousand
33	PRA	Probabilistic Risk Assessment
34	PSA	Probabilistic Safety Assessment
35	PSD	prevention of significant deterioration
36	PSW	plant service water
37	PWR	pressurized water reactor
38	PW	present worth
39		

## Abbreviations/Acronyms

1	RAB	reactor auxiliary building
2	RAI	request for additional information
3	RCP	reactor coolant pump
4	RCS	Reactor Coolant System
5	REMP	radiological environmental monitoring program
6	RWST	Refueling Water Storage Tank
7	ry	reactor year
8		
9	s	second(s)
10	SAG	Severe Accident Guideline
11	SAMA(s)	Severe Accident Mitigation Alternative(s)
12	SAMDA	Severe Accident Mitigation Design Alternative
13	SAMG	Severe Accident Management Guideline
14	SAR	Safety Analysis Report
15	SBO	station blackout
16	SC	South Carolina
17	SCH	South Carolina Highway
18	SEIS	Supplemental Environmental Impact Statement
19	SER	Safety Evaluation Report
20	SGTR	steam generator tube rupture
21	SHPO	State Historic Preservation Office
22	SCDHEC	South Carolina Department of Health and Environmental Control
23	SCDNR	South Carolina Department of Natural Resources
24	SCIAA	South Carolina Institute of Archaeology and Anthropology
25	SIC	Standard Industrial Classification
26	SO <sub>2</sub>	sulfur dioxide
27	SO <sub>x</sub>	sulfur oxide(s)
28	SSS	standby shutdown system
29		
30	TBq	terabecquerel
31		
32	UDB	urban development boundary
33	UFSAR	Updated Final Safety Analysis Report
34	U.S.	United States
35	USC	United States Code
36	USCB	U.S. Census Bureau
37	USDA	U.S. Department of Agriculture
38	USFWS	U.S. Fish and Wildlife Service
39	UST	upper storage tank
40		
41	yr	year