

# 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. 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 the Virginia Electric and Power Company (VEPCo) to renew the OLs for North Anna Power Station, Units 1 and 2, for an additional 20 years under 10 CFR Part 54. This SEIS includes the NRC staff's analysis in which the staff 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 VEPCo nor the staff has identified information that is both new and significant for any of these issues that apply to North Anna. In addition, 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 North Anna Power Station 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 spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, those that apply to North Anna Power Station, Units 1 and 2, 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 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 North Anna Power Station, Units 1 and 2, are not so great

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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.

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

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# Executive Summary

By letter dated May 29, 2001, the Virginia Electric and Power Company (VEPCo) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for North Anna Power Station, Units 1 and 2, for an additional 20-year period. If the OLs are renewed, State regulatory agencies and VEPCo will ultimately decide whether the plants will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, then the plants must be shut down at or before the expiration dates of the current OLs, which are April 1, 2018, for Unit 1 and August 21, 2020, 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. 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.<sup>(a)</sup>

Upon acceptance of the VEPCo 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 North Anna in October 2001 and held public scoping meetings on October 18, 2001, in Louisa, Virginia. In preparing this Supplemental Environmental Impact Statement (SEIS) for North Anna, the staff reviewed the VEPCo 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 the scope of the environmental review are provided in Appendix A, Part I, of this SEIS.

On May 17, 2002, the U.S. Environmental Protection Agency (EPA) published the Notice of Availability of the draft SEIS (67 FR 35108). A 75-day comment period began on that date, during which members of the public could comment on the preliminary results of the NRC staff's review. Two public meetings were held near North Anna Power Station on June 25, 2002, to describe the preliminary results of the NRC environmental review, answer questions, and provide members of the public with information to assist them in formulating comments on

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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.

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- | 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 the 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 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, even if an OL is renewed, there are other factors that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

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

The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent

fuel after cessation of reactor operation—generic determination of no significant environmental impact”] and in accordance with § 51.23(b).

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

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

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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 North Anna) 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 North Anna is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the North Anna site or some other unspecified alternate location.

VEPCo 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 VEPCo 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 VEPCo nor the staff has identified any new issue applicable to North Anna that has a significant environmental impact. These determinations include the consideration of public comments. Therefore, the staff relies upon the conclusions of the GEIS for all of the Category 1 issues that are applicable to North Anna.

VEPCo's license renewal application presents an analysis of the Category 2 issues that are applicable to North Anna. In addition, the staff has evaluated the two uncategorized issues, environmental justice and chronic effects from electromagnetic fields. The staff has reviewed the VEPCo 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 North Anna. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. VEPCo 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 North Anna 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 Continuation of Construction and the Operation of North Anna Power Station, Units 1 and 2 and the Construction of Units 3 and 4*, issued by the U.S. Atomic Energy Commission in 1973, and two addenda to the final environmental statement related to the operation of North Anna Power Station, Units 1 and 2, issued by the NRC in 1976 and 1980.



Twelve Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. 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. Based on its review of the SAMAs for North Anna and the plant improvements already made, the staff concludes that none of the candidate SAMAs are cost-beneficial.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate 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 North Anna 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 North Anna. 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 North Anna 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 VEPCo; (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

$\mu\text{Ci}$	microcurie(s)
$\mu\text{m}$	micrometer(s)
AAC	alternate alternating current
ac	acre(s)
AC	alternating current
ACC	averted cleanup and decontamination costs
A.D.	Anno Domini
ADAMS	Agencywide Document Access and Management System
AEA	Atomic Energy Act of 1954, 42 USC 2011 et seq.
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
AOC	averted offsite property damage costs
AOE	averted occupational exposure costs
AOSC	averted onsite costs
APE	averted public exposure costs
ATWS	anticipated transient(s) without scram
B.C.	before Christ
Bq	becquerel(s)
Btu	British thermal unit(s)
$^{\circ}\text{C}$	degrees Celsius
CAA	Clean Air Act of 1970, as amended, 42 USC 7401, et seq.
CCW	component cooling water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CET	containment event tree
CFR	Code of Federal Regulations
cfs	cubic feet per second
Ci	curie(s)
cm	centimeter(s)
COE	cost of enhancement
COV	Code of Virginia
CW	circulating water
CWA	Clean Water Act of 1977 (also known as Federal Water Pollution Control Act)
CZMA	Coastal Zone Management Act, 16 USC 1451, et seq.
DBAs	design basis accidents
DC	direct current

## Abbreviations/Acronyms

DHR	decay heat removal
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSM	demand-side management
EIA	Energy Information Administration (of DOE)
EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EPA	U.S. Environmental Protection Agency
EPZ	emergency planning zone
ER	Environmental Report
ESA	Endangered Species Act, 16 USC 1531, et seq.
ESGR	emergency switchgear room
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FES	Final Environmental Statement
FR	Federal Register
ft	foot/feet
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
FWS	U.S. Fish and Wildlife Service
gal	gallon
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
gpd	gallon(s) per day
gpm	gallon(s) per minute
Gy	Gray(s)
ha	hectare(s)
HEPA	high-efficiency particulate air (filter)
HLW	high-level waste
hp	horsepower
hr	hour(s)
HVAC	heating, ventilation and air conditioning
Hz	hertz
ICRP	International Commission on Radiological Protection
in.	inch(es)
INEEL	Idaho National Engineering and Environmental Laboratory

## Abbreviations/Acronyms

IPA	integrated plant assessment
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination for External Events
ISFSI	independent spent fuel storage installation
ISLOCA	interfacing system loss-of-coolant accident
J	joule(s)
kg	kilogram(s)
km	kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
kW	kilowatt
kWh	kilowatt hour(s)
L	liter(s)
lb	pound(s)
LERF	large early release frequency
LHSI	low heat safety injection
LNG	liquefied natural gas
LOCAs	loss-of-coolant accidents
LOOP	loss of offsite power
m	meter(s)
mA	milliampere(s)
MACCS2	MELCOR Accident Consequence Code System 2
MFW	main feedwater
MG	motor generator
MGD	million gallons per day
mGy	milligray(s)
mi	mile(s)
min	minute(s)
MJ	megajoule(s)
mL	milliliter(s)
MOX	mixed-oxide fuel
mph	mile(s) per hour
mrad	millirad(s)
mrem	millirem(s)
MSIV	main steam isolation valve
MSLB	main steam line break
mSv	millisievert(s)

## Abbreviations/Acronyms

MT	metric ton(s) (or tonne[s])
MTHM	metric ton(s) (or tonne[s]) heavy metal
MW	megawatt(s)
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)
NA	not applicable
NAPS	North Anna Power Station
NAS	National Academy of Sciences
n.d.	not dated
NEPA	National Environmental Policy Act of 1969
NESC	National Electrical Safety Code
ng	nanograms
NHPA	National Historic Preservation Act of 1966, 16 USC 470, et seq.
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO <sub>x</sub>	nitrogen oxide(s)
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NUG	non-utility generator
NWPPC	Northwest Power Planning Council
ODCM	Offsite Dose Calculation Manual
OL	operating license
PARS	Publicly Available Records portion of ADAMS
pCi	picocurie(s)
PM <sub>10</sub>	particulate matter with aerodynamic diameter <10 mm
psig	pounds per square inch (gauge)
PRA	Probabilistic Risk Assessment
PWR	pressurized water reactor
RAI	request for additional information
RCP	reactor coolant pump
RCRA	Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.
rem	special unit of dose equivalent, equal to 0.01 Sv
REMP	radiological environmental monitoring program
rms	root mean square

## Abbreviations/Acronyms

RPC	replacement power cost
RRW	risk reduction worth
RSA	Rapidan Service Authority
s	second(s)
SAMA	severe accident mitigation alternative
SAR	safety analysis report
SBO	station blackout
SEIS	Supplemental Environmental Impact Statement
SER	Safety Evaluation Report
SG PORV	steam generator power-operated relief valves
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Officer
SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	sulfur oxides
STC	source term category
Sv	sievert, special unit of dose equivalent
SW	service water
TBq	tera becquerel
TDAFW	turbine-driven auxiliary feedwater
UFSAR	Updated Final Safety Analysis Report
USC	United States Code
USCB	U.S. Census Bureau
VA	Virginia
VAC	Virginia Administrative Code
VDACS	Virginia Department of Agriculture and Consumer Services
VDNR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDHR	Virginia Department of Historic Resources
VEPCo	Virginia Electric and Power Company
VMRC	Virginia Marine Resources Commission
VPDES	Virginia Pollution Discharge Elimination System
VSWCB	Virginia State Water Control Board
WHTF	Waste Heat Treatment Facility
yr	year(s)