

# 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 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 Florida Power & Light Company (FPL) to renew the OLs for Turkey Point Units 3 and 4 for 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, and responses to comments received on Draft Supplement 5 to the GEIS.

Neither FPL nor the staff has identified information that is both new and significant for any of the issues for which the GEIS reached generic conclusions. 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 Turkey Point 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 high-level waste and spent fuel, which were not assigned a single significance level).

Each of the remaining 23 issues that applies to Turkey Point Units 3 and 4 is 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 recommends that the Commission determine that the adverse environmental impacts of license renewal for Turkey Point Units 3 and 4 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.

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option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by FPL; (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 September 8, 2000, the Florida Power & Light Company (FPL) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Turkey Point Units 3 and 4 for an additional 20-year period. If the OLs are renewed, State regulatory agencies and FPL will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, then the plant must be shut down at or before the expiration dates of the current OLs, which are July 19, 2012, for Unit 3, and April 10, 2013, for Unit 4.

Under Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4332), 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, Subpart A. 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 FPL 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 Turkey Point site in December 2000 and held public scoping meetings on December 6, 2000, in Homestead, Florida. The staff reviewed the FPL 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 for preparation of the draft Supplemental Environmental Impact Statement (SEIS) for Turkey Point Units 3 and 4 (issued on June 12, 2001). 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.

Two public meetings were held in Homestead, Florida, on July 17, 2001, to describe the preliminary results of the NRC environmental review and answer questions 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 document and are presented in Appendix A, Part 2.

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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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This SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures 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. 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 shows that all of the following criteria are met:

- (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 Turkey Point Units 3 and 4) 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 Units 3 and 4 is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the Turkey Point site or some other unspecified alternate location in Florida. In addition, construction of new nuclear power generation capacity was evaluated at the Turkey Point site or an unspecified site in Florida.

FPL 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 FPL 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 comments received during the scoping process or received on Draft Supplement 5 to the GEIS identified any new issue applicable to Turkey Point Units 3 and 4 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 Turkey Point Units 3 and 4.

FPL'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 FPL 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 Turkey Point. Four Category 2 issues are not discussed in this SEIS, because they are specifically related to refurbishment. FPL 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 Turkey Point Units 3 and 4 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 U.S. Atomic Energy Commission's 1972 *Final Environmental Statement Related to Operation of Turkey Point Plant*.

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. Four 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 Turkey Point Units 3 and 4, 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 Turkey Point 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 Turkey Point Units 3 and 4. 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 Turkey Point Units 3 and 4 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 FPL; (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.

## Executive Summary

## Abbreviations/Acronyms

E	degree
μCi	microcurie(s)
μCi/ml	microcuries per milliliter
μGy	microgray(s)
μm	micrometer(s)
μSv	microsievert(s)
ac	acre(s)
AC	alternating current
ACC	averted cleanup and decontamination costs
ACS	American Cancer Society
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
AOC	present value of averted offsite property damage cost(s)
AOE	present value of averted occupational exposure (costs)
AOSC	present value of averted onsite cost(s)
APE	present value of averted public exposure (costs)
ATWS	anticipated transient without scram
BEIR	biological effects of ionizing radiation
Bq	becquerel(s)
BMT	basemat melt-through
Btu	British thermal unit(s)
C	Celsius
CCW	component cooling water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHRS	containment heat removal system
Ci	curie(s)
cm	centimeter(s)
COE	cost of enhancement
COPC	chemicals of potential concern
CVCS	chemical and volume control system
CWA	Clean Water Act
DBA	design-basis accident
DCH	direct containment heating

## Abbreviations/Acronyms

DERM	Miami-Dade County Department of Environmental Resources Management
DG	diesel generator
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DPR	demonstration project reactor
DSM	demand-side management
EIA	Energy Information Administration (of DOE)
EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EOP	Emergency Operating Procedure
EPA	U.S. Environmental Protection Agency
EQ	equipment qualification
ER	Environmental Report
ESA	Endangered Species Act
ESRP	Environmental Standard Review Plan, NUREG-1555, Supplement 1, Operating License Renewal
F	Fahrenheit
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FCMP	Florida Coastal Management Program
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historic Resources
FDOH	Florida Department of Health
FERC	Federal Energy Regulatory Commission
FES	Final Environmental Statement
FFWCC	Florida Fish and Wildlife Conservation Commission
FGDL	Florida Geographic Data Library
FNAI	Florida Natural Areas Inventory
FPL	Florida Power & Light Company
FR	Federal Register
FSAR	Final Safety Analysis Report
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(s)



## Abbreviations/Acronyms

GDC	general design criteria (criterion)
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
gpm	gallon(s) per minute
ha	hectare(s)
HHSI	high heady safety injection
HLW	high-level waste
HPS	Hialean/Preston System
hr	hour(s)
Hz	Hertz
ICRP	International Commission on Radiological Protection
in.	inch(es)
IPE	individual plant examination
IPEEE	individual plant examination of external events
ISFSI	independent spent fuel storage installation
ISLOCA	interfacing systems loss-of-coolant accident
kg	kilogram(s)
km	kilometer(s)
kV	kilovolt(s)
kV/m	kilovolt(s) per meter
kWh	kilowatt hour(s)
L	liter(s)
lb	pound(s)
LNG	liquefied natural gas
LNT	linear nonthreshold
LOCA	loss-of-coolant accident
LQ	linear quadratic
LWR	light-water reactor
m	meter(s)
m/s	meter(s) per second
m <sup>3</sup> /d	cubic meters per day
m <sup>3</sup> /s	cubic meter(s) per second
mA	milliampere(s)
MACCS2	MELCOR Accident Consequence Code System 2
MDWSD	Miami-Dade Water and Sewer Department
mi	mile(s)

## Abbreviations/Acronyms

mGy	milligray(s)
mL	milliliter(s)
mph	mile(s) per hour
mrad	millirad(s)
mrem	millirem(s)
mSv	millisievert(s)
MT	metric ton(s) (or tonne[s])
MTU	metric ton(s)-uranium
MW	megawatt(s)
MWd/MTU	megawatt-day(s) per metric ton of uranium
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)
NA	not applicable
NAS	National Academy of Sciences
NASCAR	National Association for Stock Car Auto Racing
NCRP	National Council on Radiation Protection and Measurements
NCI	National Cancer Institute
NEPA	National Environmental Policy Act of 1969
NESC	National Electric Safety Code
ng/J	nanogram(s) per joule
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO <sub>x</sub>	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NWPPC	Northwest Power Planning Council
ODCM	Offsite Dose Calculation Manual
OL	operating license
PAR	passive autocatalytic recombiners
PDS	plant damage state
PM <sub>10</sub>	particulate matter, 10 µm or less in diameter
ppt	part(s) per thousand
PRA	Probabilistic Risk Assessment
PRC	power replacement costs

## Abbreviations/Acronyms

PSA	Probabilistic Safety Assessment
PSD	prevention of significant deterioration
PSW	plant service water
PWR	pressurized water reactor
RAB	reactor auxiliary building
RAI	request for additional information
RCP	reactor coolant pump
RCS	Reactor Coolant System
REMP	radiological environmental monitoring program
RPHP	Radiation and Public Health Project
rms	root mean square
RWST	Refueling Water Storage Tank
ry	reactor year(s)
s	second(s)
SAG	Severe Accident Guideline
SAMA	severe accident mitigation alternative
SAMG	Severe Accident Management Guideline
SAR	Safety Analysis Report
SBO	station blackout
SEIS	Supplemental Environmental Impact Statement
SER	Safety Evaluation Report
SFWMD	South Florida Water Management District
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Office
SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	sulfur oxide(s)
TB <sub>q</sub>	terrabecquerel(s)
UDB	urban development boundary
UFSAR	Updated Final Safety Analysis Report
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
U.S.	United States
USAF	United States Air Force
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
yr	year(s)