



Environmental Impact Statement for an Early Site Permit (ESP) at the Grand Gulf ESP Site

Final Report

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



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**Division of License Renewal
Office of Nuclear Reactor Regulation
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Abstract

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by System Energy Resources, Inc. (SERI) for an early site permit (ESP). The proposed action requested in SERI's application is for the NRC to (1) approve a site within the existing Grand Gulf site boundaries as suitable for the construction and operation of a new nuclear power generating facility, and (2) issue an ESP for the proposed site identified as the Grand Gulf ESP site co-located with the existing Grand Gulf Nuclear Station. This EIS includes the NRC staff's analysis that considers and weighs the environmental impacts of constructing and operating one or more new nuclear units at the Grand Gulf ESP site or at alternative sites, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation to the Commission regarding the proposed action.

As part of the NRC review of the application, the NRC solicited comments from the public on a draft of this EIS. Appendix E of this document sets forth all public comments received on the draft EIS and the NRC staff's responses to these comments, organized by subject matter. The comments on the draft EIS are in the Agencywide Document Access and Management System (ADAMS). ADAMS can be accessed through the NRC's website at www.nrc.gov/reading-rm/adams.html. Where appropriate, changes were made to the draft EIS and are identified by change bars in the margins of this EIS.

The staff's recommendation to the Commission related to the environmental aspects of the proposed action is that the ESP should be issued. The staff's evaluation of the safety and emergency preparedness aspects of the proposed action is documented in a separate safety evaluation report prepared in accordance with Title 10 of the Code of Federal Regulations Part 52.

This recommendation is based on (1) the application, including the environmental report, submitted by SERI; (2) consultation with Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of comments related to the environmental review that were received during the public scoping process and on the draft EIS; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the environmental report and this EIS. In addition, in making its recommendation, the staff concluded that there are no environmentally preferable or obviously superior alternative sites.

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Executive Summary

On October 16, 2003, the U.S. Nuclear Regulatory Commission (NRC) received an application from System Energy Resources, Inc. (SERI) for an early site permit (ESP) for a location identified as the Grand Gulf ESP site, co-located with the Grand Gulf Nuclear Station. The proposed Grand Gulf ESP site is located in Claiborne County, Mississippi, approximately 40 km (25 mi) south of Vicksburg, Mississippi, 10 km (6 mi) northwest of Port Gibson, Mississippi, and 60 km (37 mi) north-northeast of Natchez, Mississippi. An ESP is a Commission approval of a location for siting one or more nuclear power facilities and is a separate action from the filing of an application for a construction permit or combined construction permit and operating license (combined license) for such a facility. An ESP application may refer to a reactor's or reactors' characteristics or plant parameter envelope, which is a set of postulated design parameters that bound the characteristics of a reactor or reactors that might be built at a selected site. Alternatively, an ESP application may refer to a detailed reactor design. An ESP is not a license to build a nuclear power plant. Rather, the application for an ESP initiates a process undertaken to assess whether a proposed site is suitable should SERI decide to pursue a construction permit or combined license.

Section 102 of the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321 et seq.) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. Subpart A of Title 10 of the Code of Federal Regulations (CFR) Part 52 contains the NRC regulations related to ESPs. The NRC implemented Section 102 of NEPA in 10 CFR Part 51. As set forth in 10 CFR 52.18, the Commission determined that an EIS will be prepared during the review of an application for an ESP. The purpose of SERI's requested action, issuance of the ESP, is for the NRC to determine whether the Grand Gulf ESP site is suitable for one or more new nuclear units by resolving certain safety and environmental issues before SERI incurs the substantial additional time and expense of designing and seeking approval to construct such units at the site. Part 52 of Title 10 describes the ESP as a "partial construction permit." An applicant for a construction permit or combined license for a nuclear unit or units to be located at the site for which an ESP was issued can reference the ESP, thus reducing the review of siting issues at that stage of the licensing process. However, a construction permit or combined license to construct and operate a nuclear power plant is a major Federal action that requires its own environmental review in accordance with 10 CFR Part 51.

Three primary issues – site safety, environmental impact, and emergency planning – must be addressed in an ESP application. Likewise, in its review of the application, the NRC assesses SERI's proposal in relation to these issues and determines if the application meets the requirements of the Atomic Energy Act of 1954 and the NRC regulations. This EIS addresses the potential environmental impacts resulting from construction and operation of one or more new nuclear units at the proposed and alternative sites.

Executive Summary

In accordance with 10 CFR 52.18, the EIS is focused on the environmental effects of construction and operation at the ESP site and alternative sites of a reactor or reactors that have characteristics that fall within SERI's plant parameter envelope.

Upon acceptance of the SERI ESP application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing in the *Federal Register* a Notice of Intent (68 FR 75656) to prepare an EIS and conduct a scoping process. The staff held a public scoping meeting in Port Gibson, Mississippi on January 21, 2004, and visited the Grand Gulf ESP site on July 29, 2003, January 21, 2004, and April 12 and 13, 2004. Subsequent to the scoping meeting and the site visits and in accordance with NEPA and 10 CFR Part 51, the staff evaluated the potential environmental impacts of constructing and operating one or more new nuclear units at the Grand Gulf ESP site.

During the course of preparing this EIS, the staff reviewed the application, including the environmental report submitted by SERI, consulted with Federal, State, Tribal, and local agencies, and followed the guidance set forth in NRC review standard RS-002, *Processing Applications for Early Site Permits*, to conduct an independent review of the issues. The review standard draws from the previously published NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants*, and NUREG-1555, *Environmental Standard Review Plan*. In addition, the staff considered the public comments related to the environmental review received during the scoping process and on the draft EIS (DEIS). These comments are provided in Appendix D and Appendix E of this EIS.

Following the practice the staff used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NUREG-1437) and supplemental operating license renewal EISs, environmental issues are evaluated using the three-level standard of significance – SMALL, MODERATE, or LARGE – developed by NRC using guidelines from the Council on Environmental Quality. The footnote to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, provides the following definitions of the three significance levels:

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 results of this evaluation were documented in a DEIS issued for public comment on April 29, 2005. During the comment period, the staff conducted a public meeting in Port Gibson, Mississippi on June 28, 2005 to describe the results of the NRC environmental review, answer questions, and provide members of the public with information to assist them in formulating comments on the DEIS. After closure of the comment period on the DEIS, the staff considered and dispositioned all the comments received.

Included in this EIS are (1) the results of the NRC staff's analyses, which consider and weigh the environmental effects of the proposed action (issuance of the ESP) and of constructing and operating one or more new nuclear units at the ESP site, (2) mitigation measures for reducing or avoiding adverse effects, (3) the environmental impacts of alternatives to the proposed action, and (4) the NRC staff's recommendation regarding the proposed action based on its environmental review.

The NRC staff's recommendation to the Commission related to the environmental aspects of the proposed action is that the ESP should be issued. The NRC staff's evaluation of the safety and emergency preparedness aspects of the proposed action is documented in a separate safety evaluation report prepared in accordance with 10 CFR Part 52.

The NRC staff's recommendation is based on (1) the application, including the environmental report submitted by SERI; (2) consultation with other Federal, State, Tribal, and local agencies; (3) the NRC staff's independent review; (4) the NRC staff's consideration of public comments related to the environmental review that were received during the scoping process and on the DEIS; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the environmental report and this EIS. In addition, in making its recommendation to the Commission, the NRC staff has determined that there are no environmentally preferable or obviously superior alternative sites.

Abbreviations/Acronyms

ABWR	Advanced Boiling Water Reactor	
ac	acre	
ACE	U.S. Army Corps of Engineers	
ACR-700	Advanced CANDU (CANada Deuterium Uranium) Reactor	
ADAMS	Agencywide Document Access and Management System	
ALARA	as low as is reasonably achievable	
AP1000	Advanced Pressurized Water Reactor	
AQCR	air quality control region	
AQI	Air Quality Index	
ATWS	anticipated transient without scram	
BEIR	Biological Effects of Ionizing Radiation	
Bq	becquerel	
Btu	British thermal unit	
BWR	boiling water reactor	
°C	degree Celsius	
CEDE	committed effective dose equivalent	
CEQ	Council on Environmental Quality	
CFR	Code of Federal Regulations	
cfs	cubic feet per second	
Ci	curie(s)	
cm	centimeter(s)	
CO	carbon monoxide	
COL	combined license	
CORMIX	Cornell Mixing Zone Expert System	
CP	construction permit	
CZMA	Coast Zone Management Act of 1972	
d	day	
dba	decibels, A scale	
DBA	design basis accident	
DEIS	draft environmental impact statement	
DOE	U.S. Department of Energy	
EAB	exclusion area boundary	
EIA	Energy Information Administration	
EIS	environmental impact statement	
ELF-EMF	extremely low frequency-electromagnetic field	
EMI	Entergy Mississippi, Inc.	
EMF	electromagnetic field	

Abbreviations/Acronyms

EPA	U.S. Environmental Protection Agency
ESBWR	Economic Simplified Boiling Water Reactor
ESP	early site permit
ESRP	Environmental Standard Review Plan
°F	degree Fahrenheit
FE	Federal endangered
FERC	Federal Energy Regulatory Commission
FFIEC	Federal Financial Institutions Examination Council
FR	<i>Federal Register</i>
FT	Federal threatened
ft	feet
FWS	U.S. Fish and Wildlife Service
gal	gallon(s)
GEIS	generic environmental impact statement
GGNS	Grand Gulf Nuclear Station
gpd	gallons per day
gpm	gallons per minute
GT-MHR	Gas Turbine Modular Helium Reactor
ha	hectare(s)
HMA	Habitat Management Area
hr	hour(s)
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
in.	inch(es)
INEEL	Idaho National Engineering and Environmental Laboratory
IRIS	International Reactor Innovative and Secure
J	Joule(s)
kg	kilogram(s)
km	kilometer(s)
kWh	kilowatt-hour(s)
L	liter(s)
L/d	liters per day
LMDCT(s)	linear mechanical draft cooling tower(s)
LNHP	Louisiana Natural Heritage Program
LOCA	loss-of-coolant accident
LPZ	low population zone
LWR	light water reactor

Abbreviations/Acronyms

m	meter(s)	
MDEQ	Mississippi Department of Environmental Quality	
MEI	maximally exposed individual	
mg	milligram(s)	
mGy	milligray(s)	
mi	mile(s)	
MISER	Massachusetts Institute for Social and Economic Research	
MNHP	Mississippi Natural Heritage Program	
MP&L	Mississippi Power and Light	
mrad	millirad(s)	
mrem	millirem(s)	
MS	Mississippi State (Highway)	
MSL	mean sea level	
mSv	millisievert(s)	
MT	metric ton(s)	
MTU	metric tons uranium	
MWd	megawatt day	
MW(e)	megawatts electrical	
MW(t)	megawatts thermal	
NA	not available	
NCRP	National Council on Radiation Protection and Measurements	
NEPA	National Environmental Policy Act of 1969	
NESC	National Electrical Safety Code	
NHPA	National Historical Preservation Act of 1966	
NHS	normal heat sink	
NIEHS	National Institute of Environmental Health Sciences	
NMPNS	Nine Mile Point Nuclear Station	
NOAA	National Oceanic and Atmospheric Administration	
NOx	nitrogen oxides	
NPDES	National Pollutant Discharge Elimination System	
NRC	U.S. Nuclear Regulatory Commission	
OSHA	Occupational Safety and Health Administration	
PBMR	Pebble Bed Modular Reactor	
PM	particulate matter	
PM ₁₀	particulate matter with a diameter of fewer than 10 micrometers	
PPE	plant parameter envelope	
ppm	parts per million	
ppt	parts per thousand	
PWR	pressurized water reactor	
RCIC	reactor core isolation cooling	
REMP	radiological environmental monitoring program	
RM	River Mile	

Abbreviations/Acronyms

ROI	region of interest
RSICC	(Oak Ridge) Radiation Safety Information Computational Center
Ryr	reactor year(s)
SCR	selective catalytic reduction
SE	state endangered
SERI	System Energy Resources, Inc.
SMEPA	South Mississippi Electric Power Association
SOx	sulfur oxides
SR	State Route
ST	state threatened
Sv	sievert(s)
SWS	service water system
SWU	separative work units
T&D	transmission and distribution (system)
TEDE	total effective dose equivalent
TLDs	thermoluminescence dosimeters
UFSAR	Updated Final Safety Analysis Report
UHS	ultimate heat sink
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
yr	year(s)
X/Q	normalized concentration