

# **SYSTEM ENERGY RESOURCES, INC.**

## **EARLY SITE PERMIT APPLICATION**

*for the*

## **GRAND GULF NUCLEAR STATION SITE**

### **PART 1**

### **ADMINISTRATIVE INFORMATION**

**Revision 2**

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## 1.0 INTRODUCTION

The Early Site Permit (ESP) process, offered under Title 10 Code of Federal Regulations (CFR) Part 52, Subpart A, was promulgated by the United States Nuclear Regulatory Commission (USNRC) in 1989 to address industry concerns with the former licensing process under 10 CFR 50. Previously, the licensing process required large expenditures of time and money by utilities well before key environmental and safety issues regarding site suitability could be resolved. As envisioned, the ESP process is meant to resolve these key site suitability issues well in advance of when a decision is made to build a nuclear power facility.

The ESP enables companies to obtain approval from the USNRC for a nuclear power plant site before deciding to build a plant. Site suitability with regards to 10 CFR 50.34(a)(1) and 10 CFR 100 and environmental impacts are resolved, and any impediments to implementing an emergency plan are identified and resolved before substantial capital is invested in licensing a new facility. When the decision is made to proceed, having a pre-approved site can dramatically shorten the time to bring a new plant to market. Given greater certainty in final plant capital costs and the ability to be more responsive to market demand, an Early Site Permit holder would be in a better position to obtain the necessary financial support from investment and lending institutions. Otherwise, the financial community would see long-term, higher risks in the previous licensing process. When used with the USNRC's combined construction and operating license (COL), the time required to build and start up a new plant can be shortened further. The USNRC introduced ESPs and the combined operating license as part of a more effective licensing process (10 CFR 52) for new nuclear power plants. Congress affirmed and strengthened the new licensing process in the 1992 Energy Policy Act.

An ESP process that encompasses a range of reactor designs enables companies to select the best design when the decision is made to proceed with a new plant. Through the use of the plant parameters envelope (PPE) concept, the USNRC can assess the suitability of a site based on a generalized plant description that encompasses the characteristics of several designs. Under this concept, the USNRC has the information it needs to assess site suitability, and companies can choose the best technology when they proceed with a new plant. Once issued, the ESP may be valid for not less than 10 nor more than 20 years, and may be renewed for up to 20 additional years.

Reference in this document to a "proposed" facility, site, or project should not be construed to be restricted to the reactor types discussed, but rather encompasses any design within the Plant Parameters Envelope against which site suitability is evaluated.

### 1.1 Purpose of Early Site Permit Submittal

The purpose of an application for an ESP is to set aside a proposed site for future energy generation and sale on the wholesale and/or retail energy market. This site will be reserved for a nuclear facility to be operated as a utility or merchant (non-utility) generator plant.

System Energy Resources, Inc. (SERI) is the Applicant for this ESP, and will hereinafter be referred to as SERI or Applicant.

The Applicant has selected a site located approximately 1200 feet (ft) west and 1000 ft north of the center of the containment of the existing Grand Gulf Nuclear Station (GGNS) Unit 1 facility for the proposed location of the ESP facility. The specific reactor type to be constructed has not been identified. Technical information from various reactor designs has been used to develop bounding parameters that are intended to envelop the proposed facility characterization

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necessary to evaluate the suitability of the site for future construction and operation of a nuclear power plant or plants.

The Grand Gulf Nuclear Station site is located in Claiborne County in southwestern Mississippi. The plant site is on the east side of the Mississippi River about 25 miles south of Vicksburg, Mississippi, 6 miles northwest of Port Gibson, Mississippi and 37 miles north-northeast of Natchez, Mississippi. The Grand Gulf Military Park borders a portion of the north side of the property, and the community of Grand Gulf is approximately 1-1/2 miles to the north. The Universal Transverse Mercator (UTM) Grid Coordinates for the approximate center of the location of the power block area of the proposed new facility are N3,543,261 meters, and E684,018 meters.

GGNS Unit 1 is a single unit nuclear generating plant capable of producing 3898 MWt (approximately 1,353 MWe gross). The boiling-water reactor (BWR), designed by General Electric (GE), has been producing electricity for customers since 1985.

This co-location strategy (i.e., placing the proposed ESP facility on the GGNS site) will be beneficial because this existing nuclear site is already developed to a large extent, and is dedicated to nuclear power plant use. The key advantages of co-location are described below.

- Existing GGNS related documents were utilized for development of the various parts of this Application for the ESP; e.g., Updated Final Safety Analysis Report (UFSAR), Final Environmental Report (FER), NRC Safety Evaluation Report (NUREG-0831), NRC Final Environmental Statement (FES) (NUREG-0777), and the GGNS Unit 1 Emergency Plan that includes processes and agreements with local and regional entities.
- The existing GGNS site and its exclusion area previously underwent a screening and evaluation process establishing its suitability, including a National Environmental Policy Act (NEPA) evaluation of alternatives. The proposed ESP facility is located within the GGNS Unit 1 exclusion area, and the proposed ESP facility exclusion area boundary is wholly within the GGNS site property boundary.
- The resources needed to prepare this ESP Application have been significantly lessened through the application of existing GGNS Unit 1 documents in the development of the SSAR, the ER, and the Emergency Planning Information. Actual resources needed to ultimately develop the site as contemplated by the ESP Application may be reduced through utilization and sharing of existing infrastructure and site services, if and when the ESP Facility becomes operational.
- Programs, procedures, and arrangements have been established and are in place, for the GGNS Unit 1 facility, with State and local governmental agencies, covering emergency planning, discharge permits, etc.
- Liaisons with the local community are established.

This application for an ESP does not consider the need for power, as the “need for power” argument is excluded by 10 CFR 52.17 and NUREG-1555 for the ESP Environmental Report (ER).

In furtherance of the submittal of this application for an ESP for the GGNS site, the Applicant seeks the following from the USNRC:

- An ESP issued for a duration of 20 years;

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- USNRC Environmental Impact Statement (EIS) finding of no significant impact on setting aside the GGNS site for additional nuclear facility(ies) construction;
- USNRC Safety Evaluation Report finding of site suitability with regards to the radiological consequence evaluation factors identified in 10 CFR 50.34(e)(1) and site suitability requirements of 10 CFR 100; and,
- USNRC finding that there are no significant impediments to implementing an Emergency Plan, and that the major features of an emergency plan presented in the application are acceptable.

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## **2.0 APPLICATION FORMAT AND CONTENT**

### **2.1 Application Content**

This Application for an Early Site Permit (ESP) for the GGNS site is composed of the following documents: Part 1, Administrative Information; Part 2, Site Safety Analysis Report (SSAR); Part 3, Environmental Report (ER); Part 4, Emergency Planning Information; and Part 5, Programs and Plans.

Multiple sources were consulted in the development of this Application, and these references are presented in separate reference lists contained in each of the Application parts. However, the inclusion of references in these lists does not imply adherence to all criteria or guidance stated in each individual reference. The multiple reports and plans required for the ESP Application, discussed in the sections below, were developed in accordance with the applicable regulatory requirements and USNRC regulations and guidance and include:

- An Administrative Information section which provides a general description of the format and content of the application, and corporate information as required by 10 CFR 50.33(a) through (d).
- An SSAR that includes:
  - A description and safety assessment of the site;
  - Demonstration of site compliance with 10 CFR 100 requirements for site suitability; and
  - An analysis of site features affecting the plant design; e.g., major structures, systems, and components that bear significantly on site acceptability under the radiological consequence evaluation factors of 10 CFR 50.34(a)(1).
- A complete ER focusing on the environmental impacts to the site from construction and operation of one or more reactors that have characteristics that fall within the site parameters (assessments of benefits and need for power discussions not included as allowed by 10 CFR 52.17 and NUREG-1555); and
- “Major features” of an Emergency Plan which show no significant impediment to development of an emergency plan for the site.
- A description of the quality processes used in preparation of the ESP Application.

For a site to be acceptable for the granting of an ESP, the USNRC must conclude that a nuclear reactor or reactors with characteristics that fall within the site parameters can be constructed and operated on the site without undue risk to health and safety of the public. For this reason, 10 CFR 52, “Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants,” was used as the regulatory criteria for developing this ESP. Additionally, the recommendations for the ESP Application format and content identified by the Nuclear Energy Institute (NEI) in NEI-01-02, “Industry Guideline for Preparing an Early Site Permit Application,” as updated and refined in industry discussions with the NRC were followed.

The SSAR, ER and Emergency Planning Information provided herewith demonstrate that the site is suitable for construction and operation of a new nuclear facility with design features as specified for major structures, systems, and components within the bounds of the PPE.

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### 2.1.1 Part 1, Administrative Information

This Administrative Information section includes a general description of the format and content of the application, and general corporate information as required by 10 CFR 50.33(a) through (d).

### 2.1.2 Part 2, Site Safety Analysis Report

The SSAR complies with the applicable portions of 10 CFR 52.17(a)(1) and consists of a description and safety assessment of the proposed site, and an evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation actors identified in 10 CFR 50.34(a)(1). Site suitability with regards to criteria and requirements of 10 CFR 100 are also demonstrated in the SSAR. Included in the SSAR are discussions of meteorological, hydrologic, geologic, and seismic characteristics of the site.

The regulatory bases for the SSAR include consideration of the following:

- USNRC Regulations - 10 CFR 50, 10 CFR 52, and 10 CFR 100;
- USNRC Regulatory Guide 1.70, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants; and
- NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.

The following briefly describes the individual chapters of the SSAR:

- Chapter 1, Introduction and Description of Proposed Facility, includes an overview of the site and a discussion of development of the PPE, and the PPE listing.
- Chapter 2, Site Characteristics, includes geography and demography; nearby industrial, transportation, and military facilities; meteorology; hydrologic engineering; and geology, seismology and geotechnical engineering.
- Chapter 3, Site Safety Assessment, includes discussion of radiological consequences of accidents, and conformance with 10 CFR 100, "Reactor Site Criteria."

### 2.1.3 Part 3, Environmental Report

The ER provides information required by 10 CFR 52.17(a)(2), using guidance provided by NUREG-1555. The ER addresses the environmental impacts associated with the construction and operation of a new nuclear facility on the GGNS site.

This Application for an ESP is premised on the assumption that, should the Applicant ultimately decide to exercise the permit and seek a construction permit or COL, the proposed facility would be constructed and operated as a merchant or utility power plant, co-located with the GGNS Unit 1 facility. The ER discusses the existing environment surrounding the site and in the vicinity of the site; postulates environmental impacts of construction and operation, and considers appropriate mitigation measures; reviews the impacts of design basis and severe accidents; and reviews similar alternative sites. This ER does not assess impacts based on a specific facility (nor vendor) design, nor does it postulate specific costs and benefits associated with construction or operation of any one design option; rather, the ER considers bounding conditions developed from a spectrum of facility designs.

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For evaluation purposes, the following categories of information regarding interfaces of the proposed site and facilities are reviewed:

- Comparison of the functional and operational needs of the facility as they relate to the site's natural and environmental resources; and
- Impact of the facility on the site's natural and environmental resources.

The regulatory bases for the ER include:

- NEPA;
- USNRC Regulations - 10 CFR 51 and 10 CFR 52;
- USNRC Regulatory Guide 4.2, Preparation of Environmental Reports for Nuclear Power Stations;
- NUREG-1555, Environmental Standard Review Plans; and
- State environmental statutes, as applicable.

The following briefly describes sections of the ER:

Chapter 1, Introduction to the Environmental Report, includes a discussion of the proposed project and the Applicant's purpose for the permit.

Chapter 2, Environmental Description, examines the existing use of the site for the existing operating GGNS Unit 1 facility, describes the current site and surrounding areas physical environment, and provides current socioeconomic, demographic, historic, and community characteristics.

Chapter 3, Plant Description, describes the proposed facility considered for this site; however, a specific reactor design has not yet been selected for construction at the site. Therefore, the description of the facility is based on a number of bounding plant parameters used in the assessment of the potential environmental impacts of construction and operation of a nuclear power plant at the site.

Chapter 4, Environmental Impacts of Construction, describes the potential impacts on the surrounding environment of constructing the proposed facility.

Chapter 5, Environmental Impacts of Station Operation, describes the potential impacts of operating the proposed facility at this site.

Chapter 6, Environmental Measurements and Monitoring Programs, describes the programs that will be utilized to monitor the environmental impacts of the construction and operation of the proposed facility.

Chapter 7, Environmental Impacts of Postulated Accidents Involving Radioactive Materials, describes the potential radiological consequences, associated with operating a nuclear power facility at the GGNS site, due to design basis accidents and due to severe accidents.

Chapter 8, Need for Power, notes that an assessment of the power needs is not relevant to an ESP.

Chapter 9, Alternatives to the Proposed Action, reviews potential alternatives (including alternative energy sources and sites) and supports the decision for co-locating a merchant power plant at the GGNS site.

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Chapter 10, Environmental Consequences of the Proposed Action, analyzes unavoidable adverse environmental impacts, and irreversible commitments of environmental resources, associated with construction and operation of the proposed facility at the GGNS site.

2.1.4 Part 4, Emergency Planning Information

The Emergency Planning Information part consists of a document identifying the “major features” of an Emergency Plan which would be developed for the site, in accordance with 10 CFR 52.17(b), (2)(i) using guidance provided in NUREG–0654/FEMA–REP-1, Revision 1, Supplement 2, Criteria for Emergency Planning in an Early Site Permit Application. This part includes an analysis of the current GGNS Unit 1 site evacuation time estimate, supporting a conclusion that there exists no physical characteristics unique to the site that could pose a significant impediment to the development of emergency plans for the proposed new facility.

An Emergency Plan is not intended to be developed until such time as it is necessary to do so, such as at COL.

2.1.5 Part 5, Programs and Plans

2.1.5.1 Plan 1 - Quality Assurance Plan

A description of the quality processes used in preparation of the ESP Application is provided.

2.1.5.2 Plan 2 - Site Redress Plan

The Applicant at the time of this submittal has no plans for activities at the site, after grant of the Early Site Permit, as allowed by 10 CFR 50.10(e)(1); therefore, a Site Redress Plan as required by 10 CFR 52.17(c) for these type activities is not provided.

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## 2.2 Application Format

### 2.2.1 Page Labeling

Each page of text and tables in the application includes a header which indicates the part of the application to which the page belongs.

### 2.2.2 Paragraph Numbering

Chapter and section headings are itemized in sequential numeric order, with subdivisions separated by periods. The first level section headings of a chapter are two digit (e.g., 2.1 is the first section of Chapter 2.0). The second level and subsequent headings increase by one digit for each level (e.g., 2.1.1, 2.1.1.1, etc.). Section and subsection numbers of three digits or less are indicated in the Table of Contents for the ESP Application documents.

### 2.2.3 Page Numbering

Page numbers are entered into the footer for each text page. Pages are sequentially numbered using the associated document section number or abbreviation (typically the two-digit section number if three-digit sections exist) as a prefix; e.g., page 2.4-1 is page 1 of Section 2.4 of the respective document, and TOC-i is the first page of the Table of Contents.

### 2.2.4 References

References for each two-digit section are provided in the final three-digit section of each two-digit section.

Notations for footnotes are included in the text as superscripts. Footnotes are located at the bottom of the footnoted page. Footnotes start with the number “1” in each two-digit section.

### 2.2.5 Tables and Figures

Tables and Figures are located at the end of the associated two-digit section, and are numbered with sequential dash numbers based on the associated two-digit section number (e.g., Figure 3.4-1 is the first figure of Section 3.4, and Table 3.4-1 is the first table of Section 3.4). Figures and tables in the Emergency Planning Information document are associated with the respective chapter (i.e., Figure 2-1 is the first figure in Chapter 2, etc.).

Each table typically begins on a new page. Multi-page tables will have “Sheet X of Y” in the footer. Table titles are indicated on the first page of the table only; subsequent sheets of a table will have the table number followed by “(Continued)” on the same line as the table number.

GGNS UFSAR, FER and Emergency Plan tables and figures incorporated into the ESP document as an ESP Application figure with appropriate ESP Application figure number, will reference the GGNS document table or figure as the source (e.g., the UFSAR figure number is included in parenthesis beneath the ESP Application figure number in the title block, and UFSAR table numbers are included in parenthesis below the ESP document table number).

### 2.2.6 Use of Text from GGNS Documents (UFSAR, FER, etc.)

Where text from the existing GGNS documents such as the UFSAR, FER, etc. is used in the ESP Application documents (SSAR and ER), and is copied verbatim into the ESP Application document, the copied text is highlighted through the use of the *ITALICS* font. In the SSAR, text taken from the GGNS UFSAR will be *ITALICS* font, and in the ER, text taken from the GGNS FER will be in *ITALICS* font. UFSAR text included in the ER is not highlighted in *ITALICS*, however.

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2.2.7 Document Revision Level

Revision level of the document is indicated in the footer for all text (by text section) and table pages. Figures contain the revision designator in the title block.

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**3.0 GENERAL CORPORATE INFORMATION**

3.1 Name of Applicant  
System Energy Resources, Inc. (SERI)

3.2 Address of Applicant  
System Energy Resources, Inc.  
Echelon One  
1340 Echelon Parkway  
Jackson, Mississippi 39213

3.3 Description of Applicant’s Business  
SERI is a subsidiary of Entergy Corporation. SERI, an Arkansas corporation, owns and leases an aggregate 90% undivided interest in Grand Gulf Nuclear Station. SERI sells all of the capacity and energy from its interest in Grand Gulf Nuclear Station at wholesale to its only customers, Entergy Arkansas, Entergy Louisiana, Entergy Mississippi, and Entergy New Orleans. Entergy Corporation is a Delaware corporation which, through its subsidiaries, engages principally in the following businesses: domestic utility, power marketing and trading, global power development, and domestic non-utility nuclear. SERI is not owned, controlled, or dominated by an alien, a foreign corporation, or foreign government.

3.4 U.S. State of Incorporation  
Date of Incorporation: February 11, 1974\* (\*Initially incorporated as Middle South Energy, Inc. but changed to System Energy Resources, Inc. in 1986.)

State of Incorporation: Arkansas

3.5 Descriptions of Organization and Management of Applicant

SERI BOARD OF DIRECTORS		
NAME	ADDRESS	CITIZENSHIP
Gary J. Taylor, Chairman	Entergy Nuclear 1340 Echelon Parkway Jackson, MS 39213	US
Leo P. Denault	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113	US
Steven C. McNeal	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113	US

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SERI PRINCIPAL OFFICERS		
NAME	ADDRESS	CITIZENSHIP
Gary J. Taylor	Entergy Nuclear 1340 Echelon Parkway Jackson, MS 39213	US
William A. Eaton	Entergy Nuclear 1340 Echelon Parkway Jackson, MS 39213	US
Robert D. Sloan	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113	US

### 3.6 Permit Duration Sought by Applicant

As indicated above, SERI requests an Early Site Permit with a permit duration of 20 years pursuant to 10 CFR 52, Subpart A. Once issued, the permit may be renewed for up to 20 additional years.

During the ESP Application development process, the Applicant did not identify any site data, or methodologies used to make future predictions (time-dependent site characteristics or ones that would not fully support a 20-yr ESP duration), that would adversely affect the work done in support of, and the conclusions reached in, this Application. Such data would normally involve population growth predictions, man-made hazards analysis, geology, and meteorology. None of the data provided, or the methodologies for future projections, involve conditions or limitations beyond those normally expected in such an Application, which would invalidate a 20-yr ESP.