1.0 INTRODUCTION AND GENERAL DESCRIPTION

1.1 Introduction

In April 1989, the Nuclear Regulatory Commission (NRC) published 10 CFR Part 52 to govern the issuance of Early Site Permits (ESP), Standard Design Certifications, and Combined Licenses (COL) for nuclear power facilities. 10 CFR Part 52 provides a licensing process to resolve, with finality, safety and environmental issues early in the licensing process of a nuclear power facility.

This Site Safety Analysis Report (SSAR) has been prepared to meet the requirements of 10 CFR 52.17 for an Early Site Permit. The format and content of Regulatory Guide 1.70 (Reference 1) was used for Chapters 1 and 2, as appropriate for those sections applicable to an ESP application. This report supports the application, of which it is a part, by System Energy Resources, Inc. (SERI) for an Early Site Permit for a new nuclear power plant or plants to be located on the existing Grand Gulf Nuclear Station (GGNS) site near Port Gibson, Mississippi[1].

This report, Part 2 of the application for an ESP, addresses the safety assessment and suitability review with respect to the addition of new nuclear plant(s) onto the GGNS site.[2]

In order to evaluate the GGNS site for its suitability or acceptability for possible siting of a new nuclear reactor or reactors as required by 10 CFR 52 for an Early Site Permit, it is necessary to discuss "construction and operation" of said reactor or reactors. This report may make reference to a new facility (reactor or reactors) using such terms as a project, proposed new facility, proposed facility, proposed plant, reactor or reactors to be constructed, the proposed project, ESP Facility, etc., all of which refer to a reactor or reactors, defined by the parameters in the Plant Parameters Envelope of Section 3.0 of this document. However, by this application SERI is making no commitment to the actual construction of a plant of any type on the GGNS site; rather, SERI seeks only to obtain an Early Site Permit, as allowed by 10 CFR 52, Subpart A, for the <u>potential future construction</u> of a reactor or reactors on the site.

1.1.1 Site Ownership

System Energy Resources, Inc. (SERI) owns the Grand Gulf site property (~2100 acres) with the following clarifications:

- The property associated with the existing Grand Gulf Nuclear Station power plant and support facilities (~104 acres) has subdivided ownership interests.
    - South Mississippi Electric Power Association (SMEPA), a Mississippi corporation, maintains a 10% undivided ownership interest in the property associated with the existing Grand Gulf Nuclear Station power plant and support facilities.

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[1] For the purposes of this Early Site Permit application, that portion of the Grand Gulf Nuclear Station site which is proposed and evaluated herein for an Early Site Permit may be referred to as the GGNS ESP Site or the ESP Site. The site areas evaluated for a new facility are wholly contained with the existing property boundary for the existing GGNS site.

[2] This ESP application makes use of material provided in the GGNS Updated Final Analysis Report (UFSAR) where considered appropriate. When such material (text) is used in this application (verbatim), it is shown in italics.

  - SERI's 90% ownership interest in the existing Grand Gulf Nuclear Station power plant and support facilities has been further subdivided. SERI has a sale/leaseback agreement in which SERI maintains 77.23% ownership. The remaining 12.77% interest is owned by equity investors: Textron Financial Corporation and Resources Capital Management Corporation, and is leased back to SERI. Title to the property reverts back to SERI on termination of the sale/leaseback agreement.

- Entergy Mississippi, Inc. (formerly named Mississippi Power & Light) owns the switchyard and transmission lines.
- SMEPA also holds certain easement rights associated with the Grand Gulf site property.

SERI has the exclusive rights to develop the Grand Gulf site property outside the existing power plant and support facilities. SERI has the authority to enter into emergency planning agreements with government institutions as included in this ESP application.

Entergy Operations, Inc. (EOI) is licensed to operate the existing Grand Gulf Nuclear Station power plant facility. EOI does not have an ownership interest in the Grand Gulf site property. Entergy Nuclear Potomac Company (ENPC) was authorized by SERI to prepare this ESP application. ENPC does not have an ownership interest in the Grand Gulf Nuclear Station site property.

SERI, EOI, ENPC, and Entergy Mississippi, are wholly owned subsidiaries of Entergy Corporation, a registered public utility holding company.

1.1.2 The Applicant

System Energy Resources, Inc. (SERI), is the applicant for the Early Site Permit for the Grand Gulf Nuclear Station site. Refer to Part 1 of the application for more discussion regarding the applicant.

1.1.3 References

1. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.70, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, Revision 3, November 1978.

1.2 General Site Description

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 a new facility are N3,543,261 meters and E684,018 meters.

The property boundary shown on Figure 1.2-1 encompasses approximately 2100 acres of property that makes up the Grand Gulf Nuclear Station (GGNS) site. The site and its environs consist primarily of woodlands and farms. Within this area are two lakes, Gin Lake and Hamilton Lake. These lakes were once the channel of the Mississippi River and averaged about 8 to 10 feet in depth.

The western half of the plant site consists of materials deposited by the Mississippi River and extends eastward from the river about 0.8 mile. This area is generally 55 to 75 feet above mean sea level (msl).

The eastern half of the plant site is rough and irregular with steep slopes and deep-cut stream valleys and drainage courses. Elevations in this portion of the plant site range from about 80 feet above msl to more than 200 feet above msl at the inland of the site. Elevations of about 400 feet above mean sea level occur on the hilltops east and northeast of the site.

1.3 Plant Parameters Envelope

1.3.1 Plant Parameters Envelope Approach

1.3.1.1 Background

Nuclear Energy Institute (NEI) draft document, NEI-01-02, "Industry Guideline for Preparing an Early Site Permit Application" (Reference 1) provided a generic Plant Parameters Envelope (PPE) table template for the Early Site Permit (ESP) application. Extensive discussions held in pre-application activities between the NRC and industry representatives in 2002 and 2003 resulted in further refinement of the PPE concept, process, and application of its content. The PPE, provided in this application, for the GGNS ESP is consistent with industry positions regarding the PPE.

1.3.1.2 PPE Concept

An ESP application does not normally specify a particular plant design or reactor vendor. Rather, the application provides an evaluation of the selected site (for this application, the Grand Gulf Nuclear Station site or GGNS) considering a bounding set of parameters for a group of potential plant candidates being considered. This bounding information is captured in the PPE.

The PPE is a set of postulated design parameters that are expected to bound the characteristics of a reactor or reactors that might be deployed at a site. This would include certain site parameters specified by the reactor vendor which must be met by the selected site.

- In terms of safety reviews, this means that design characteristics of potential plant designs will be no more demanding from a site suitability perspective than the bounding design parameters in the PPE
- In terms of environmental reviews, this means that impacts of the selected design will not be significantly greater than impacts evaluated in the ESP using the bounding design parameters in the PPE.

For purposes of preparing ESP applications, the PPE serves as a surrogate for actual facility information. For example, values for maximum building height, acreage for plant facilities, ponds, etc., and cooling water requirements, are among the design parameters specified in the PPE.

PPE parameters, along with information established by features of the site itself (i.e., "site characteristics"), support the 10 CFR Part 52.17 analyses required to demonstrate site suitability. These analyses are provided in this Site Safety Analysis Report (SSAR) and in the environmental impact assessments reported in the Environmental Report (ER) included with this application.

In developing and refining the PPE concept, the industry established a number of draft definitions for key terms to facilitate discussion and understanding of the PPE approach (Reference 2). These definitions are provided below and apply to the use of these terms in this application:

1. **Site parameters** – The postulated physical, environmental and demographic features of an as-yet unidentified site. These are the site-related parameters that vendors have assumed in completing a reactor design. They establish the physical, environmental and demographic characteristics that a site must "deliver" if it is to be suitable for the vendor's reactor or reactors.

2. **Design parameters** – The postulated features of the reactor or reactors that could be built. These features describe design information that is necessary to prepare and review an ESP application. At COL, these will be compared with "design characteristics" of the selected design to determine whether significant new safety or environmental issues exist.

3. **Site characteristics** – The real physical, environmental and demographic features of the proposed location for a new facility. These values are established through data collection and/or analysis and are reported in the applicant's ESP application. They are developed in accordance with NRC requirements and guidance and form the basis for future comparison (at the COL stage) with "design characteristics" of the selected design to verify that the site is suitable for that design.

4. **Design characteristics** – The real features of a reactor or reactors. At COL, design characteristics are assessed to ensure they fall within the **site characteristics** and **design parameters** approved in the ESP.

1.3.1.3 PPE Development Process

The PPE was developed considering a number of reactor designs that were either commercially available at the time of this application, or may possibly be commercially available within the term of the ESP. The reactors chosen for the PPE development represent a wide range of nuclear technologies.

The light-water-cooled technologies considered include the ABWR (Advanced Boiling Water Reactor), the ESBWR (Economic Simplified Boiling Water Reactor), the AP-1000 (Advanced Passive PWR), the IRIS (International Reactor Innovative and Secure), and the ACR-700 (Advanced CANDU Reactor). The ABWR is a single unit, 4300 MWt[1], 1500 MWe reactor. The ESBWR is a similar BWR, single unit, 4000 MWt, 1390 MWe. The AP-1000 pressurized-water reactor single unit specifications are 3400 MWt and 1117-1150 MWe. The IRIS is a three module pressurized-water reactor configuration with a total of 3000 MWt and 1005 MWe. And the ACR-700 is a twin unit, 3964 MWt, 1462 MWe, light-water-cooled reactor with a heavy-water moderator. There were two gas-cooled reactor technologies considered in the PPE development. These gas-cooled reactor technologies are the GT-MHR (Gas Turbine-Modular Helium Reactor), and the PBMR (Pebble Bed Modular Reactor). The GT-MHR is a four module, 2400 MWt, 1150 MWe gas-cooled reactor. The PBMR is an eight module, 3200 MWt, 1280 MWe gas-cooled reactor.

The parameters which define the relevant aspects of each plant type under consideration were captured individually in a PPE "worksheet." The PPE table was then derived from the worksheet based on parameter "usage" in the associated document. (Note that the PPE included in this Site Safety Analysis Report is different from that presented in the Environmental Report, included as Part 3 of the ESP Application, based on parameter "usage" in the documents.) Each parameter, from all of the plant types considered, was evaluated and a bounding parameter value chosen for the bounding PPE. For example, a parameter with a possible significant environmental impact is the cooling water requirement for a new facility. Depending on the type, size and efficiency of the plant, each design has a specific cooling water requirement.

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[1] This specification of thermal power of 4,300 MWt includes a consideration for approximately 10% power uprate from the design certified thermal power level of 3,926 MWt (and corresponding electrical output of 1,356 MWe).

Therefore, in this example, the plant that requires the most cooling water to be withdrawn from the available water source would produce the bounding value for this particular parameter. On the other hand, the plant that has the most demand on the cooling water source may have the smallest plant foot print and, therefore, have the least terrestrial impact; thus, another plant with the bounding foot print would establish the value listed in the PPE.

For two plant functions, the normal plant heat sink (NHS) and the ultimate heat sink (UHS), there is more than one method to accomplish the cooling function. The NHS removes heat generated by normal operation of the plant (e.g., from the main condenser for a steam driven turbine application, plant auxiliary system cooling, non-safety related HVAC, etc.). The UHS removes heat from the reactor core and/or reactor containment during transient or accident conditions (UHS may also be used to remove decay heat from the core during normal plant cooldown and/or shutdown). The methods available for heat removal for the NHS and UHS are similar. For the NHS, there are four methods used in the commercial power industry: mechanical draft cooling towers, natural draft cooling towers, once through cooling, and cooling canals or ponds. All of these, except for the natural draft cooling towers, are also used for an UHS. Therefore, for these two plant functions, NHS and UHS, a “bounding system” to accomplish these functions with a set of bounding parameters must be determined from review of all the proposed cooling methods. All four traditional cooling methods were addressed in the PPE worksheet for each of the plant types considered.

As mentioned above, a PPE worksheet was first developed which included PPE parameters from all of the plant types that are under consideration for the site. From this worksheet a "bounding plant" was defined, reflecting a composite of the bounding parameters for all plant types considered. A review was then performed to determine if the proposed site could accommodate the "bounding plant," (i.e., was suitable). If it was determined that the site could not support a particular bounding parameter of the "bounding plant," then that particular option or plant type would have been removed from consideration so that the final "bounding plant" could be accommodated both physically and environmentally on the site under consideration. For example, if 3000 acres are required for a NHS cooling pond but there are only 1000 acres available, then a cooling pond was eliminated from consideration for the site. However, the plant type that specified a 3000 acre cooling pond was not necessarily eliminated if another method to perform the NHS function is available (e.g., mechanical draft cooling tower that takes only 6 acres). An example of a plant type that might be eliminated from consideration, would be one in which design requirements did not meet the peak ground acceleration parameters for the site.

The initial PPE worksheet listing of parameters was based on NEI-01-02 (Reference 1). This was later refined through NEI ESP Task Force work with the NRC in 2002 and 2003. A sample (preliminary) version of the PPE worksheet was provided to the NRC by NEI to further promote NRC Staff understanding of the PPE concept and methodology (Reference 2). The site-specific form of the PPE, as provided in this application, was established based on the unique analyses of data required to support the safety and environmental assessments for the ESP. As discussed in Reference 2, a site specific PPE would, therefore, be expected to differ from the NEI “sample” PPE, as well as the site specific PPEs submitted by other applicants involved in the ESP “pilot” process (2002-2003). In addition, the PPE provides fewer parameters (than the worksheet) since the PPE tables include only those parameters that were directly relevant to the site safety assessment and/or environmental reports, as note above.

Bounding values established in the PPE were based on the best available information obtained primarily from the vendors of plants being considered for the PPE development, in cooperation with NEI, other ESP applicants involved in the “pilot ESP process,” as well as EPRI and other industry representatives. It is expected that vendor input to the PPE worksheet will change as designs are refined and improved after this application is submitted, reviewed, and approved by the NRC. However, the values provided in the approved PPE along with the site characteristics described in the application will represent the “permit bases,” against which any future design would be compared (i.e., at COL).

“Permit bases,” in the above use, refers to the bases established in the NRC’s review and approval of the ESP application. The bases are the combination of site characteristics and bounding design parameter values from the PPE that will be compared to the design characteristics of the actual facility chosen for construction at COL.

It is recognized that some (but not all) PPE design parameters (included in the PPE worksheet) have direct correspondence to site characteristics. For example, maximum snow loading is both a characteristic of the site that is quantified based on site and regional meteorological data, as well as a design parameter used in roof design. In contrast, building height is solely associated with the design and has no directly corresponding site characteristic. Regarding the expected establishment of the “permit bases,” the site characteristic should always become the permit basis for a parameter and, thus, would be the focus of comparison at COL. This is considered consistent with the objective at COL to confirm that an actual plant design is suitable for the site. Where there is no corresponding site characteristic, the bounding design parameter value from the PPE becomes part of the “permit basis.” Based on this approach, PPE parameters in the worksheet having a corresponding site characteristic (such as snow loading) are not included in the final site PPE listings (in the SSAR or ER). The “permit basis” for such parameters is that which is presented in the SSAR or ER text where the specific site characteristic is discussed.

1.3.1.4 Grand Gulf Site Specific “Bounding Plant”

To support this application, as discussed above, a bounding plant parameters envelope (PPE) approach was taken. An early step in this process established an approximate target value for the desired electrical output from the new facility that could be sited on the GGNS ESP Site. As a result, a value of approximately 2000 MWe was selected. It should be emphasized that this value is required for the above purposes but does not reflect a future commitment to a specific reactor type or a specific level of generating capacity. Based on many factors involving commercial, market, policy, and regulatory considerations, the final capacity of the new facility may be more or less than the target value of 2000 MWe. However, the PPE approach sets bounding values for key parameters used in this report based on this minimum target electrical output.

Establishment of the target site capacity of 2000 MWe was an initial step in PPE development. Because each reactor type considered in development of the PPE was of a different size, an exact comparison of electrical output ratings and the associated environmental impacts was not possible. For example, for single reactor units, the types considered represented capacities ranging from 160 MWe to 1500 MWe. In order to facilitate comparison between the different plant types in the PPE, the number of units/modules of a specific reactor type was chosen, based on vendors recommended combinations, to approximate 1000 MWe. This resulted in “single-unit plants” with capacities in the range of 1005 MWe to 1500 MWe. Given that the target size of a facility site is on the order of 2000 MWe, the bounding number for each parameter in the PPE was doubled, where appropriate, to determine the overall magnitude of each parameter. In the PPE (Table 1.3-1), the “Composite Value” generally reflects the values corresponding to a plant that is twice the vendor's specified "standard size plant."[2] Some PPE values were not doubled since having twice the vendor's specified standard size plant does not cause twice the environmental impact.

The PPE bounding values were "driven" by a multiple of reactor units representing a total generation capacity that was either equivalent to or, in some cases, much greater than 2000 MWe[3]. For example, PPE bounding values for auxiliary boiler sulfur dioxide emissions were associated with sulfur dioxide estimates from a sufficient number of boilers to support two large LWR units. In this case, these two large LWRs are expected to be capable of producing approximately 2400 MWe.

Environmental impacts associated with PPE values are evaluated in the Environmental Report included with this ESP application.

A wide range of parameters are included in the PPE worksheet, many of which have no bearing on the assessment of site suitability as required by Part 52. Therefore, only those parameters which are used/quoted in this analysis of site suitability are included in Table 1.3-1. In like manner, the parameters which define the "bounding plant" in terms of environmental impact assessments were included in the Environmental Report, as ER Table 3.0-1. Again, because of the different reasons for development of these two documents (i.e., SSAR and ER), the information (parameters listed) in the tables may be different.

1.3.2 References

1. NEI 01-02, "Industry Guideline for Preparing an Early Site Permit Application," 10 CFR Part 52, Subpart A, Rev. A Sept 2001.
2. Ronald L. Simard, NEI, to James E. Lyons, US NRC, letter dated February 7, 2003, ESP Plant Parameter Envelope Worksheet.

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[2] For the reactor technologies considered in the PPE, the vendor's "standard plant" may consist of one (e.g., larger advanced LWR design) to eight individual reactor units (e.g., gas-cooled design).

[3] The largest advanced LWR design considered in the PPE has a capacity rating of 1500 MWe per unit; thus, to meet the target site capacity of 2000 MWe two units are required, resulting in a total site electrical capacity of 3000 MWe.

1.4 Conformance With Regulatory Requirements and Guidance

Table 1.4-1 provides a consolidated listing of NRC Regulatory Guides discussed in this ESP application Site Safety Analysis Report (SSAR).

Using the guidance of Regulatory Guide 1.70 (Rev. 3), those regulatory guides (or portions, thereof) that were considered relevant and applicable to an ESP application were included in the SSAR discussion and, therefore, listed in Table 1.4-1. Per the guidance of Regulatory Guide 1.70 (Section 1.8), Table 1.4-1 lists ESP applicable regulatory guides (discussed in the SSAR), the applicable revision and date of issuance, and the SSAR section in which the subject regulatory guide is discussed. The extent of compliance information is provided by way of the discussions in the referenced SSAR sections.

TABLE 1.3-1

PLANT PARAMETERS ENVELOPE (PPE)

PPE Section		Composite Value[1]	Comments	Value[2]
2.	Normal Plant Heat Sink			
2.3	Condenser			
2.3.2	Condenser / Heat Exchanger Duty	10.7 E9 Btu/hr		US
2.4	NHS Cooling Towers – Mechanical Draft (Natural Draft) (See Note 3)			
2.4.6 (2.5.6)	Cycles of Concentration	4		US
2.4.8 (2.5.8)	Height	60 ft (475 ft)		US
2.4.9 (2.5.9)	Makeup Flow Rate	47,900 gpm expected (78,000 gpm max)		TP
2.4.12 (2.5.12)	Cooling Water Flow Rate	865,000 gpm		US
5.	Potable Water/Sanitary Waste System			
5.2	Raw Water Requirements			
5.2.1	Maximum Use	240 gpm		TP
5.2.2	Monthly Average Use	180 gpm		TP
6.	Demineralized Water System			
6.2	Raw Water Requirements			
6.2.1	Maximum Use	1440 gpm		TP
6.2.2	Monthly Average Use	1100 gpm		TP
7.	Fire Protection System			
7.1	Raw Water Requirements			
7.1.1	Maximum Use	1890 gpm		TP
7.1.2	Monthly Average Use	(30 gpm)		TP
9.	Unit Vent/Airborne Effluent Release Point			
9.4	Release Point			
9.4.2	Elevation (Normal)	Ground level		US
9.4.3	Elevation (Post Accident)	Ground level		US
9.4.4	Minimum Distance to Site Boundary	0.52 mi (841 m) exclusion area		US

TABLE 1.3-1 (Continued)

PPE Section		Composite Value[1]	Comments	Value[2]
9.5	Source Term			
9.5.1	Airborne Effluents (Normal)	32,699 Ci/yr	See TABLE 1.3-2	TP
9.5.2	Airborne Effluents (Post-Accident)	Based on limiting DBAs	See Note 4	US
9.5.3	Tritium Airborne Effluent (Normal)	7060 Ci/yr		TP
17.	Plant Characteristics			
17.3	Megawatts Thermal	4300 MWt	Includes allowance for ~10% uprate from 3926 MWt.	US
18.	Construction			
18.4	Plant Population			
18.4.1	Construction	3150 people max		US

NOTES:

1. The “Composite Value” provides an envelope (bounding values) for design parameters for the various plant designs considered for the site. See Site Safety Analysis Report Section 1.3 for a discussion of the basis for parameter values.
2. “Value” pertains to the “Composite Value” for each parameter listed. In this table, a value designated “US” represents a “unit specific” value, meaning that it is applied per unit, or group of units or modules. A designation of “TP” is given to a value that represents total facility requirements. See Site Safety Analysis Report Section 1.3 for a discussion of the basis for parameter values.
3. Several main condenser cooling system alternatives were considered (i.e., mechanical and natural draft cooling towers, cooling ponds, and once-through cooling).
   - The once through cooling option was eliminated due to significant environmental impact.
   - The cooling pond option was eliminated due to insufficient GGNS site acreage to accommodate pond.
4. In general, source terms for any given accident are those used by the vendors in their safety analyses. The methodologies used by the Vendors for establishing source terms include those established in TID-14844 and Regulatory Guide 1.183. See SSAR Sections 3.3.2 and 3.3.3 for additional detail on accident selection and source term methods.

TABLE 1.3-2

NORMAL OPERATIONS GASEOUS RELEASE SOURCE TERM[1]

Radionuclide	Composite Normal Release[2] (Ci/yr)	Radionuclide	Composite Normal Release[2] (Ci/yr)
Kr-83m	1.68E-03	Rb-89	8.65E-05
Kr-85m	7.20E+01	Sr-89	1.14E-02
Kr-85	8.20E+03	Sr-90	3.60E-03
Kr-87	5.03E+01	Y-90	9.19E-05
Kr-88	9.20E+01	Sr-91	2.00E-03
Kr-89	4.81E+02	Sr-92	1.57E-03
Kr-90	6.49E-04	Y-91	4.81E-04
Xe-131m	3.60E+03	Y-92	1.24E-03
Xe-133m	1.74E+02	Y-93	2.22E-03
Xe-133	9.20E+03	Zr-95	3.19E-03
Xe-135m	8.11E+02	Nb-95	1.68E-02
Xe-135	9.19E+02	Mo-99	1.19E-01
Xe-137	1.03E+03	Tc-99m	5.95E-04
Xe-138	8.65E+02	Ru-103	7.03E-03
Xe-139	8.11E-04	Rh-103m	2.22E-04
I-131	5.19E-01	Ru-106	2.34E-04
I-132	4.38E+00	Rh-106	3.78E-05
I-133	3.41E+00	Ag-110m	4.00E-06
I-134	7.57E+00	Sb-124	3.62E-04
I-135	4.81E+00	Sb-125	1.83E-04
C-14	2.19E+01	Te-129m	4.38E-04
Na-24	8.11E-03	Te-131m	1.51E-04
P-32	1.84E-03	Te-132	3.78E-05
Ar-41	1.02E+02	Cs-134	1.24E-02
Cr-51	7.03E-02	Cs-136	1.19E-03
Mn-54	1.08E-02	Cs-137	1.89E-02
Mn-56	7.03E-03	Cs-138	3.41E-04
Fe-55	1.30E-02	Ba-140	5.41E-02
Co-57	2.46E-05	La-140	3.62E-03
Co-58	6.90E-02	Ce-141	1.84E-02
Fe-59	1.62E-03	Ce-144	3.78E-05
Co-60	2.61E-02	Pr-144	3.78E-05
Ni-63	1.30E-05	W-187	3.78E-04
Cu-64	2.00E-02	Np-239	2.38E-02
Zn-65	2.22E-02		
		Total without Tritium	25,639
		Tritium (H-3)	7.06E+03
		Total with Tritium	32,699

NOTES:

1. See PPE Table 1.3-1, Section 9.5.
2. Composite source term based on highest radionuclide release for all plant types considered.

TABLE 1.3-3

PLANT PARAMETERS DEFINITIONS

Parameter	Units	Definition	Bounding Value (Notes)
2. Normal Plant Heat Sink			
2.3 Condenser			
2.3.2 Condenser / Heat Exchanger Duty	BTU per hour	Design value for the waste heat rejected to the circulating water system across the normal heat sink condensers.	2
2.4 (2.5) NHS Cooling Towers (Mechanical Draft or Natural Draft)			
2.4.6 (2.5.6) Cycles of Concentration	Number of cycles	The ratio of total dissolved solids in the cooling water blowdown streams to the total dissolved solids in the makeup water streams.	1
2.4.8 (2.5.8) Height	Feet	The vertical height above finished grade of either natural draft or mechanical draft cooling towers associated with the cooling water systems.	1
2.4.9 (2.5.9) Makeup Flow Rate	Gallons per minute	The expected (and maximum) rate of removal of water from a natural source to replace water losses from closed cooling water systems.	2
2.4.12 (2.5.12) Cooling Water Flow Rate	Gallons per minute	The total cooling water flow rate through the normal heat sink condensers/heat exchangers.	1
5. Potable Water/Sanitary Waste System			
5.2 Raw Water Requirements			
5.2.1 Maximum Use	Gallons per minute	The maximum short-term rate of withdrawal from the water source for the potable and sanitary waste water systems.	2
5.2.2 Monthly Average Use	Gallons per minute	The average rate of withdrawal from the water source for the potable and sanitary waste water systems.	2
6. Demineralized Water System			
6.2 Raw Water Requirements			
6.2.1 Maximum Use	Gallons per minute	The maximum short-term rate of withdrawal from the water source for the demineralized water system.	2
6.2.2 Monthly Average Use	Gallons per minute	The average rate of withdrawal from the water source for the demineralized water system.	2
7. Fire Protection System			
7.1 Raw Water Requirements			
7.1.1 Maximum Use	Gallons per minute	The maximum short-term rate of withdrawal from the water source for the fire protection water system.	2
7.1.2 Monthly Average Use	Gallons per minute	The average rate of withdrawal from the water source for the fire protection water system.	2
9. Unit Vent/Airborne Effluent Release Point			
9.4 Release Point			
9.4.2 Elevation (Normal Operation)	Feet	The elevation above finished grade of the release point for routine operational releases.	3
9.4.3 Elevation (Post Accident)	Feet	The elevation above finished grade of the release point for accident sequence releases.	3

TABLE 1.3-3 (Continued)

Parameter	Units	Definition	Bounding Value (Notes)
9.4.4 Minimum Distance to Site Boundary	Feet	The minimum lateral distance from the release point to the site boundary.	3
9.5 Source Term			
9.5.1 Airborne Effluents (Normal)	Curies per year	The annual activity, by isotope, contained in routine (normal) plant airborne effluent streams.	2
9.5.2 Airborne Effluents (Post-Accident)	Curies	The activity, by isotope, activity contained in post-accident airborne effluents.	1
9.5.3 Tritium Airborne Effluent (Normal)	Curies per year	The annual activity of tritium contained in routine (normal) plant airborne effluent streams.	2
17. Plant Characteristics			
17.3 Megawatts Thermal	Mega-watts	The maximum thermal power generated by a single unit or group of units/modules of a specific reactor plant type.	2
18. Construction			
18.4 Plant Population			
18.4.1 Construction	Persons	The number of people required to construct the plant.	2

NOTES:

1. The Bounding Value is the maximum value for any of the plant designs being considered for the site.
2. The Bounding Value is the maximum value for any of the plant design/number of unit combinations being considered for the site.
3. The Bounding Value is the minimum value for any of the plant designs being considered for the site.

TABLE 1.4-1

CONFORMANCE WITH NRC REGULATORY GUIDES AND GUIDANCE

Regulatory Guide No.	Title	Rev.	Date	SSAR Para. Reference
1.3	Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors	2	6/74	2.3.2.3, 3.3.4.10
1.23	Onsite Meteorological Programs	-	2/72	2.3.2, 2.3.3, 2.3.4.2
1.25	Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors	-	3/72	3.3.4.13
1.59	Design Basis Flood for Nuclear Power Plants	2	8/77[1]	2.4.2.2, 2.4.2.3, 2.4.2.3.3.2.1.2, 2.4.3
1.70	Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants	3	11/78	1.1, 1.4
1.76	Design Basis Tornado for Nuclear Power Plants	-	4/74	2.3.1.4[2]
1.77	Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors	-	5/74	3.3.4.3
1.78	Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release	-	6/74[3]	2.2.3.1.2
1.91	Evaluations of Explosions Postulated To Occur on Transportation Routes Near Nuclear Power Plants	1	2/78	2.2.3.1.1, 3.1.5
1.95	Protection of Nuclear Power Plant Control Room Operators Against An Accidental Chlorine Release	1	1/77[4]	2.2.3.1.2

TABLE 1.4-1 (Continued)

Regulatory Guide No.	Title	Rev.	Date	SSAR Para. Reference
1.109	Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I	1	10/77	3.2.1, 3.2.2, 3.2.3
1.111	Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors	1	7/77	2.3.5.2, 3.2.1
1.132	Site Investigation for Foundations of Nuclear Power Plants	1	3/79[5]	2.5.1, 2.5.4
1.138	Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants	-	4/78[6]	2.5.1
1.145	Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants	1	11/82[7]	2.3.4
1.165	Identification and Characterization of Seismic Sources and Determination Safe Shutdown Earthquake Ground Motion	-	3/97	2.5.1
1.183	Alternative Radiological Source Terms For Evaluating Design Basis Accidents At Nuclear Power Reactors	-	7/00	3.3.1, 3.3.2, 3.3.3
DG-1105	Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites	-	3/01	2.5.1

NOTES:

1 As updated by the errata published July 30, 1980.

2 Using later data from the National Severe Storms Forecast Center, and Regulatory Guide 1.76 methodology, the NRC developed an interim position, establishing an update to the design basis tornado characteristics. The NRC's updated criteria were described in its safety evaluation, dated March 25, 1988. The design basis tornado characteristics defined for this project, as listed in Section 2.3.1.4, are based on the NRC's interim position.

TABLE 1.4-1 (Continued)

[3] Regulatory Guide 1.78 (June 1974) is the licensing basis for GGNS Unit 1 and is listed here as a matter of completeness since this guide is discussed in SSAR Section 2.2.3.1.2 involving analyses performed for Unit 1. Subsequent analyses performed for the proposed facility, once the design is established at COL, will address the latest applicable guidance for control room habitability with regards to postulated hazardous chemical releases.

[4] The NRC withdrew Regulatory Guide 1.95 in January 2002. Toxic gas analyses described in the GGNS UFSAR and in SSAR 2.2.3.1.2 utilized Reg. Guide 1.95 (Rev. 1). As in the case of Regulatory Guide 1.78, Regulatory Guide 1.95 (Rev. 1) is listed here as a matter of completeness. Subsequent analyses performed for the proposed facility, once the design is established at COL, will address the latest applicable guidance for control room habitability with regards to postulated chlorine releases.

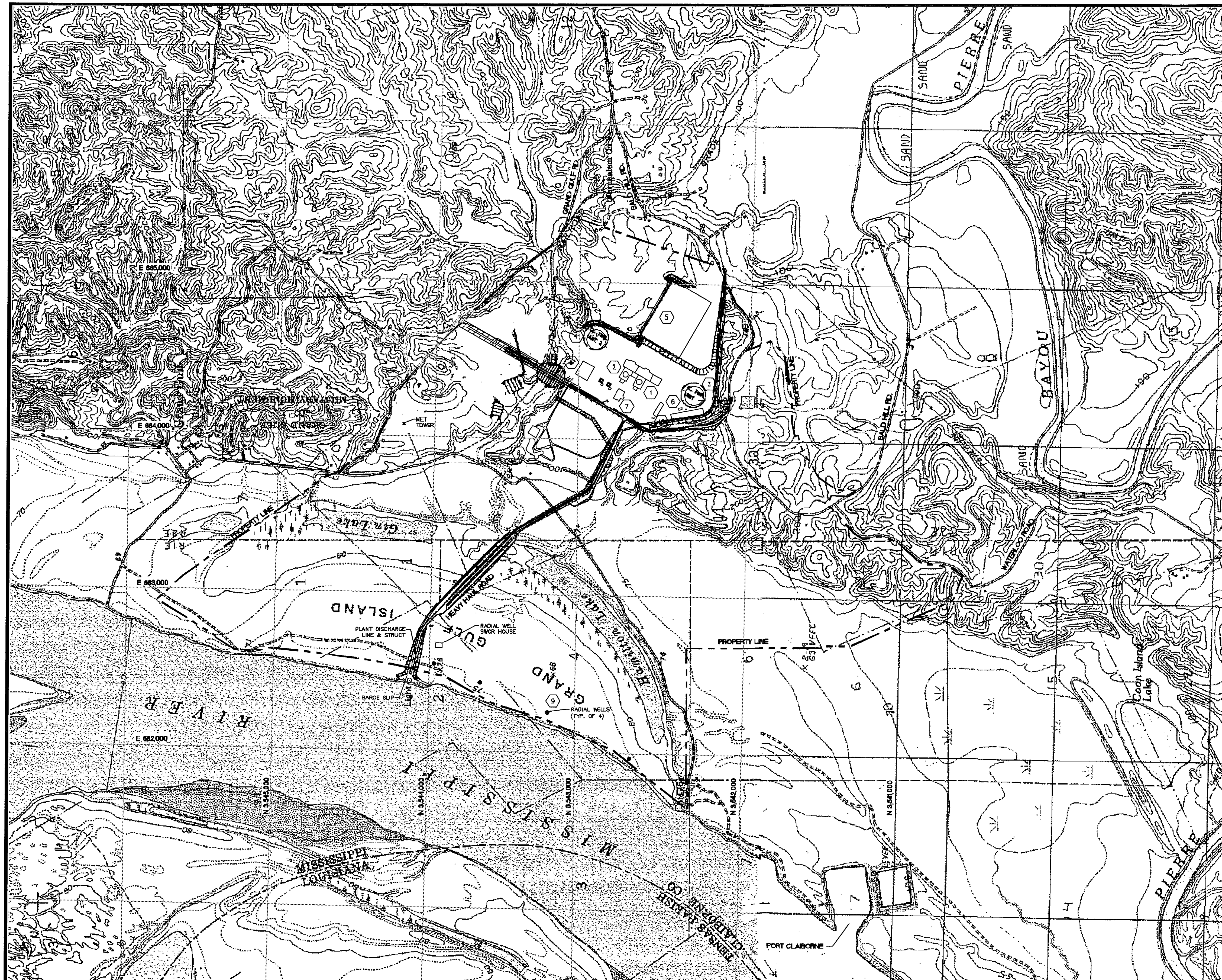
[5] Draft guidance contained in the proposed revision to Regulatory Guide 1.132 (DG-1101, February 2002) was also followed. See Sections 2.5.1 and 2.5.4.

[6] Draft guidance contained in the proposed revision to Regulatory Guide 1.138 (DG-1109, August 2001) was also followed. See Section 2.5.1.

[7] As corrected, per the reissued guide (February 1983) to correct page 1.145-7.

CALLED

TRUE N 30°



GGNS BUILDING LEGEND:

1. UNIT 1
2. UNIT 2 (NOT COMPLETED)
3. UNIT 1 NDCT
4. UNIT 2 NDCT BASIN
5. SWITCHYARD
6. WAREHOUSE
7. ADMINISTRATION BUILDING
8. ESC BUILDING
9. RADIAL WELLS
10. AUXILIARY COOLING TOWER

UTM COORD. GRID SHOWN.

SOURCE:
USGS TOPO MAP GRAND GULF, MS – LA (1963–1973) AND WIDOWS CREEK, MS – LA (1986 PROVISIONAL)

SERI
GRAND GULF NUCLEAR STATION SITE
EARLY SITE PERMIT APPLICATION
SITE SAFETY ANALYSIS REPORT

SITE LAYOUT
EXISTING GGNS FACILITIES

FIGURE 1.2-1 REV. 1