April 5, 2007

Mr. William A. Eaton, Vice President
System Energy Resources, Inc.
Entergy Operations
1340 Echelon Parkway
Jackson, MS 39213

SUBJECT: ISSUANCE OF EARLY SITE PERMIT (ESP) FOR SYSTEM ENERGY RESOURCES, INC. - GRAND GULF ESP SITE (ESP-002)

Dear Mr. Eaton:

The U.S. Nuclear Regulatory Commission (NRC) has issued early site permit (ESP) ESP-002 to System Energy Resources, Inc. pursuant to Section 52.24, "Issuance of Early Site Permit," of Title 10 of the *Code of Federal Regulations* (10 C.F.R. § 52.24) and in view of the report of the Advisory Committee on Reactor Safeguards dated December 23, 2005, the Atomic Safety and Licensing Board's initial decision dated January 26, 2007, and the Commission Decision dated March 27, 2007. This permit expires on April 5, 2027.

Pursuant to 10 C.F.R. Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," an application for a construction permit under 10 C.F.R. Part 50, "Domestic Licensing of Production and Utilization Facilities," or an application for a combined license under 10 C.F.R. Part 52 may reference ESP-002 during the period ESP-002 remains valid. Any references also are subject to the terms and conditions specified in ESP-002. The ESP does not authorize site preparation or preliminary construction activities.

I have enclosed a copy of ESP-002. A related notice will be forwarded to the Office of the Federal Register for publication. If you have questions regarding ESP-002, please contact Mr. George Wunder at 301-415-1494, or gfw@nrc.gov.

Sincerely,

/RA/

David B. Matthews, Director
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-009

Enclosure:
As stated

cc w/encl: See next page

April 5, 2007

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Entergy Operations
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Pursuant to 10 C.F.R. Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," an application for a construction permit under 10 C.F.R. Part 50, "Domestic Licensing of Production and Utilization Facilities," or an application for a combined license under 10 C.F.R. Part 52 may reference ESP-002 during the period ESP-002 remains valid. Any references also are subject to the terms and conditions specified in ESP-002. The ESP does not authorize site preparation or preliminary construction activities.

I have enclosed a copy of ESP-002. A related notice will be forwarded to the Office of the Federal Register for publication. If you have questions regarding ESP-002, please contact Mr. George Wunder at 301-415-1494, or gfw@nrc.gov.

Sincerely,

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Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-009

Enclosure:
As stated

cc w/encl: See next page

ADAMS Accession No. ML070780457 ** By telephone***By email

OFFICE	NRO:DNRL/LA	NRO:DNLR:PM	NRO:DSER:PM	NRO:DSER:BC
NAME	SGreen	GWunder	AKugler	BClayton**
DATE	03 /20 /2007	03 /20 /2007	Non-concur	03 /28 /2007
OFFICE	NRO:DNRL:BC	NRO:DSER:D	NRO:DNLR:D	
NAME	MShuaibi	JLyons***	DMatthews	
DATE	03 /28 /2007	03 /29 /2007	03 /29 /2007	

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SYSTEM ENERGY RESOURCES, INC.

GRAND GULF ESP SITE

DOCKET NO. 52-009

EARLY SITE PERMIT

Early Site Permit No. ESP-002

1. The U.S. Nuclear Regulatory Commission (the NRC or the Commission) has found the following:

   A. The application for an early site permit (ESP) filed by System Energy Resources, Inc. (SERI, or the permit holder) complies with the applicable requirements of the Atomic Energy Act of 1954, as amended, and the applicable rules and regulations of the Commission, and all required notifications to other agencies or bodies have been duly made;

   B. Based on consideration of the site criteria contained in Title 10, Part 100, "Reactor Site Criteria," of the *Code of Federal Regulations* (10 C.F.R. Part 100), a reactor, or reactors, having design characteristics that fall within the site characteristics and controlling parameters of the Grand Gulf ESP Site can be constructed and operated without undue risk to the health and safety of the public;

   C. There is reasonable assurance that the permit holder will comply with the regulations in 10 C.F.R. Chapter I, and the health and safety of the public will not be endangered;

   D. Issuance of an ESP to the permit holder will not be inimical to the common defense and security or the health and safety of the public;

   E. There is no significant impediment to the development of emergency plans, as referenced in 10 C.F.R. § 52.17(b)(1) and 10 C.F.R. § 52.18, "Standards for Review of Applications." The descriptions of contacts and arrangements made with Federal, State, and local governmental agencies with emergency planning responsibilities, as set forth in 10 C.F.R. § 52.17(b)(3), are acceptable. Major features A, B, C, D, E, F, G, I, J, K, L, O, and P of the emergency plan described in the application are acceptable to the extent specified in NUREG-1840, "Safety Evaluation Report for an Early Site Permit (ESP) at the Grand Gulf Site";

   F. The issuance of this ESP, subject to the conditions for the protection of the environment set forth herein, is in accordance with the National Environmental Policy Act of 1969, as amended, and with applicable sections of 10 C.F.R. Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," as referenced by Subpart A of 10 C.F.R. Part 52,

"Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," and all applicable requirements therein have been satisfied.

2. Based on the foregoing findings, and pursuant to Sections 103 and 185 of the Atomic Energy Act of 1954, as amended, and 10 C.F.R. Part 52, and the Initial Decision of the Atomic Safety and Licensing Board, dated January 26, 2007 (LBP-07-01), and the Commission Memorandum and Order dated March 27, 2007 (CLI-07-14), the NRC hereby issues Early Site Permit No. ESP-002 to System Energy Resources, Inc. for a site located near Port Gibson, Mississippi, approximately 25 miles south of Vicksburg, Mississippi, and adjacent to an existing nuclear power reactor, for additional nuclear power plants, which may be modular, designed to operate at no more than 8600 megawatts thermal, collectively, as described in the application and amendments thereto (the application) filed in this matter by the permit holder, and as described in the evidence received at the public hearing on that application.

3. This ESP shall be deemed to contain and is subject to the conditions specified in the Commission's regulations in 10 C.F.R. Chapter I; is subject to all applicable provisions of the Atomic Energy Act of 1954, as amended, and rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the following conditions specified or incorporated below:

   A. The characteristics of the Grand Gulf ESP Site set forth in Appendix A to this ESP are hereby incorporated into this ESP.

   B. The controlling values of parameters set forth in Appendix B to this ESP are hereby incorporated into this ESP.

   C. The combined license (COL) action items set forth in Appendix C to this ESP are hereby incorporated into this ESP. These COL action items identify certain matters that an applicant who submits an application referencing this ESP shall address in the final safety analysis report (FSAR). These items constitute information requirements but are not the only acceptable set of information in the FSAR. An applicant may depart from or omit these items, provided that it identifies and justifies the departure or omission in the FSAR. In addition, these items do not relieve an applicant from any requirement in 10 C.F.R. Chapter I that governs the application. After issuance of a construction permit (CP) or COL, these items are not requirements for the permit holder or licensee unless such items are included in a permit or license condition.

   D. The values of plant parameters considered in the environmental review of the application and set forth in Appendix D to this ESP are hereby incorporated into this ESP.

E. The following safety conditions apply:

(1) An applicant for a CP or COL referencing this ESP shall demonstrate that they have been granted the right to exercise sufficient control within the exclusion area identified in the ESP including authority to maintain ingress to and egress from the exclusion area and to evacuate individuals from the exclusion area in the event of an emergency. Such an applicant shall also secure any necessary arrangements to provide, in the event of a declared emergency, for the control of traffic on county roads and the evacuation of individuals within the ESP exclusion area. These arrangements shall be obtained and executed before the construction of a nuclear plant begins under a CP or COL referencing the ESP.

(2) An applicant for a CP or COL referencing this ESP shall ensure that any new unit's radioactive waste management systems, structures, and components, as defined in Regulatory Guide 1.143, for a future reactor include features to preclude accidental releases of radionuclides into potential liquid pathways.

(3) An applicant for a CP or COL referencing this ESP shall perform geologic mapping of future excavations for safety-related structures and shall evaluate any unforseen geologic features that are encountered. Such an applicant shall notify the NRC no later than 30 days before any excavations for safety-related structures are open in order to allow for NRC's examination and evaluation.

F. An applicant for a CP or COL referencing this ESP shall develop an Environmental Protection Plan (EPP) for construction and operation of the proposed reactor and include the EPP in the application. The portion of the EPP directed to operation shall include any environmental conditions derived in accordance with 10 C.F.R. § 50.36b.

4. In accordance with 10 C.F.R. § 52.37, "Reporting of Defects and Noncompliance; Revocation, Suspension, Modification of Permits for Cause," the holder of this ESP is subject to the requirements of 10 C.F.R. Part 21, "Reporting of Defects and Noncompliance," as of the date of issuance of this ESP.

5. This ESP is effective as of its date of issuance and shall expire at midnight on April 5, 2027.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

R. W. Borchardt, Director
Office of New Reactors

Attachments:
Appendix A: Characteristics of the Grand Gulf ESP Site

Appendix B: Controlling Values of Parameters and Design Basis Accident Source Term Plant Parameters

Appendix C: Combined License (COL) Action Items

Appendix D: Values of Plant Parameters Considered in the Environmental Review of the Application

5. This ESP is effective as of its date of issuance and shall expire at midnight on April 5, 2027.

FOR THE NUCLEAR REGULATORY COMMISSION

R. W. Borchardt, Director
Office of New Reactors

Attachments:
Appendix A: Characteristics of the Grand Gulf ESP Site

Appendix B: Controlling Values of Parameters and Design Basis Accident Source Term Plant Parameters

Appendix C: Combined License (COL) Action Items

Appendix D: Values of Plant Parameters Considered in the Environmental Review of the Application

ADAMS Accession No. ML070780457 **By eMail *** By telephone

OFFICE	NRO:DNRL:LA	NRO:DNRL: PM	NRO:DSER: PM	NRO:DSER:BC
NAME	SGreen	GWunder	AKugler	BClayton***
DATE	03/20/07	03/20 /2007	Non-concur	03 /28 /2007
OFFICE	NRO:DNLR:BC	Technical Editor	NRO:DSER:D	NRO:DNLR:D
NAME	MShuaibi	HChang**	JLyons**	DMatthews*
DATE	03 /29 /2007	03 /23 /2007	03 /29 /2007	03 /29 /2007
OFFICE	NSIR:OD WDean for	OGC	NRO:OD	
NAME	RZimmerman	KWinsberg NLO	RBorchardt	
DATE	03 /30 /2007	04 /03 /2007	04/05/2007	

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Appendix A: Characteristics of the Grand Gulf ESP Site

Site Characteristic	Value	Definition
2.1 - Introduction		
Exclusion Area Boundary	The perimeter of a 2760 ft radius circle from the circumference of a 630 ft circle encompassing the proposed power block housing the reactor containment structure for new unit	The area surrounding the reactor, in which the reactor licensee has the authority to determine all activities including exclusion or removal of personnel and property from the area
Low Population Zone	2 mile radius circle from the circumference of a 630 ft circle encompassing the proposed power block housing the reactor containment structure for new unit	The area immediately surrounding the exclusion area which contains residents
Population Center Distance	2.7 miles	The minimum allowable distance from the reactor to the nearest boundary of a densely populated center containing more than about 25,000 residents
2.2 - Nearby Industrial, Transportation, and Military Facilities		
Minimum separation distance from GGNS onsite storage of liquid hydrogen.	737 ft	Minimum distance between GGNS onsite storage of 20,000 gallons of liquid hydrogen and safety related systems of a new plant at the proposed ESP site.

Site Characteristic		Value	Definition
2.3 - Meteorology			
Ambient Air Temperature and Humidity			
Maximum Dry-Bulb Temperature	2% annual exceedance	92 °F	The ambient dry-bulb temperature that will be exceeded 2% of the time annually
	0.4% annual exceedance	95 °F	The ambient dry-bulb temperature that will be exceeded 0.4% of the time annually
	average annual highest	98 °F	The average of the maximum temperatures recorded each year
	100-year return period	108 °F	The ambient dry-bulb temperature that has a 1% annual probability of being exceeded (100-year mean recurrence interval)
Minimum Dry-Bulb Temperature	99% annual exceedance	25 °F	The ambient dry-bulb temperature below which dry-bulb temperatures will fall 1% of the time annually
	99.6% annual exceedance	21 °F	The ambient dry-bulb temperature below which dry-bulb temperature will fall 0.4% of the time annually
	average annual lowest	14 °F	The average of the minimum temperatures recorded each year
	100-year return period	-6 °F	The ambient dry-bulb temperature for which a 1% annual probability of a lower dry-bulb temperature exists (100-year mean recurrence interval)

Site Characteristic		Value	Definition
Maximum Wet-Bulb Temperature	2% annual exceedance	78 °F	The ambient wet-bulb temperature that will be exceeded 2% of the time annually
	0.4% annual exceedance	80 °F	The ambient wet-bulb temperature that will be exceeded 0.4% of the time annually
Basic Wind Speed			
Fastest-mile		83 mi/h	The fastest-mile wind speed to be used in determining wind loads, defined as the fastest-mile wind speed at 33 feet above the ground that has a 1% annual probability of being exceeded (100-year mean recurrence interval)
3-Second Gust		96 mi/h	The 3-second gust wind speed to be used in determining wind loads, defined as the 3-second gust wind speed at 33 feet above the ground that has a 1% annual probability of being exceeded (100-year mean recurrence interval)
Tornado			
Maximum Wind Speed		300 mi/h	Maximum wind speed resulting from passage of a tornado having a probability of occurrence of 10^{-7} per year
Translational Speed		60 mi/h	Translation component of the maximum tornado wind speed
Maximum Rotational Speed		240 mi/h	Rotation component of the maximum tornado wind speed
Radius of Maximum Rotational Speed		150 feet	Distance from the center of the tornado at which the maximum rotational wind speed occurs

Site Characteristic	Value	Definition
Pressure Drop	2.0 lbf/in.^{2}	Decrease in ambient pressure from normal atmospheric pressure resulting from passage of the tornado
Rate of Pressure Drop	1.2 lbf/in.^{2}/s	Rate of pressure drop resulting from the passage of the tornado
Winter Precipitation		
100-Year Snowpack	6.1 lbf/ft^2	Weight of the 100-year return period snowpack (to be used in determining normal precipitation loads for roofs)
48-Hour Probable Maximum Winter Precipitation	35 inches of water	Probable maximum precipitation during the winter months (to be used in conjunction with the 100-year snowpack in determining extreme winter precipitation loads for roofs)
Ultimate Heat Sink		
Meteorological Conditions Resulting in the Minimum Water Cooling during Any 1 Day	81.0 °F wet-bulb temperature with coincident 86.3 °F dry-bulb temperature	Historic worst 1-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures
Meteorological Conditions Resulting in the Minimum Water Cooling during Any Consecutive 5 Days	80.2 °F wet-bulb temperature with coincident 86.2 °F dry-bulb temperature	Historic worst 5-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures
Meteorological Conditions Resulting in the Maximum Evaporation and Drift Loss during Any Consecutive 30 Days	78.5 °F wet-bulb temperature with coincident 83.1 °F dry-bulb temperature	Historic worst 30-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures
Meteorological Conditions Resulting in Maximum Water Freezing in the ultimate heat sink (UHS) Water Storage Facility	98 °F degree days below freezing	Historic maximum cumulative degree days below freezing

Site Characteristic	Value	Definition
Short-Term (Accident Release) Atmospheric Dispersion		
0–2-H χ/Q Value @ EAB	5.95×10^{-4} s/m^3	The 0–2-hour atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the EAB
0–8-H χ/Q Value @ LPZ	8.83×10^{-5} s/m^3	The 0–8-hour atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ
8–24-H χ/Q Value @ LPZ	6.16×10^{-5} s/m^3	The 8–24-hour atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ
1–4-Day χ/Q Value @ LPZ	2.82×10^{-5} s/m^3	The 1–4-day-atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ
4–30-Day χ/Q Value @ LPZ	9.15×10^{-6} s/m^3	The 4–30-day atmospheric dispersion factor to be used to estimate dose consequences of accidental airborne releases at the LPZ
Long-Term (Routine Release) Atmospheric Dispersion		
Annual Average Undepleted/No Decay χ/Q Value @ Site Boundary	8.8×10^{-6} s/m^3	The maximum annual average site boundary undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Depleted/No Decay χ/Q Value @ Site Boundary	7.8×10^{-6} s/m^3	The maximum annual average site boundary depleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average D/Q Value @ Site Boundary	1.2×10^{-8} 1/m^2	The maximum annual average site boundary D/Q value for use in determining gaseous pathway doses to the maximally exposed individual

Site Characteristic	Value	Definition
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Home	2.2×10^{-6} s/m^3	The maximum annual average home undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Depleted/No Decay χ/Q Value @ Nearest Home	1.9×10^{-6} s/m^3	The maximum annual average home depleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average D/Q Value @ Nearest Home	7.0×10^{-9} 1/m^2	The maximum annual average home D/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Garden	2.0×10^{-6} s/m^3	The maximum annual average garden undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Depleted/No Decay χ/Q Value @ Nearest Garden	1.7×10^{-6} s/m^3	The maximum annual average garden depleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average D/Q Value @ Nearest Garden	5.4×10^{-9} 1/m^2	The maximum annual average garden D/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Milk Cow	7.0×10^{-8} s/m^3	The maximum annual average milk cow undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual

Site Characteristic	Value	Definition
Annual Average Depleted/No Decay χ/Q Value @ Nearest Milk Cow	4.7×10^{-8} s/m^3	The maximum annual average milk cow depleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average D/Q Value @ Nearest Milk Cow	8.7×10^{-11} 1/m^2	The maximum annual average milk cow D/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Meat Cow	1.4×10^{-7} s/m^3	The maximum annual average meat cow undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average Depleted/No Decay χ/Q Value @ Nearest Meat Cow	1.1×10^{-7} s/m^3	The maximum annual average meat cow depleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual
Annual Average D/Q Value @ Nearest Meat Cow	4.0×10^{-10} 1/m^2	The maximum annual average meat cow D/Q value for use in determining gaseous pathway doses to the maximally exposed individual

Site Characteristic	Value	Definition
2.4 - Hydrology		
Hydrology		
Proposed Facility Boundaries	UFSAR Figure 2.4-1 shows the areal extent of proposed facility boundaries. This figure is reproduced below as Figure 1, bounding coordinates of the ESP site are a site characteristic. During construction, the ESP site could be disturbed up to a depth ranging from 35 to 140 feet plus some additional excavation.	ESP site boundary map
Site Grade	132.5 feet above MSL	Finished plant grade of the ESP site
Highest Ground Water Elevation	70 feet below grade; 62.5 feet above MSL; perched water may be present between the site grade at 132.5 feet above MSL and the water table at 62.5 feet above MSL.	The maximum elevation of ground water at the ESP site
Flood Elevation	Flood water elevation at the ESP site caused by local intense precipitation will be established by the COL applicant using local intense precipitation values established in Section 2.4.2.3 of the SER. Local intense precipitation itself is a site characteristic, listed below.	Maximum flood level at the ESP site resulting from local intense precipitation
Local Intense Precipitation	19.2 in./h, of which 6.2 in. falls during the first 5 minutes.	Maximum potential rainfall at the immediate ESP site
Frazil and Anchor Ice	The ESP site does not have the potential for the formation of frazil and anchor ice.	Accumulated ice formation in a turbulent flow condition
Maximum Cumulative Degree Days Below Freezing	98 °F	A measure of severity of winter weather conditions conducive to ice formation (computed using observed air temperature data)

Site Characteristic	Value	Definition
Distance to the Closest Surface Water	Stream B is the closest surface water feature; 1017 ft.	Distance to closest surface water body from center of ESP powerblock
Location of Aquifers Used by Large Population for Domestic, Municipal, Industrial, or Irrigation Water Supplies	2760 ft.	Distance of nearest public water supply well located just outside the exclusion area boundary from center of ESP powerblock
2.5 - Geology, Seismology, and Geotechnical Engineering		
Basic Geologic and Seismic Information		
Capable Tectonic Structures	No fault displacement potential within the Site Area	
Vibratory Ground Motion		
Design Response Spectra	Appendix A. Figure 2 (SSER Figure 2.5-68)	Site Specific response spectra
Stability of Subsurface Materials and Foundations		
Minimum shear wave velocity of soil at the proposed plant foundation Level	1000 feet per second (fsp)	Current reactor designs require the minimum shear wave velocity at the foundation level be at least 1000 fsp.

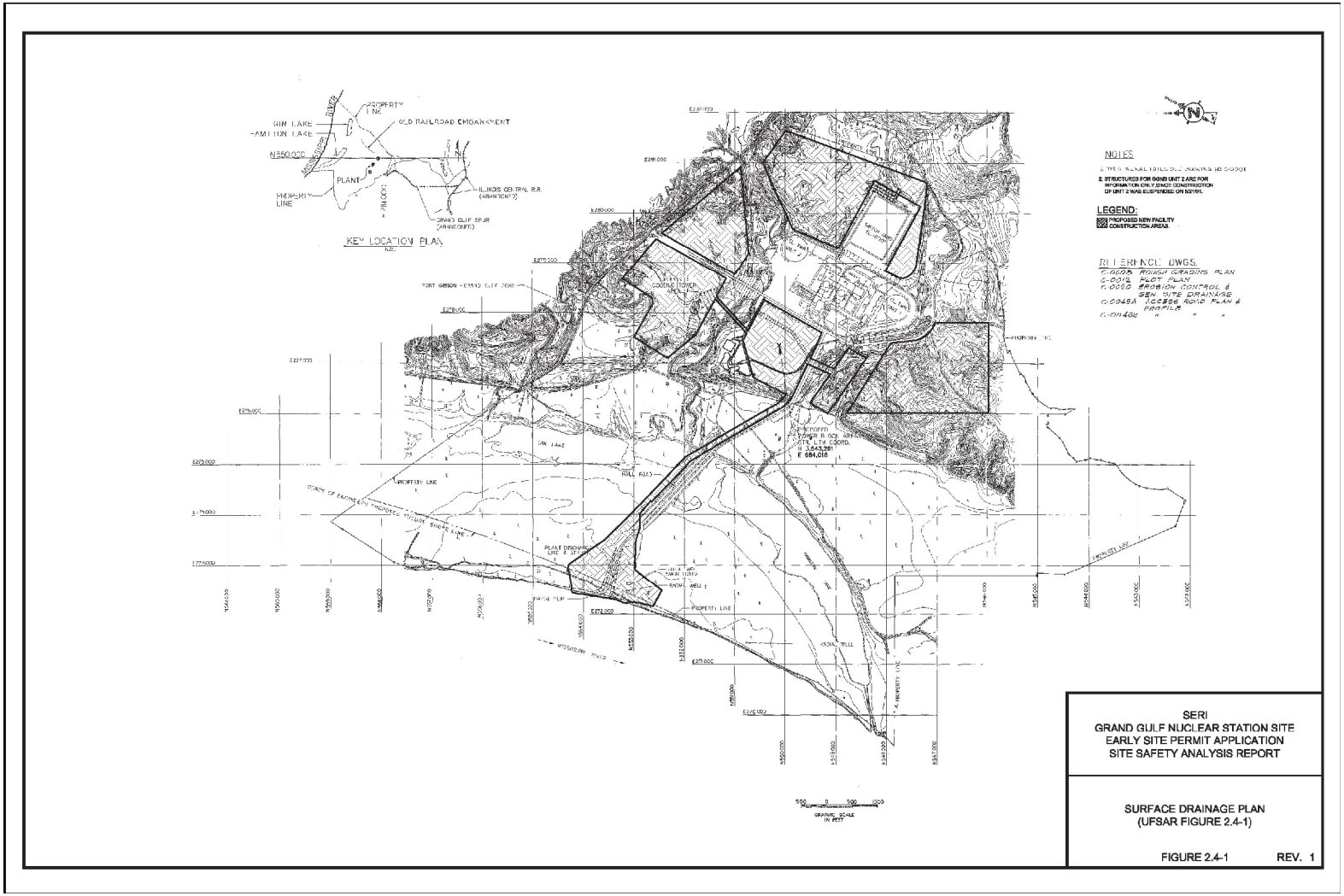
KEY LOCATION PLAN
NOTES
LEGEND:
PROPOSED NEW FACILITY CONSTRUCTION AREAS
REFERENCE DWGS.
SERI
GRAND GULF NUCLEAR STATION SITE
EARLY SITE PERMIT APPLICATION
SITE SAFETY ANALYSIS REPORT
SURFACE DRAINAGE PLAN
(UFSAR FIGURE 2.4-1)
FIGURE 2.4-1
REV. 1

Figure 1

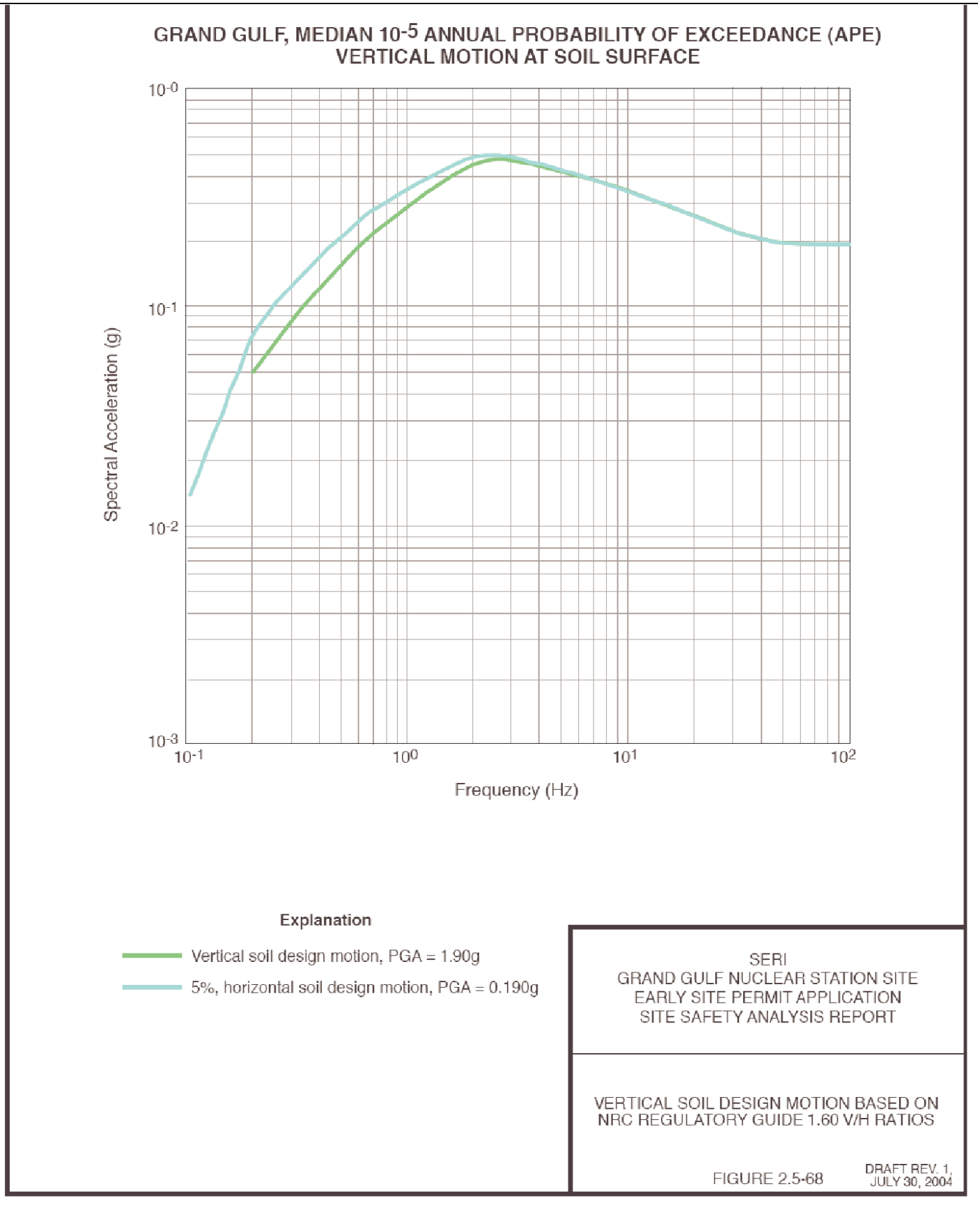

Figure 2

Note: Although labeled as “Draft” this figure contains the same information as that submitted in the application.

Appendix B:Controlling Values of Parameters and Design Basis Accident Source Term Plant Parameters

Controlling Values of Parameters

Parameter	Value	Definition
2.4 - Hydrology		
Makeup water flow	78,000 gpm	Maximum flow required to replenish evaporation and blowdown losses from normal heat sink cooling towers
Potable Water/Sanitary Waste System (max)	240 gpm	Maximum flow of water for plant housekeeping
Demineralized Water System (max)	1440 gpm	Maximum water flow for demineralization of blowdown discharge
Fire Protection System (max)	1890 gpm	Maximum water flow for fire fighting system

Design Basis Accident Source Term Plant Parameters

Main Steam Line Break Outside Containment (BWR and PWR)

Isotopic time-dependent fission product release rates to the environment
Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-4
Advanced Boiling Water Reactor Main Steam Line Break Outside Containment

Isotope	Maximum Equilibrium For Full Power Operation Value Megabecquerel Released 0-2 Hours	Pre-existing Iodine Spike Megabecquerel Released 0-2 Hours
I-131	7.29E+04	1.46E+06
I-132	7.10E+05	1.42E+07
I-133	5.00E+05	9.99E+06
I-134	1.40E+06	2.79E+07
I-135	7.29E+05	1.46E+07
Total Halogens	3.41E+06	6.81E+07
Kr-83m	4.07E+02	2.44E+03
Kr-85m	7.18E+02	4.29E+03
Kr-85	2.26E+00	1.36E+01
Kr-87	2.44E+03	1.47E+04
Kr-88	2.46E+03	1.48E+04
Kr-89	9.88E+03	5.92E+04
Kr-90	2.55E+03	1.55E+04
Xe-131m	1.76E+00	1.06E+01
Xe-133m	3.39E+01	2.04E+02
Xe-133	9.47E+02	5.70E+03
Xe-135m	2.89E+03	1.74E+04
Xe-135	2.70E+03	1.62E+04
Xe-137	1.23E+04	7.40E+04
Xe-138	9.44E+03	5.66E+04
Xe-139	4.33E+03	2.59E+04
Total Noble Gases	5.11E+04	3.07E+05

Fuel Handling Accident (BWR and PWR)

Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-19
AP-1000 Fuel Handling Accident - Curies Released to Environment

Isotope	Release 0-2 Hours
I-130	3.52E-02
I-131	2.90E+02
I-132	1.54E+02
I-133	1.91E+01
I-134	0.00E+00
I-135	1.36E-02
Kr-83m	0.00E+00
Kr-85m	2.68E-03
Kr-85	1.10E+03
Kr-87	0.00E+00
Kr-88	0.00E+00
Kr-89	0.00E+00
Xe-131m	5.36E+02
Xe-133m	1.29E+03
Xe-133	6.94E+04
Xe-135m	4.37E-01
Xe-135	1.32E+02
Xe-137	0.00E+00
Xe-138	0.00E+00

Locked Rotor Accident

Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-23
AP-1000 Locked Rotor Accident - Curies Released to Environment

Isotope	Release 0-1.5 Hours
I-130	4.15E+00
I-131	1.83E+02
I-132	1.33E+02
I-133	2.31E+02
I-134	1.44E+02
I-135	2.04E+02
Kr-85m	4.09E+02
Kr-85	3.77E+01
Kr-87	6.05E+02
Kr-88	1.05E+03
Xe-131m	1.87E+01
Xe-133m	1.02E+02
Xe-133	3.33E+03
Xe-135m	1.63E+02
Xe-135	8.01E+02
Xe-138	6.48E+02
Rb-86	6.69E-02
Cs-134	5.83E+00
Cs-136	1.85E+00
Cs-137	3.42E+00
Cs-138	3.05E+01

Control Rod Ejection Accident

AP1000 Control Rod Ejection Accident
Curies Released to Environment by Interval - Pre-Existing Iodine Spike
Ref: System Energy Resources, Inc. Site Safety Analysis Report Rev. 3, Table 3.3-24

Isotope	0 to 2 Hours	2 to 8 Hours	8 to 24 Hours	24 to 96 Hours	96 to 720 Hours
I-130	5.93E+00	7.28E+00	4.32E+00	4.06E-01	5.88E-04
I-131	1.64E+02	2.45E+02	2.31E+02	6.20E+01	3.33E+01
I-132	1.90E+02	9.94E+01	9.85E+00	1.65E-02	0
I-133	3.29E+02	4.40E+02	3.18E+02	4.56E+01	4.81E-01
I-134	2.18E+02	2.85E+01	1.37E-01	8.96E-08	0
I-135	2.91E+02	2.97E+02	1.19E+02	4.79E+00	1.46E-04
Kr-85m	2.85E+02	6.48E+01	3.87E+01	3.53E+00	5.01E-05
Kr-85	1.24E+01	5.60E+00	1.49E+01	6.70E+01	5.71E+02
Kr-87	4.86E+02	2.60E+01	1.03E+00	1.67E-04	0
Kr-88	7.49E+02	1.18E+02	3.49E+01	7.18E-01	1.68E-08
Xe-131m	1.22E+01	5.46E+00	1.42E+01	5.72E+01	2.31E+02
Xe-133m	6.62E+01	2.81E+01	6.49E+01	1.69E+02	1.06E+02
Xe-133	2.18E+03	9.58E+02	2.40E+03	8.53E+03	1.68E+04
Xe-135m	2.18E+02	5.30E-02	4.33E-09	0	0
Xe-135	5.39E+02	1.72E+02	2.09E+02	8.69E+01	3.58E-01
Xe-138	8.89E+02	1.38E-01	3.19E-09	0	0
Rb-86	3.70E-01	7.27E-01	6.96E-01	1.73E-01	6.79E-02
Cs-134	3.15E+01	6.22E+01	6.03E+01	1.55E+01	1.03E+01
Cs-136	8.98E+00	1.75E+01	1.67E+01	4.10E+00	1.31E+00
Cs-137	1.83E+01	3.62E+01	3.51E+01	9.04E+00	6.05E+00
Cs-138	1.13E+02	7.05E+00	1.68E-03	0	0

Steam Generator Tube Rupture Accident

Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-25
AP-1000 Steam Generator Tube Rupture Accident - Curies Released to Environment
Accident Initiated Iodine Spike

Isotope	0 to 2 Hours	2 to 8 Hours	8 to 24 Hours
I-130	7.30E-02	1.19E-02	3.13E-02
I-131	4.90E+00	1.15E+00	3.55E+00
I-132	5.79E+00	1.75E-01	2.30E-01
I-133	8.79E+00	1.68E+00	4.73E+00
I-134	1.12E+00	1.18E-03	5.21E-04
I-135	5.15E+00	6.01E-01	1.36E+00
Kr-85m	5.67E+01	1.91E+01	2.50E-02
Kr-85	2.25E+02	1.07E+02	4.44E-01
Kr-87	2.46E+01	3.56E+00	3.02E-04
Kr-88	9.44E+01	2.61E+01	1.80E-02
Xe-131 m	1.02E+02	4.82E+01	1.96E-01
Xe-133m	1.26E+02	5.83E+01	2.19E-01
Xe-133	9.37E+03	4.41E+03	1.75E+01
Xe-135m	3.61E+00	5.78E-03	0.00E+00
Xe-135	2.51E+02	1.00E+02	2.35E-01
Xe-138	4.78E+00	4.99E-03	0.00E+00
Rb-86	*	*	*
Cs-134	1.65E+00	6.35E-02	2.27E-01
Cs-136	2.45E+00	9.30E-02	3.30E-01
Cs-137	1.19E+00	4.58E-02	1.64E-01
Cs-138	5.71E-01	3.07E-06	6.00E-07

Note: * = Rb-86 contribution considered negligible for this accident.

Steam Generator Tube Rupture

Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-26
AP-1000 Steam Generator Tube Rupture Accident - Curies Released to Environment
Pre-Existing Iodine Spike

Isotope	0 to 2 Hours	2 to 8 Hours	8 to 24 Hours
I-130	1.81E+00	6.12E-02	2.90E-01
I-131	1.22E+02	5.97E+00	3.32E+01
I-132	1.43E+02	8.53E-01	2.08E+00
I-133	2.19E+02	8.68E+00	4.41E+01
I-134	2.78E+01	5.16E-03	4.57E-03
I-135	1.28E+02	3.06E+00	1.26E+01
Kr-85m	5.67E+01	1.91E+01	2.50E-02
Kr-85	2.25E+02	1.07E+02	4.44E-01
Kr-87	2.46E+01	3.56E+00	3.02E-04
Kr-88	9.44E+01	2.61E+01	1.80E-02
Xe-131m	1.02E+02	4.82E+01	1.96E-01
Xe-133m	1.26E+02	5.83E+01	2.19E-01
Xe-133	9.37E+03	4.41E+03	1.75E+01
Xe-135m	3.61E+00	5.78E-03	0.00E+00
Xe-135	2.51E+02	1.00E+02	2.35E-01
Xe-138	4.78E+00	4.99E-03	0.00E+00
Rb-86	*	*	*
Cs-134	1.65E+00	6.35E-02	2.27E-01
Cs-136	2.45E+00	9.30E-02	3.30E-01
Cs-137	1.19E+00	4.58E-02	1.64E-01
Cs-138	5.71E-01	3.07E-06	6.00E-07

Note: * = Rb-86 contribution considered negligible for this accident.

Small Line Break Accident

Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-27
AP-1000 Small Line Break Accident - Curies Released to Environment
Accident Initiated Iodine Spike

Isotope	0 to 0.5 Hours
I-130	1.90E+00
I-131	9.26E+01
I-132	3.49E+02
I-133	2.01E+02
I-134	1.58E+02
I-135	1.68E+02
Kr-85m	1.24E+01
Kr-85	4.40E+01
Kr-87	7.00E+00
Kr-88	2.21E+01
Xe-131m	1.99E+01
Xe-133m	2.50E+01
Xe-133	1.84E+02
Xe-135m	2.60E+00
Xe-135	5.20E+01
Xe-138	3.60E+00
Cs-134	4.20E+00
Cs-136	6.20E+00
Cs-137	3.00E+00
Cs-138	2.20E+00

Loss-of-Coolant Accident[1]

Ref: System Energy Resources, Inc. Site Safety Analysis Report, Rev. 3, Table 3.3-28
AP-1000 Design Basis Loss of Coolant Accident - Curies Released to Environment
By Time Interval

Isotope	0 to 1 Hours	2 to 3 Hours	0 to 8 Hours	8 to 24 Hours	24 to 96 Hours	96 to 720 Hours
Halogen Group						
I-130	5.62E+00	4.92E+01	7.80E+01	2.96E+00	1.11 E+00	1.99E-02
I-131	1.54E+02	1.44E+03	2.36E+03	1.56E+02	3.74E+02	1.12E+03
I-132	1.79E+02	1.18E+03	1.67E+03	7.64E+00	2.29E-02	0.00E+00
I-133	3.11E+02	2.80E+03	4.51E+03	2.16E+02	1.63E+02	1.62E+01
I-134	1.96E+02	7.51E+02	1.02E+03	1.26E-01	1.07E-07	0.00E+00
I-135	2.75E+02	2.27E+03	3.50E+03	8.31E+01	9.55E+00	4.95E-03
Noble Gas Group						
Kr-85m	6.74E+01	1.31 E+03	3.77E+03	1.87E+03	1.71E+02	2.43E-03
Kr-85	3.08E+00	7.32E+01	2.96E+02	7.05E+02	3.17E+03	2.70E+04
Kr-87	9.54E+01	1.14E+03	1.94E+03	4.97E+01	8.11E-03	0.00E+00
Kr-88	1.70E+02	2.95E+03	7.26E+03	1.70E+03	3.49E+01	8.16E-07
Xe-131m	3.07E+00	7.28E+01	2.94E+02	6.79E+02	2.74E+03	1.11E+04
Xe-133m	1.68E+01	3.92E+02	1.54E+03	3.15E+03	8.21E+03	5.15E+03
Xe-133	5.49E+02	1.30E+04	5.19E+04	1.16E+05	4.11E+05	8.10E+05
Xe-135m	1.44E+01	2.14E+01	3.59E+01	2.14E-07	0.00E+00	0.00E+00
Xe-135	1.32E+02	2.85E+03	9.64E+03	1.01 E+04	4.21E+03	1.73E+01
Xe-138	5.31E+01	6.69E+01	1.20E+02	1.58E-07	0.00E+00	0.00E+00
Alkali Metal Group						
Rb-86	3.32E-01	2.61E+00	4.26E+00	9.37E-02	2.03E-03	1.05E-02
Cs-134	2.81E+01	2.22E+02	3.63E+02	8.06E+00	1.88E-01	1.59E+00
Cs-136	8.01E+00	6.30E+01	1.03E+02	2.25E+00	4.72E-02	2.03E-01
Cs-137	1.64E+01	1.29E+02	2.11E+02	4.70E+00	1.10E-01	9.39E-01
Cs-138	1.06E+02	2.06E+02	3.19E+02	6.92E-04	0.00E+00	0.00E+00

[1] Not applicable to the General Electric Advanced Boiling Water Reactor Design certified in Appendix A to10 CFR Part 52 with the reactor design basis accident source term specified in United States Atomic Energy Commission Technical Information Document, TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites (1962)."

Loss-of-Coolant Accident (Continued)

Isotope	0 to 1 Hours	2 to 3 Hours	0 to 8 Hours	8 to 24 Hours	24 to 96 Hours	96 to 720 Hours
Tellurium Group						
Sr-89	3.23E+00	7.56E+01	1.19E+02	2.87E+00	6.54E-02	4.60E-01
Sr-90	2.78E-01	6.52E+00	1.03E+01	2.48E-01	5.82E-03	4.97E-02
Sr-91	3.77E+00	8.14E+01	1.22E+02	1.74E+00	2.76E-03	1.44E-05
Sr-92	3.45E+00	6.13E+01	8.30E+01	3.26E-01	1.06E-05	0.00E+00
Sb-127	8.55E-01	1.98E+01	3.11E+01	7.13E-01	1.16E-02	1.60E-02
Sb-129	2.25E+00	4.43E+01	6.28E+01	4.83E-01	1.01E-04	1.00E-09
Te-127m	1.10E-01	2.58E+00	4.06E+00	9.83E-02	2.27E-03	1.77E-02
Te-127	7.99E-01	1.72E+01	2.57E+01	3.65E-01	5.63E-04	2.72E-06
Te-129m	3.76E-01	8.80E+00	1.38E+01	3.33E-01	7.47E-03	4.79E-02
Te-129	1.50E+00	1.89E+01	2.32E+01	8.54E-03	7.27E-10	0.00E+00
Te-131m	1.15E+00	2.62E+01	4.05E+01	8.29E-01	6.86E-03	1.60E-03
Te-132	1.14E+01	2.65E+02	4.15E+02	9.42E+00	1.44E-01	1.60E-01
Ba-139	3.83E+00	5.30E+01	6.63E+01	4.73E-02	2.03E-08	0.00E+00
Ba-140	5.71E+00	1.33E+02	2.10E+02	5.00E+00	1.05E-01	4.41E-01
Noble Metals Group						
Mo-99	7.63E-01	1.77E+01	2.76E+01	6.19E-01	8.79E-03	7.72E-03
Tc-99m	6.09E-01	1.26E+01	1.83E+01	1.94E-01	1.08E-04	2.73E-08
Ru-103	6.07E-01	1.42E+01	2.23E+01	5.38E-01	1.21E-02	8.11E-02
Ru-105	3.59E-01	7.08E+00	1.01E+01	7.97E-02	1.82E-05	2.40E-10
Ru-106	2.00E-01	4.67E+00	7.36E+00	1.78E-01	4.16E-03	3.46E-02
Rh-105	3.70E-01	8.48E+00	1.32E+01	2.76E-01	2.64E-03	8.48E-04

Loss-of-Coolant Accident (Continued)

Isotope	0 to 1 Hours	2 to 3 Hours	0 to 8 Hours	8 to 24 Hours	24 to 96 Hours	96 to 720 Hours
Lanthanide Group						
Y-90	2.90E-03	6.65E-02	1.04E-01	2.32E-03	3.25E-05	2.75E-05
Y-91	4.19E-02	9.71E-01	1.53E+00	3.69E-02	8.43E-04	6.09E-03
Y-92	3.70E-02	6.93E-01	9.64E-01	5.77E-03	5.86E-07	0.00E+00
Y-93	4.75E-02	1.02E+00	1.53E+00	2.25E-02	4.05E-05	2.91E-07
Nb-95	5.64E-02	1.31E+00	2.06E+00	4.95E-02	1.11E-03	7.23E-03
Zr-95	5.61E-02	1.30E+00	2.05E+00	4.94E-02	1.13E-03	8.29E-03
Zr-97	5.35E-02	1.19E+00	1.81E+00	3.26E-02	1.38E-04	7.58E-06
La-140	6.06E-02	1.38E+00	2.14E+00	4.58E-02	4.84E-04	1.97E-04
La-141	4.69E-02	8.98E-01	1.26E+00	8.69E-03	1.31E-06	0.00E+00
La-142	3.58E-02	5.15E-01	6.53E-01	6.67E-04	6.96E-10	0.00E+00
Nd-147	2.19E-02	5.06E-01	7.95E-01	1.89E-02	3.88E-04	1.49E-03
Pr-143	4.93E-02	1.14E+00	1.79E+00	4.27E-02	9.01E-04	3.95E-03
Am-241	4.23E-06	9.81E-05	1.54E-04	3.74E-06	8.75E-08	7.48E-07
Cm-242	9.98E-04	2.31E-02	3.64E-02	8.8 E-04	2.04E-05	1.64E-04
Cm-244	1.22E-04	2.84E-03	4.47E-03	1.08E-04	2.53E-06	2.16E-05
Cerium Group						
Ce-141	1.37E-01	3.19E+00	5.02E+00	1.21E-01	2.71E-03	1.72E-02
Ce-143	1.25E-01	2.85E+00	4.42E+00	9.20E-02	8.29E-04	2.34E-04
Ce-144	1.03E-01	2.41E+00	3.80E+00	9.19E-02	2.14E-03	1.77E-02
Pu-238	3.22E-04	7.51E-03	1.18E-02	2.86E-04	6.71E-06	5.73E-05
Pu-239	2.83E-05	6.60E-04	1.04E-03	2.52E-05	5.90E-07	5.04E-06
Pu-240	4.15E-05	9.69E-04	1.53E-03	3.69E-05	8.65E-07	7.39E-06
Pu-241	9.33E-03	2.17E-01	3.42E-01	8.30E-03	1.94E-04	1.66E-03
Np-239	1.60E+00	3.69E+01	5.76E+01	1.27E+00	1.67E-02	1.17E-02

Appendix C: Combined License (COL) Action Items

Action Item No.	SER Section	Subject To Be Addressed	Reason for Deferral
2.2 - Nearby Industrial, Transportation, and Military Facilities			
2.2-1	2.2.3	A COL or CP applicant should perform an evaluation of industrial hazards associated with the site, and should assess design-specific interactions between the existing and new unit(s) and, if necessary, propose measures to account for such interactions.	New unit design and specific location not known at ESP stage.
2.3 - Meteorology			
2.3-1	2.3.3	A COL or CP applicant should evaluate interaction between the existing meteorological tower and the proposed facility's cooling towers.	Design and specific location of cooling tower units are not known at ESP stage.
2.3-2	2.3.4	A COL or CP applicant should evaluate dispersion of airborne radioactive materials to the control room.	Control room location and design not known at ESP stage.
2.3-3	2.3.5	A COL or CP application should confirm specific release point characteristics and locations of potential receptors for routine release dose computations.	Exact release points and receptor locations not known at ESP stage.
2.4 - Hydrology			
2.4-1	2.4.1.3	A COL or CP application should demonstrate that sufficient separation between the new ESP intake and the combined effluent outfall is provided so that the effluent recirculating back to the new ESP intake will not adversely affect the intake.	Design of ESP facility intake and outfall will be completed only at the COL or CP stage after a reactor design is chosen.

Action Item No.	SER Section	Subject To Be Addressed	Reason for Deferral
2.4-2	2.4.1.3	A COL or CP applicant should demonstrate that if dewatering is necessary for the operation of the ESP facility, it will be considered a safety-related facility and must be designed, operated, and maintained as such.	Detailed design of the facility is not known at ESP stage.
2.4-3	2.4.1.3	A COL or CP applicant should design the site grading to provide flooding protection to safety-related structures at the ESP site based on a comprehensive flood water routing analysis for a local probable maximum precipitation (PMP) event on the ESP site.	Detailed design of the facility, including the site grade are beyond the scope of an ESP review.
2.4-4	2.4.1.3	A COL or CP applicant should design the ESP facility with a maximum withdrawal of 85,000 gpm from the Mississippi River for the makeup water requirement for the ESP facility.	Detailed design of the facility, including its makeup water requirements are not available at the ESP stage.
2.4-5	2.4.2.3	A COL or CP applicant should demonstrate that the ESP plant grade is safe from the flooding effects of maximum water surface elevation during local intense precipitation without relying on any active surface drainage systems that may be blocked during this event.	Certain locations within the ESP site area can be at the flood elevation of the site in response to local intense precipitation. It is not feasible to determine flooding protection needs at the ESP stage in response to local intense precipitation because final site grade and drainage patterns are not yet known.
2.4-6	2.4.8.3	A COL or CP applicant should demonstrate that 30-day cooling water supply for the ESP facility UHS will be available as liquid water in any dedicated water storage basin(s) accounting for any losses including, but not limited to, those resulting from evaporation, seepage, icing, and a margin of safety.	Detailed engineering design of underground UHS reservoirs, should they be needed, to ensure adequate capacity is not within the scope of ESP review.

Action Item No.	SER Section	Subject To Be Addressed	Reason for Deferral
2.4-7	2.4.8.3	A COL or CP applicant should demonstrate that the ESP facility UHS will not be used frequently for non emergency operation of the ESP facility.	The ESP water budget analysis relies on independent UHS reservoirs only, but need for a UHS is not known at the ESP stage.
2.4-8	2.4.12.3	A COL or CP applicant should demonstrate that an adequately designed ground water well system capable of withdrawing a maximum of 3570 gpm is provided for the ESP facility.	Detailed design of the facility is not known at the ESP stage.
2.4-9	2.4.12.3	A COL or CP applicant should provide detailed ground water information including location and depth of perched aquifers.	Additional ground water characterization is not known at the ESP stage.

Action Item No.	SER Section	Subject To Be Addressed	Reason for Deferral
2.5 - Geology, Seismology, and Geotechnical Information			
2.5-1	2.5.4	A COL or CP applicant should use excavation walls (or a combination of ground improvement with tied-back walls) and control the ground water during the excavations at the COL or CP stage.	Exact unit locations not known at ESP stage.
2.5-2	2.5.4	A COL or CP applicant should conduct detailed studies on the fill material and the required treatment to the fill material.	Exact unit locations and design not known at ESP stage.
2.5-3	2.5.4	A COL or CP applicant should perform additional borings, laboratory testing, and a geophysical survey to confirm the current base case material properties and their variabilities throughout the site during the COL or CP stage. If the investigations to be performed during the COL or CP stage indicate differences in material properties which may have significantly impact to design ground motions, the applicant should evaluate the need to perform additional site response analyses with the updated properties to develop updated design ground motions.	Exact unit locations and design not known at ESP stage.
2.5-4	2.5.4	A COL or CP applicant should perform geotechnical investigations during the COL or CP stage to provide additional verification regarding the soil properties of the zone with rise and fall of P-wave velocity, indicated in the SSAR.	Exact unit locations and design not known at ESP stage.
2.5-5	2.5.4	A COL or CP applicant should provide information to correlate plot plans and profiles of each seismic Category I facility with subsurface profiles and material properties to ascertain the sufficiency of selected borings to represent soil variations under each structure.	Exact unit locations not known at ESP stage.
2.5-6	2.5.4	A COL or CP applicant should evaluate potential excavation procedures that may be used, as well as the impact of the adjacent bluff on temporary support conditions and on standoff distance in the ESP area.	Exact unit locations and design not known at ESP stage.

Action Item No.	SER Section	Subject To Be Addressed	Reason for Deferral
2.5-7	2.5.4	A COL or CP applicant should provide a detailed dewatering plan for evaluating the ground water conditions (procedure for dewatering during construction, and ground water control throughout the life of the plant) regarding their effects on the foundation stability.	Exact unit locations and design not known at ESP stage.
2.5-8	2.5.4	A COL or CP applicant should perform additional site investigations during the COL or CP stage, including deep borings in the footprint of the powerblock structures to evaluate the potential for karst formation.	Exact unit locations and design not known at ESP stage.
2.5-9	2.5-4	A COL or CP applicant should develop specific design criteria (such as potential wall rotations, facility sliding, and overturning) during the COL or CP stage when the specific characteristics of the operating system are known.	Site average shear-wave velocity of the Zone III-IV bedrock slightly less than design value provided at ESP stage.
2.5-10	2.5.5	A COL or CP applicant should incorporate the effects resulting from the local topography or possible changes in topography in the future soil-structure interface (SSI) analyses.	Locations of safety-related structures relative to the existing or new slopes not known at ESP stage.
2.5-11	2.5.6	A COL or CP applicant should evaluate the effect of potential flooding of the Mississippi River and possible future erosion of the bluff, including their impacts on SSI effects of the plant.	Locations of safety-related structures relative to the existing or new slopes not known at ESP stage.
11.1 - Radioactive Effluent Dose Consequences from Normal Operations			
11.1-1	11.1.4	A COL or CP applicant should verify that the calculated radiological doses to members of the public from radioactive gaseous and liquid effluents for any facility to be built on the Grand Gulf site are bounded by the radiological doses included in the ESP application and reviewed by the NRC.	Specific details of how the new facility will control, monitor, and maintain radioactive gaseous and liquid effluents not known at ESP stage.

Action Item No.	SER Section	Subject To Be Addressed	Reason for Deferral
13.6 - Industrial Security			
13.6-1	13.6.3	A COL or CP applicant should provide specific designs for protected area barriers.	Exact locations and design of barriers not known at ESP stage.

Appendix D: Values of Plant Parameters Considered in the Environmental Review of the Application[1](Table D1)

PPE Section/Parameter	Value	US/TP
1. Structures		
1.1 Building Characteristics		
1.1.2 Foundation Embedment	140 ft.	US
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 or Natural Draft	See Note 1	
2.4.3 (2.5.3) Blowdown		
Constituents and Concentrations	See TABLE D2	US
2.4.4 (2.5.4) Blowdown Flow Rate	12,800 gpm expected (39,000 gpm max)	TP
2.4.5 (2.5.5) Blowdown Temperature	100°F	US
2.4.6 (2.5.6) Cycles of Concentration	4	US
2.4.7 (2.5.7) Evaporation Rate	35,100 gpm expected (39,000 gpm max)	TP
2.4.8 (2.5.8) Height	See Note 2	US
2.4.9 (2.5.9) Makeup Flow Rate	47,900 gpm expected (78,000 gpm max)	TP
2.4.10 (2.5.10) Noise	55 dba @ 1000 ft	US
2.4.12 (2.5.12) Cooling Water Flow Rate	865,000 gpm	US
3. Ultimate Heat Sink		
3.3 Mech Draft Cooling Towers		
3.3.4 Blowdown Flow Rate	288 gpm expected (1700 gpm max)	TP
3.3.5 Blowdown Temperature	95°F	US
3.3.7 Evaporation Rate	822 gpm expected (1700 gpm max)	TP
3.3.9 Makeup Flow Rate	1110 gpm expected (3,400 gpm max)	TP
3.3.12 Cooling Water Flow Rate	26,125 gpm (normal) 52,250 gpm (shutdown/accident)	US

[1] "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.

Appendix D: Values of Plant Parameters Considered in the Environmental Review of the Application (Table D1 continued)

PPE Section / Parameter	Value	US/TP
5. Potable Water/Sanitary Waste System		
5.1 Discharge to Site Water Bodies		
5.1.1 Flow Rate	120 gpm expected (210 gpm max)	TP
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		
6.1 Discharge to Site Water Bodies		
6.1.1 Flow Rate	220 gpm expected (290 gpm max)	TP
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
8. Miscellaneous Drain		
8.1 Discharge to Site Water Bodies		
8.1.1 Flow Rate	200 gpm expected (300 gpm max.)	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
9.5 Source Term		
9.5.1 Airborne Effluents (Normal)	32,699 Ci/yr See TABLE D7	US
9.5.2 Airborne Effluents (Post-Accident)	Based on limiting DBAs. See Note 3	US
9.5.3 Tritium Airborne Effluent (Normal)	7060 Ci/yr	TP

Appendix D: Values of Plant Parameters Considered in the Environmental Review of the Application (Table D1 continued)

PPE Section / Parameter	Value	US/TP
10. Liquid Radwaste System		
10.2 Release Point		
10.2.1 Flow Rate	35 gpm	US
10.3 Source Term		
10.3.1 Liquid	0.694 Ci/yr See TABLE D8	US
10.3.2 Tritium	6,200 Ci/yr See TABLE D8	US
11. Solid Radwaste System		
11.2.1 Activity	5400 Ci/yr	TP
11.2.2 Principal Radionuclides	See TABLE D3	US
11.2.3 Volume	18,646 cu.ft./yr	TP
13. Auxiliary Boiler System		
13.2 Flue Gas Effluents	See TABLE D4	US
16. Standby Power System		
16.1 Diesels		
16.1.3 Diesel Flue Gas Effluents	See TABLE D5	US
16.2 Gas Turbines		
16.2.3 Gas-Turbine Flue Gas Effluents	See TABLE D6	US
17. Plant Characteristics		
17.3 Megawatts Thermal	4300 MWt Includes ~10% uprate from 3926 MWt	US
17.4 Plant Design Life	60 years	US
17.5 Plant Population		
17.5.1 Operation	1160 people	TP
18. Construction		
18.3.1 Noise	76-101 db @ 50 ft	US
18.4 Plant Population		
18.4.1 Construction	3150 people max	US

NOTES:

1. Several main condenser cooling system alternatives were considered (i.e., mechanical and natural draft cooling towers, cooling ponds, and once-through cooling). The most restrictive value for each cooling system PPE section has been used in this table (e.g., 550 ft cooling tower height selected since both mechanical and natural draft towers were considered).

   – 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.

2. For the purposes of environmental (aesthetic) impact, a natural draft cooling tower with a height of 550 ft is considered. The cooling tower plume model discussed in Section 5.3.3.1 of the ER was done assuming a natural draft cooling tower height of 475 ft., and a mechanical draft cooling tower height of 60 ft.

3. 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.

Blowdown Constituents and Concentrations (Table D2)

Constituent	Concentration in parts per million		
	River Source	Well/Treated Water	Envelope
Chlorine demand	10.1	--	10.1
Free available chlorine	0.5	--	0.5
Chromium	--	--	--
Copper	--	6	6
Iron	0.9	3.5	3.5
Zinc	--	0.6	0.6
Phosphate	--	7.2	7.2
Sulfate	600	3,500	3,500
Oil and grease	--	--	--
Total dissolved solids	--	17,000	17,000
Total suspended solids	50	150	150
BOD, 5-day	--	--	--

Notes:
1. See Table D1 Sections 2.4.3 and 2.5.3
2. Assumed cycles of concentration equals four
3. Concentrations are per unit/group of units as applicable

Principal Nuclides in Solid Radwaste (Table D3)

Radionuclide	Quantity (Ci/yr)
Fe-55	1761.37
Fe-59	1.35
Co-60	395.92
Mn-54	347.22
Cr-51	97.138
Co-58	93.6
Nl-63	279
H-3	1.5
C-14	0.3
Nb-95	162
Ag-110m	9
Zr-95	76.45
Ba-140	0.528
Pu-241	0.09
La-140	0.607
Other	72.858
Cs-134	605
Cs-137	507
Sr-90	1.24
I-131	81.91
Ba-137m	507
Na-24	0.44
Ru-103	2.18
Ru-106	1.37
Sb-124	11.29
I-133	4.55
Ce-141	0.14
Ce-144	0.11
Gd-153	3.09
Cs-136	0.0287
Zn-65	25.7
Sr-89	0.886
Y-90	1.24
Y-91	4.43 E-4
Rh-103m	1.22 E-3
Rh-106	0.0592
Te-129m	2.31 E-5
Te-129	1.51 E-5
Total (rounded to nearest hundred)	5400

Notes:

1. The Total represents the bounding total for twice the single unit or group of units, not the total of the bounding quantities above.
2. Individual radionuclide quantities must be doubled since they represent data for a single unit or group of units.

Yearly Emissions - Auxiliary Boilers (Table D4)

Pollutant Discharged	Quantity (lbs)
Particulates	17,250
Sulfur oxides	51,750
Carbon monoxide	1749
Hydrocarbons	50,100
Nitrogen oxides	19,022

NOTES:
1. Emissions are based on 30 days/yr operation.
2. Individual quantities must be doubled since they represent data for a single unit or group of units

Yearly Emissions from Standby Diesel Generators (Table D5)

Pollutant Discharged	Quantity (lbs) Total All DGs
Particulates	1230
Sulfur oxides	4,608
Carbon monoxide	4,600
Hydro-carbons	3,070
Nitrogen oxides	28,968

Notes
1. Emissions are based on 4 hrs/month operation for each of the diesel generators.
2. Individual quantities must be doubled since they represent data for a single unit or group of units.

Yearly Standby Power System Gas Turbine Flue Gas Effluents (Table D6)

Gas Turbine Capacity (MWe)	20 MWe
Distillate 20°F Ambient BTU/KWH (LHV)	9890
BTU/KWH (HHV)	10,480
Fuel Consumption Rate (lbs/hr)	121,200
Effluent	Quantity (lbs or PPMVD)
NOX (PPMVD @ 15% O2)	42
NOX as NO2 (lbs)	2016
CO (PPMVD)	31
CO (lbs)	912
UHC (PPMVD)	3
UHC (lbs)	48
VOC (PPMVD)	N/A
VOC (lbs)	10
SO2 (PPMVD)	N/A
SO2 (lbs)	1882
SO3 (PPMVD)	N/A
SO3 (lbs)	30
SULFUR MIST (lbs)	50
PARTICULATES (lbs)	22
Exhaust Analysis (% Vol)	(% Vol)
ARGON	0.87
NITROGEN	72.56
OXYGEN	12.52
CARBON DIOXIDE	5.19
WATER	9.87

NOTES:
1. Emissions are based on 4 hrs/month operation for each of the gas turbines.
2. Individual quantities must be doubled since they represent data for a single unit or group of units.

Normal Operations Gaseous Release Source Term (Table D7)

Radionuclide	Composite Normal Release (Ci./yr)	Radionuclide	Composite Normal Release (Ci./yr)
Kr-83m	1.680E-03	Rb-89	8.650E-05
Kr-85m	7.200E+01	Sr-89	1.140E-02
Kr-85	8.200E+03	Sr-90	3.600E-03
Kr-87	5.030E+01	Y-90	9.190E-05
Kr-88	9.200E+01	Sr-91	2.000E-03
Kr-89	4.810E+02	Sr-92	1.570E-03
Kr-90	6.490E-04	Y-91	4.810E-04
Xe-131m	3.600E+03	Y-92	1.240E-03
Xe-133m	1.740E+02	Y-93	2.220E-03
Xe-133	9.200E+03	Zr-95	3.190E-03
Xe-135m	8.110E+02	Nb-95	1.680E-02
Xe-135	9.190E+02	Mo-99	1.190E-01
Xe-137	1.030E+03	Tc-99m	5.950E-04
Xe-138	8.650E+02	Ru-103	7.030E-03
Xe-139	8.110E-04	Rh-103m	2.220E-04
I-131	5.190E-01	Ru-106	2.340E-04
I-132	4.380E+00	Rh-106	3.780E-05
I-133	3.410E+00	Ag-110m	4.000E-06
I-134	7.570E+00	Sb-124	3.620E-04
I-135	4.810E+00	Sb-125	1.830E-04
C-14	2.190E+01	Te-129m	4.380E-04
Na-24	8.110E-03	Te-131m	1.510E-04
P-32	1.840E-03	Te-132	3.780E-05
Ar-41	1.020E+02	Cs-134	1.240E-02
Cr-51	7.030E-02	Cs-136	1.190E-03
Mn-54	1.080E-02	Cs-137	1.890E-02
Mn-56	7.030E-03	Cs-138	3.410E-04
Fe-55	1.300E-02	Ba-140	5.410E-02
Co-57	2.460E-05	La-140	3.620E-03
Co-58	6.900E-02	Ce-141	1.840E-02
Fe-59	1.620E-03	Ce-144	3.780E-05
Co-60	2.610E-02	Pr-144	3.780E-05
Ni-63	1.300E-05	W-187	3.780E-04
Cu-64	2.000E-02	Np-239	2.380E-02
Zn-65	2.220E-02		
		Total without Tritium	2.564E+04
		Tritium (H-3)	7.060E+03
		Total with Tritium	3.270E+04

NOTES:
1. Composite source term based on highest Radionuclide release for all plant types considered.

Normal Operations Liquid Release Source Term (Table D8)

Radionuclide	Composite Normal Release (Ci/yr)	Radionuclide	Composite Normal Release (Ci/yr)
I-131	2.826E-02	Zr-95	2.080E-03
I-132	5.200E-03	Nb-95	3.820E-03
I-133	2.000E-02	Mo-99	1.659E-03
I-134	3.400E-03	Tc-99m	1.600E-03
I-135	1.503E-02	Ru-103	9.860E-03
H-3	6.200E+03	Rh-103m	9.860E-03
C-14	8.800E-04	Ru-106	1.470E-01
Na-24	5.622E-03	Rh-106	1.470E-01
P-32	3.600E-04	Ag-110	2.800E-04
Cr-51	1.541E-02	Ag-110m	2.100E-03
Mn-54	5.200E-03		
Mn-56	7.622E-03	Sb-124	1.358E-03
Co-57	1.438E-04	Te-129	3.000E-04
Co-58	6.720E-03	Te-129m	2.400E-04
Co-60	1.822E-02	Te-131	6.000E-05
Fe-55	1.162E-02	Te-131m	1.800E-04
Fe-59	4.000E-04	Te-132	4.800E-04
Ni-63	2.800E-04	Cs-134	1.986E-02
Cu-64	1.503E-02	Cs-136	1.260E-03
Zn-65	8.200E-04	Cs-137	2.664E-02
Br-84	4.000E-05	Ba-137m	2.490E-02
Rb-88	5.400E-04	Cs-138	3.800E-04
Rb-89	8.811E-05	Ba-140	1.104E-02
Sr-89	2.200E-04	La-140	1.486E-02
Sr-90	7.027E-05	Ce-141	2.400E-04
Y-90	6.216E-06	Ce-143	3.800E-04
Sr-91	1.800E-03	Ce-144	6.320E-03
Y-91	2.200E-04	Pr-143	2.600E-04
Y-91m	2.000E-05	Pr-144	6.320E-03
Sr-92	1.600E-03	W-187	2.600E-04
Y-92	1.200E-03	Np-239	6.216E-03
Y-93	1.800E-03	All Others	4.000E-05
		Total All w/o Tritium	6.941E-01
		Total Tritium	6.200E+03

NOTES:
1. Composite source term based on highest Radionuclide release for all plant types considered.

Definition of Plant Parameters (Table D9)

Parameter	Units	Definition	Note
1. Building Characteristic			
1.1.2 Foundation Embedment	Feet	The depth from finished grade to the bottom of the basemat for the most deeply embedded power block structure.	1
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)			
2.4.3 (2.5.3) Blowdown Constituents and Concentrations	ppm	The maximum expected concentrations for anticipated constituents in the cooling water systems blowdown to the receiving water body.	2
2.4.4 (2.5.4) Blowdown Flow Rate	Gallons per minute	The normal (and maximum) flow rate of the blowdown stream from the cooling water systems to the receiving water body for closed system designs.	2
2.4.5 (2.5.5) Blowdown Temperature	°F	The maximum expected blowdown temperature at the point of discharge to the receiving water body.	1
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
2.4.7 (2.5.7) Evaporation Rate	Gallons per minute	The expected (and maximum) rate at which water is lost by evaporation from the cooling water systems.	2
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

Definition of Plant Parameters (Table D9)

Parameter	Units	Definition	Note
2.4.10 (2.5.10) Noise	Decibels	The maximum expected sound level produced by operation of a cooling tower, measured at 1000 feet from the noise source.	1
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
3. Ultimate Heat Sink			
3.3 Mechanical Draft Cooling Towers			
3.3.4 Blowdown Flow Rate	Gallons per minute	The normal (and maximum) flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs.	2
3.3.5 Blowdown Temperature	°F	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body.	1
3.3.7 Evaporation Rate	Gallons per minute	The expected (and maximum) rate at which water is lost by evaporation from the UHS system.	2
3.3.9 Makeup Flow Rate	Gallons per minute	The expected (and maximum) rate of removal of water from a natural source to replace water losses from the UHS system.	2
3.3.12 Cooling Water Flow Rate	Gallons per minute	The total cooling water flow rate through the UHS system.	1
5. Potable Water/Sanitary Waste System			
5.1 Discharge to Site Water Bodies			
5.1.1 Flow Rate	Gallons per minute	The expected (and maximum) effluent flow rate from the potable and sanitary waste water systems to the receiving water body.	3
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

Definition of Plant Parameters (Table D9)

Parameter	Units	Definition	Note
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			
6.1 Discharge to Site Water Bodies			
6.1.1 Flow Rate	Gallons per minute	The expected (and maximum) effluent flow rate from the demineralized water processing system to the receiving water body.	3
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
8. Miscellaneous Drain			
8.1 Discharge to Site Water Bodies			
8.1.1 Flow Rate	Gallons per minute	The expected (and maximum) effluent flow rate from miscellaneous drains to the receiving water body.	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

Definition of Plant Parameters (Table D9)

Parameter	Units	Definition	Note
9.4.3 Elevation (Post Accident)	Feet	The elevation above finished grade of the release point for accident sequence releases.	3
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, contained in post-accident airborne effluents.	1
9.5.3 Tritium Airborne Effluents (Normal)	Curies per year	The annual activity of tritium contained in routine (normal) plant airborne effluent streams.	2
10. Liquid Radwaste System			
10.2 Release Point			
10.2.1 Flow Rate	Gallons per minute	The flow rate of liquid potentially radioactive effluent streams from plant systems to the receiving water body.	2
10.3 Source Term			
10.3.1 Liquid	Curies per year	The annual activity, by isotope, contained in routine plant liquid effluent streams.	2
10.3.2 Tritium	Curies per year	The annual activity of tritium contained in routine plant airborne effluent streams.	2
11. Solid Radwaste System			
11.2.1 Activity	Curies per year	The annual activity, by isotope, contained in solid radioactive wastes generated during routine plant operations.	2
11.2.2 Principal Radionuclides	Curies per year	The principal radionuclides contained in solid radioactive wastes generated during routine plant operations.	2
11.2.3 Volume	Cubic feet per year	The expected volume of solid radioactive wastes generated during routine plant operation.	2

Definition of Plant Parameters (Table D9)

Parameter	Units	Definition	Note
13. Auxiliary Boiler System			
13.2 Flue Gas Effluents	Pounds per year	The expected combustion products and anticipated quantities released to the environment due to operation of auxiliary boilers.	2
16. Standby Power System			
16.1 Diesel			
16.1.3 Diesel Flue Gas Effluents	Pounds per year	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby diesel generators.	1
16.2 Gas-Turbine			
16.2.3 Gas-Turbine Flue Gas Effluents	Pounds per year	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby gas-turbine generators.	1
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
17.4 Plant Design Life	Years	The life for which the plant is designed to operate.	1
17.5 Plant Population			
17.5.1 Operation	Persons	The number of people required to operate and maintain the plant.	2
17.6 Station Capacity Factor	Percent	The percentage of time that a plant is capable of providing power to the grid.	1
18. Construction			
18.4 Plant Population			
18.4.1 Construction	Persons	The number of people required to construct the plant.	2

Definition of Plant Parameters (Table D9)

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.

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Letter to William A. Eaton from David B. Matthews dated April 5, 2007

SUBJECT: ISSUANCE OF EARLY SITE PERMIT (ESP) FOR SYSTEM ENERGY RESOURCES, INC. - GRAND GULF ESP SITE (ESP-002)

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