

May 19, 2004

Mr. William A. Eaton, Vice President
System Energy Resources, Inc.
Entergy Operations, M-ECH-38
1340 Echelon Parkway
Jackson, MS 39213

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE STAFF'S
REVIEW OF THE ENVIRONMENTAL REPORT FOR THE GRAND GULF
EARLY SITE PERMIT (ESP) APPLICATION (TAC NO. MC1379)

Dear Mr. Eaton:

The NRC staff has reviewed the environmental report (ER) submitted by System Energy Resources, Inc. (SERI) as part of its application for an early site permit for the Grand Gulf ESP site. The staff concludes that additional information is needed before it can complete its review. You are requested to provide a response to the enclosed request for additional information (RAI) within 60 days of the date of this letter, as discussed with your staff.

If you have any questions about this RAI, please contact me at (301) 415-1108.

Sincerely,

/RA/

James H. Wilson, Senior Project Manager
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 52-009

Enclosure: As stated

cc: See next page

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**Request for Additional Information Regarding
the SERI Early Site Permit Application
for the Grand Gulf ESP Site**

Unless otherwise indicated, section numbers refer to the applicant's environmental report (ER) for the early site permit (ESP).

Section 2.2, Land

E2.2-1 **General.** Please provide information on locations of borrow sites for soils/fill that will be used on the Grand Gulf site.

E2.2-2 **General.** The ER makes use of reproductions of maps contained in the UFSAR and other black and white scans of maps. During the site audit the applicant indicated that no GIS data has been developed specific to the Grand Gulf site or the alternative sites. Please provide the following figures electronically in their native format (preferably .TIFF) and resolution:

ER Figure 2.1-1	ER Figure 2.2-2	ER Figure 2.2-5	SSAR Figure 2.2-6
ER Figure 2.1-2	ER Figure 2.2-3	SSAR Figure 2.2-2	SSAR Figure 2.2-7
ER Figure 2.2-1	ER Figure 2.2-4	SSAR Figure 2.2-4	SSAR Figure 2.2-8

E2.2-3 **General.** Provide the original native electronic versions (typically TIFF format) of the maps appearing in or being referenced in the ER. For Land Use purposes, these include the following figures: ER Figure 2.1-1, ER Figure 2.1-2, ER Figure 2.2-1, ER Figure 2.2-3.

Section 2.3, Water

E2.3-1 **Section 2.3 (Hydrology).** Provide a high-quality electronic copy of Figures 2.2-1 and 2.3-12

E2.3-2 **Section 2.3 (Hydrology).** Provide a high-quality electronic map showing the site water features (including streams and wetlands).

E2.3-3 **Section 2.3.1.1.1 (Mississippi River).** The application states that "the river is known to have undergone shifting and continues to shift laterally." Provide the rationale and reference. Are these comments only applicable to pre-levee conditions or are they still applicable? Describe the shifting that has taken place on the east shore. Has any of the shifting encroached on the bluffs that the plant sits on?

- E2.3-4 **Section 2.3.1.1.1 (Mississippi River)**. The rating curve shown in Figure 2.3-4 River Rating Curve is from 1972-1974 data and the channel has presumably changed since then. Provide a current rating curve or a justification for using the 1972-1974 version.
- E2.3-5 **Section 2.3.1.1.1 (Mississippi River)**. Provide a description of dredging activities in vicinity of the barge offloading area (i.e. proposed intake).
- E2.3-6 **Section 2.3.1.1.1 (Mississippi River)**. The application states that "in order to stabilize the river alignment, the Corps of Engineers carried out extensive river control work in this area (dikes, revetment, riprap)." Provide references describing this work. The application also states that "revetments installed on west bank, and some on east bank with a gap at the plant left unprotected to undergo erosion until it attained acceptable alignment." Provide references.
- E2.3-7 **Section 2.3.1.1.1 (Mississippi River)**. Provide data on flood frequency distributions and levee failures in the reach of the river adjacent to the plant.
- E2.3-8 **Section 2.3.1.1.2 (Local Streams)**. For surface water bodies and wetlands on site, provide estimated erosion characteristics and sediment transport including rate, bed, and suspended load fractions.
- E2.3-9 **Section 2.3.1.1.4 (Physical Properties of Surface Waters)**. Provide a list of hydrographic surveys (e.g., riverbed elevation, navigation, velocity, shoreline location, and dredge maps) of the reach of the Mississippi between Vicksburg and Port Gibson, and particularly near the proposed location of the makeup water intake and the blowdown discharge.
- E2.3-10 **Section 2.3.1.1.4 (Physical Properties of Surface Waters)**. Provide monthly water temperatures for the river (maximum, average-maximum, average, average-minimum, minimum) preferably from the site temperature monitoring program.
- E2.3-11 **Section 2.3.1.1.4 (Physical Properties of Surface Waters)**. Provide a map of the temperature sampling area and sampling plan. Provide NPDES Sampling from January 2002 Reference 2 GGNS Plant Operations Manual, Environmental Instruction-NPDES Sampling, 08-S-09-4, Revision 8, January 14, 2002. Provide Entergy 2002 NPDES renewal Application Attachment C 2001 Winter and Summer Thermal monitoring reports .
- E2.3-12 **Section 2.3.1.1.4 (Physical Properties of Surface Waters)**. Provide a legible figure that shows the temperature monitoring locations.

Section 2.4, Ecology

- E2.4-1 **Section 2.4 of ER (Ecology).** Please provide a report, if available, for Enercon's reconnaissance visits to the Grand Gulf site from August 19 to 24 and October 29 to November 1, 2002.
- E2.4-2 **Section 2.4.1 of ER (Terrestrial Ecology).** During the onsite visit at Grand Gulf on April 13, Entergy Environmental Specialist, Don Crawley, referred to the Entergy Forester, Jim Monk (in Jackson), in regard to the implementation of a forest management/harvest plan on the Grand Gulf site. Please provide this plan, if available. Of specific interest are reforestation (reason, species used, and location) and harvest (harvest type [clearcut, select cut, etc.], species, approximate age, and location [specify upland bluffs or bottomlands]) efforts.
- E2.4-3 **Section 2.4.1.1 of ER (Terrestrial Ecology – Terrestrial Habitats).** No wildlife habitat information is provided for the existing Grand Gulf transmission line right-of-ways (ROWs), except to say that a certain percentage is forested. Please provide the same information for riparian areas, wetlands, floodplains, etc., that cross the ROWs. Please also indicate what important areas for wildlife (U.S. Fish and Wildlife Service national wildlife refuges, state wildlife or natural areas, state/municipal parks, etc.) are crossed by the transmission lines.
- E2.4-4 **Section 2.4.1.2.1 of ER (Terrestrial Ecology--Louisiana Black Bear).** During the onsite visit at Grand Gulf on April 13, Entergy Environmental Specialist, Don Crawley, referred to the Entergy Forester, Jim Monk (in Jackson), regarding to the possibility that he and/or his forestry staff may have incidentally observed black bears on the Grand Gulf site. If such anecdotal sightings have been made, please provide any of the following information, if available (i.e. who made the observation, the date, and specific location). Please indicate whether sighting information is typically reported to the U.S. Fish and Wildlife Service or the state Natural Heritage Program office.
- E2.4-5 **Section 2.4.1.2.1 of ER (Terrestrial Ecology--Louisiana Black Bear).** During the onsite visit at Grand Gulf of April 13, Entergy Environmental Specialist, Don Crawley, referred to the onsite hunting club, comprised of Entergy employees, in regard to the possibility of club members having incidentally observed black bears on the Grand Gulf site. If such anecdotal bear sightings have been made, please provide any of the following information, if available (i.e., who made the observation, the date, and specific location). Please indicate whether sighting information is typically reported to the U.S. Fish and Wildlife Service or the Natural Heritage Program office.

Section 2.5, Socioeconomic

- E2.5-1 **Reference 1.** URL, U.S. Census Bureau 2000, September 2002, <http://www.census.gov/>. 2.5.1 These data were captured in Landview 5 and were aggregated. Please provide documentation of how the aggregations were performed (copies of the electronic queries, list of census blocks queried, explanation of how the analysis was done, and the table number and title for the table from the 2000 census that was used).
- E2.5-2 **Reference 2.** Provide revised table data for Table 2.5-12 and exact table references for citation (number and title of census table[s] used).
- E2.5-3 **Reference 3.** Provide copy of front explanatory matter for tables actually used from the correct source and a correct specific citation. Provide example of applying county rates to a portion of Census block groups for two counties (Claiborne county – portion of block groups, Warren county – portion of block groups). Hard copy is preferred.
- E2.5-4 **Reference 5.** Provide a copy of record of telephone phone conversation.
- E2.5-5 **Reference 9.** This is a dynamic URL that changes number and date (and perhaps data) whenever used. Provide copies of data actually used.
- E2.5-6 **Reference 10.** (Tensas Parish economic data) Provide a copy of data as accessed. Also provide a brief explanation of how the State of LA develops these economic data and a citation.
- E2.5-7 **Reference 13.** URL, National Center for Education Statistics. Citation is very general. Provide copies of data downloaded. Provide an explanation of protocol used for downloading data.
- E2.5-8 **Reference 15.** Supply copies of phone record.
- E2.5-9 **Reference 16.** Custer, Casey, Warner-Tully YMCA Camp, personal communication, Vicksburg, Mississippi, November 4, 2002. Provide a copy of phone record.
- E2.5-10 **Reference 17.** URL, Mississippi Wildlife Fisheries and Parks, Downloaded September 2000. Provide a copy of data downloaded and the protocol used.
- E2.5-11 **References 18-20.** 18. Lake Bruin State Park, Louisiana Boehringer Public Information Direction LSP, email correspondence to John Anderson, Enercon Services, Inc., September 20, 2002. 19. Ainsworth, John Mississippi Wildlife Fisheries and Parks, personal communications, Brookhaven, MS, October, 2002. 20. Goodson, Robert, Tensas Parish Chairman, LSU AgCenter Research & Extension, St. Joseph, LA, personal communication email to J. Anderson, Enercon Services, Inc., December 9, 2002. For 18, provide a copy of data. For 19, provide a copy of call record. For 20, a provide copy of data and citation.

- E2.5-12 **Reference 22.** Covington, Clifton, Claiborne County Extension Office, personal communication, Port Gibson, Mississippi, October 16, 2002. Based on discussion, the reference for the statement regarding the Mississippi Development Authority (MDA) helping local government should be the MDA mission statement. Provide a copy of the mission statement and the correct citation. Also provide a copy of the phone record for the personal communication with Covington.
- E2.5-13 **Reference 25.** Paul Conguist, of Willowford, Gerhart, and Knight, personal communication, Port Gibson, Mississippi, October 1, 2002, and March 2003. Provide a copy of the record of this communication.
- E2.5-14 **Reference 32.** Based on discussion, actual source was one on persistent poverty counties (Ref. 6) by Deborah Tuttle which utilized a figure from, and cited, the 1995 document listed as Reference 32. Provide title page and table used from Reference 6.
- E2.5-15 **Reference 34.** Myers, Rene, Nurse Station Manager, Claiborne County, Hospital personal communication, Port Gibson, Mississippi. May 2002. Provide a copy of the phone record for this communication.
- E2.5-16 **Reference 35.** Kegerreis, Jim, Enercon Services, Inc, employee personal communication, Port Gibson, MS, November 2002. Provide a copy of the record of this communication.
- E2.5-17 **Table 2.5.9.** AREA EMPLOYMENT BY INDUSTRY. Based on discussion, these data came from Census SF-3 data on employment by industry that were aggregated. Provide citation to what tables were used; provide a short discussion of what aggregations were performed.

Section 2.5.3, Historic Properties

- E2.5.3-1 **General.** Provide electronic (TIFF) copies of the aerial imagery for the plant site (preconstruction of Unit 1, immediate post-construction, and recent).

Section 2.7, Meteorology and Air Quality

- E2.7-1 **Section 2.7.2.1 (Wind).** Compares wind speeds for the GGNS with wind speeds at Vicksburg for 1996-2001. Update the comparison using only wind data collected by the updated GGNS meteorological data systems. Include data for 2002.
- E2.7-2 **Tables.** Provide updated Tables 2.7-1 and 2.7-2 and confirm that the wind directions and speeds in the tables are components of the resultant wind vector. In particular, confirm that the direction is the resultant direction, not the most common wind angle as stated in the tables.

- E2.7-3 **Section 2.7.4.1.2 (Grand Gulf Wind Data)**. Presents an analysis of the wind data from the GGNS meteorological tower for the years 1996 through 2001. Revise the analysis using only wind data from the updated GGNS meteorological system. Include data for 2002. Provide documentation on changes to the ER relative to tables that have been revised.
- E2.7-4 **Additional data needs**. Provide at least 2 years of meteorological data from the updated meteorological system in the format specified in NUREG-1555 ESRP 2.7 Appendix A or Appendix A of SRP 2.3.3 in Attachment 2 to RS-002.
- E2.7-5 **Section 2.7.4.1.3 (Wind Direction Persistence)**. Presents an analysis of the wind data from the GGNS meteorological tower for the years 1996 through 2001. Revise the analysis using only wind data from the updated GGNS meteorological system. Include data for 2002. Provide documentation on changes to the ER relative to tables that have been revised.
- E2.7-6 **Section 2.7.4.6 (Atmospheric Stability)**. Includes tables that present the frequency of atmospheric stability classes at GGNS as a function of wind direction for an unspecified 5 year period. State what the 5 years were. If the years were prior to 1996, affirm that the wind directions used were representative. Otherwise, update the analysis using only data from the updated GGNS meteorological system.
- E2.7-7 **Section 2.7.6.2 (Short-Term Diffusion Estimates– Calculations and Results)**. Presents atmospheric diffusion estimates calculated using wind data from the GGNS meteorological tower for the years 1996-2000. Redo the calculations using only data from the updated GGNS meteorological system. Update Section 2.7.6.1 to reflect the meteorological data used in the diffusion estimates.
- E2.7-8 **Additional data needs**. Provide updated tables presenting the short-term atmospheric diffusion estimates.
- E2.7-9 **Section 2.7.7.3 (Long Term Diffusion Estimates– Calculations and Results)**. Presents atmospheric diffusion estimates calculated using wind data from the GGNS meteorological tower for the years 1996-2000. Revise the calculations using only data from the updated GGNS meteorological system. Update Section 2.7.6.2 to reflect the meteorological data used in the diffusion estimates.
- E2.7-10 **Additional data needs**. Provide updated tables presenting the long term atmospheric diffusion estimates.
- E2.7-11 **Additional data needs**. Provide GG ESP site-specific input files (meteorology, population, and source terms) for the MACCS2 computer code.

Section 3.7, Power Transmission System

- E3.7-1 **Sections 3.7 (Power Transmission System), Section 5.1.2 (Transmission Corridors and Offsite Areas), and Section 5.6 (Transmission System Impacts)**. Provide the right-of-way (ROW) management plan (including ROW width) for the existing Grand Gulf transmission line corridors. The ROW management plan for the existing system will be used to project impacts to terrestrial ecological resources that could result from operation and maintenance of transmission line corridors for the Grand Gulf ESP Facility. The ROW management plan should include frequency and mode of corridor inspection, vegetation control methods (herbicide, manual, mechanical) including frequency and time of year employed, special provisions for herbicide use near surface water, etc.

Section 3.8, Transportation of Radioactive Materials

The following information is requested to support development of RADTRAN 5 computer code input files to model shipments of advanced reactor irradiated fuels to calculate incident-free exposures and accident risks. To assist in modeling the advanced reactor irradiated fuel and packaging systems, provide the following:

- E3.8-1 **Radionuclide content of advanced design irradiated fuel**. For the IRIS reactor design, provide a detailed listing of all radionuclides and their inventories (e.g., Curies per metric ton uranium (Ci/MTU) or other suitable unit that can be used to calculate the inventories of each radionuclide in irradiated fuel shipments). In addition, for the ACR-700 reactor design, provide a detailed listing of all actinide radionuclides and their inventories. Explain the technical basis for the data (how the information was obtained) and the accuracy of the data.
- E3.8-2 **Detailed information about the advanced fuel designs**. Provide information to support a preliminary comparative evaluation of the abilities of the advanced fuel designs to withstand structural and thermal accident conditions relative to current design fuel assemblies. In particular, provide the following information on the advanced fuels:
- a. Fuel mechanical and thermal properties
 - b. For the fuel cladding:
 1. material(s) used and form/manufacturing processes
 2. physical dimensions
 3. mechanical and thermal properties
 - c. Investigation/analysis of fission product transport within and out of the fuel matrix

- d. Irradiation and temperature effects on the mechanical and thermal properties discussed above
- e. Assumptions about packaging that would be used as inner containers (i.e. overpack) inside a conceptual shipping cask
- f. Expected release fractions from the fuel during accident conditions - if this information is given as a comparison to light-water-cooled reactor (LWR) fuels release fractions, provide the basis for the comparison.

E3.8-3 **Information about the designs of shipping casks for advanced reactor irradiated fuels.** Provide capacities and dimensions of the shipping casks being modeled. It is assumed that the advanced LWR irradiated fuels would be shipped in casks similar to the current generation. For advanced non-LWR irradiated fuels, provide information about irradiated fuel handling, fuel behavior regarding failure and release fractions, and shipping cask concepts. Include all references and provide the basis for all assumptions made.

The following are specific questions related to Section 3.8 of the ER:

E3.8-4 **General.** Provide a transportation risk assessment for gas-cooled reactor spent fuel shipments using an accepted methodology, such as RADTRAN V. Provide justification that the best available information has been used to generate the RADTRAN input values, and that those values are appropriate for gas-cooled fuel shipments. Provide a comparison of the results of that assessment with the spent fuel shipment risk estimates contained in NUREG-0170, *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes*.

E3.8-5 **General question.** For the light water reactor designs, what is the bounding value for 1) the number of truck shipments of irradiated fuel annually per unit, and 2) MTU of spent fuel per truck cask?

E3.8-6 **Section 3.8.1, p. 3.8-3, (Light-Water-Cooled Reactors).** Provide justification for the statement that the Department of Energy (rather than licensees) would make the decision on transport mode.

E3.8-7 **Section 3.8.2.2, p. 3.8-6, last paragraph (Gas-Cooled Reactors - Analysis).** The ER states that adjustments have been made on the basis of electrical output, but the note to Table 3.8-2 states that results were not adjusted. Describe all adjustments or normalizations that have been made (e.g., decay time, shipment, electrical generation, etc.).

- E3.8-8 **Section 3.8.2.2.3, p. 3.8-9, first paragraph (Risk Contributors - Contents).**
The ER states that the reference LWR used a 90-day decay time, but 150 days is stated as the decay time prior to shipment in the Reference LWR column of Table 3.8-2. What reference LWR decay time was used for the impact evaluation? In addition, what gas-cooled reactor radionuclide inventory was used for the impact evaluation?
- E3.8-9 **Section 3.8.2.2.3, p. 3.8-9, first paragraph (Risk Contributors - Contents).**
Justify the applicability of the depletion code used to calculate the isotopic content of spent fuel for the new reactor designs.
- Explain the in-core differences between a commercial LWR and the new reactor designs and how these differences affect the performance of the depletion calculation. These differences may include: initial enrichment, fuel configuration, type of moderator, specific power, fuel temperature, moderator temperature, and the presence of soluble, burnable, and integral poisons.
- E3.8-10 **Section 3.8.2.2.3, p. 3.8-9, third paragraph (Risk Contributors - Contents).**
The ER provides a comparison of reference LWR actinide and gas-cooled fuel inventories that states that the actinide inventory in Ci/MTU for the gas-cooled fuel exceeds that of the reference LWR, and that the pebble bed modular reactor (PBMR) would have essentially the same MTU per cask as the reference LWR. Provide the basis for the total actinide inventory per gas-cooled fuel truck cask. Does the increased actinide inventory call for additional cask shielding relative to that needed for reference LWR fuel? If so, does the added shielding affect cask payload and the number of shipments by truck, as shown in Table 3.8-2?
- E3.8-11 **Section 3.8.2.3, p. 3.3-10, second paragraph (Gas-Cooled Reactors - Discussion).** The ER quotes NUREG/CR-6703, *Environmental Effects of Extending Fuel Burnup Above 60 Gwd/MTU* [gigawatt days/MTU], (p. 3), regarding actinide dose contribution; however, the quoted text relates to pressurized water reactor (PWR) fuels burned in the presence of burnable poison rod assemblies. Describe the relevance of this information to the type of gas-cooled reactor spent fuel shipments contemplated in the ER.
- E3.8-12 **Section 3.8.2.3, p. 3.8-10, second paragraph (Gas-Cooled Reactors - Discussion).** For each gas cooled reactor technology proposed, demonstrate/quantify how the increased actinide activity in the fuel impacts neutron dose.
- E3.8-13 **Section 3.8.2.3, p. 3.8-10, second paragraph (Gas-Cooled Reactors - Discussion).** Justify the representation that only minor modifications to the amount of neutron shielding on the transportation packages will allow them to be used for fuel with a significantly higher neutron source term.

Address the effect of additional neutron shielding on other design aspects of the package performance such as the ability to reject the thermal heat load, the method for attaching the shielding, and the size of the impact limiter which affects the package's performance during a drop accident. Address the effect of additional shielding on package diameter, impact limiter size, rail or truck bed width, package weight, cask capacity, and number of shipments needed.

Address how the neutron source term for gas-cooled reactor fuel will be distributed when the fuel is shipped, and how that distribution might affect the shielding design of the transportation cask.

Section 4.1, Land-Use Impacts

E4.1-1 **Section 4.1 of ER (Land Use Impacts).** The following is stated: "New rail service may be required to support materials deliveries and new construction activities." Because the closest passage of a rail line is currently 28 miles to the NE, where would the potential rail corridor run and where would it junction with the KC Southern line? What information was consulted to determine that a new rail line might be required? No material is cited in this regard. During the site audit the applicant indicated that a clarification of this statement would be written and docketed.

E4.1-2 **Section 4.1 of ER (Land Use Impacts).** The following is stated: "Review of the Claiborne County Soil Survey issued in 1963 and inquiry with the Claiborne County Natural Resources Conservation Service (NRCS) indicates the presence of soil types, which may be considered "Prime Farmland" at the GGNS site (Reference 4). However, some exclusions apply. If land is frequently flooded during the growing season or is already in or committed to urban development or water storage, it is not considered "prime farmland" (References 4, 5, 6, and 7)." References 4, 6, and 7 do not appear to be publically available or are not cited completely enough to permit acquiring them. During the site audit the applicant indicated that these references would be made available:

4. United States Department of Agriculture, Soil Conservation Service, in Cooperation with the Mississippi Agricultural Experiment Station, "Claiborne County Soil Survey," issued July 1963.
6. Carver, A.D. and J.E. Yahner, Defining Prime Agricultural Land and Methods of Protection Purdue Cooperative Extension Service, AY-283.
7. United States Department of Agriculture, Soil Conservation Service. May 28, 1992, Obtained from the Claiborne County NRCS, Port Gibson, MS, February 21, 2003.

Section 4.4, Socioeconomic Impacts

- E4.4-1 **References 5 and 6.** 5. Middleton, Carl, Mississippi Department of Transportation, Assistant District Engineer, Yazoo City, Mississippi, March 2003. 6. Valentine, Ray, Mississippi Department of Transportation, Planning Department, Jackson, Mississippi, March 2003. Provide a copy of the record of these communications.
- E4.4-2 **Section 4.4.2.6 Local Employment. Reference 5.** Middleton, Carl, Mississippi Department of Transportation, Assistant District Engineer, Yazoo City, Mississippi, March 2003. Provide the citation(s) and a copy of the referenced material.
- E4.4-3 **Section 4.4.3.2.** For the most recent year available, provide a table showing the distribution of Mississippi's in-lieu tax dollars collected under Mississippi Code Section 27-35-309 (3) for Grand Gulf and provided to individual local governments. Show emergency planning dollars and the remaining shares separately for all local governments receiving these dollars. Also note any dollars paid by Entergy to the state of Mississippi for Grand Gulf that may not have been allocated to local governments. Provide a citation for these data.
- E.4.4-4 **General.** Provide a table showing the current number of plant workers for Grand Gulf plant by zip code or city.

Section 4.5, Radiation Exposure to Construction Workers

- E4.5-1 **Section 4.5.4, p.4.5-2.** Provide a site map showing the locations (with respect to the existing plant) of the nine "inner ring" TLDs described in Section 4.5.3.3 and Table 4.5-4 of the ESP application.
- E4.5-2 **Section 4.5.4, p. 4.5-3.** Section 4.5.4 of the ER provides the expected dose rates at various locations around the existing Grand Gulf unit where construction workers will be during the construction of the first new unit. Using these expected dose rates and the estimated construction work force, provide a table (similar in format to Table 4.5-6) showing the expected dose to construction workers from the construction of the first new unit. Include all dose contributions from N-16 shine, the condensate storage tank, and any other radiation sources.
- E4.5-3 **Section 4.5.5, p.4.5-3.** Section 4.5.5 of the ER state that the information in Table 4.5-6 (estimated dose to construction workers from skyshine dose rates) is based on a study done of the estimated exposure of construction workers on GGNS Unit 2 from radiation emitted from GGNS Unit 1. Because GGNS Unit 1 first began operation in the mid 1980s and this study is probably at least 20 years old, justify the use of data from that study.

a) Verify that the number of person-hours and the representative dose rates from this study (and listed in Table 4.5-6) are still valid and can be used to accurately estimate the dose received by construction workers working on a second new unit from the first new unit.

b) In addition to the contribution from skyshine, verify that the dose rates listed in Table 4.5-6 include any contribution from airborne and liquid releases as well as from other contained sources from the first new unit.

The estimated doses to construction workers at a second new unit should also reflect the contribution of any radiation sources from the existing Grand Gulf unit.

E4.5-4 **Table 4.5-1.** Verify why the units for total body dose and skin dose are given in mrem/yr instead of in mrem. In this section of the same table, what is the source of the direct radiation measurements given?

E4.5-5 **Section 4.5.3.3, p.4.5-2.** In the ESP application it is stated that the TLD data for the year 2001 (as shown in Tables 4.5-3 through 4.5-5) was used to estimate the direct radiation dose at locations surrounding GGNS Unit 1. Justify the reasons for using the four quarters of TLD data for 2001 (as opposed to using TLD data from other recent years) as bounding data for estimating the direct radiation dose around GGNS Unit 1. Because the TLD readings at the protected area boundary (listed in Table 4.5-5) are especially dependant on the plant power level due to their proximity to the plant, revise Table 4.5-5 to indicate the average plant capacity factor of GGNS Unit 1 during each of the calender quarters listed.

E4.5-6 **Section 4.5.4.** Section 4.5.4 of the ER states that the annual construction worker doses attributable to the operation of GGNS Unit 1 for the proposed construction areas for a new facility would be a small fraction of the 10 CFR 20 or 10 CFR 50 Appendix I limits. Include tables at the end of Section 4.5 that provide the following information to verify this statement:

- a. The annual estimated construction worker doses to an individual. This table should contain the contributions to the whole body dose, critical organ dose, and TEDE for each of the contributing sources of radiation (i.e. direct radiation, and gaseous and liquid effluents).
- b. Comparison of the construction worker public dose to 10 CFR 20.1301 criteria.
- c. Comparison of the construction worker occupational dose to 10 CFR 20.1201 criteria.
- d. Comparison with 10 CFR 50, Appendix I criteria for effluent doses

Section 5.2, Water-Related Impacts

- E5.2-1 **Section 5.2.3 (Water Use/ Water Quality Regulations)**. Provide documentation of any consultations regarding CWA Section 404 certifications.
- E5.2-2 **Section 5.2.3 (Water Use/ Water Quality Regulations)**. Provide documentation of any consultations regarding CWA Section 401 certifications.
- E5.2-3 **Section 5.2.3 (Water Use/ Water Quality Regulations)**. Provide documentation of any consultations regarding CZMA.
- E5.2-4 **Section 5.2.3 (Water Use/ Water Quality Regulations)**. Provide documentation of any consultations regarding NPDES permitting.
- E5.2-5 **Section 5.2.1.3 (Water Returns/Discharges)**. The application states the new outfall will be surface discharge. Provide the rationale for selecting a shoreline surface discharge in lieu of an offshore submerged discharge.

Section 5.3, Cooling System Impacts

- E5.3-1 **Section 5.3.2.1 (Thermal Description and Physical Impacts)**. Provide input files (electronic) for CORMIX model simulations.

Section 5.4 Radiological Impacts of Normal Operations

- E5.4-1 **Section 5.4.2, p. 5.4-3 (Radiation Doses to Members of the Public)**. ESRP Section 5.4.2 identifies the need for information on occupational radiation dose estimates. Provide occupational dose estimates for the plant parameter envelope reactor designs.
- E5.4-2 Provide data for milk production that were used in the GASPARG runs for miles 0-1, 1-2, 2-3, 3-4, 4-5, 5-10 (see Table 5.4-5 of the Grand Gulf ER). If there is no production in these areas, so state.
- E5.4-3 Provide the site-specific values used in the GASPARG run for the following:
- Distance to N.E. Corner of US (Maine) in miles
 - Fraction of year leafy vegetables are grown
 - Fraction of year cows are on pasture
 - Fraction of crop from garden
 - Fraction of daily intake of cows derived from pasture while on pasture
 - Humidity over growing season

- g. Average Temp over growing season
- h. Fraction of year goats are on pasture
- i. Fraction of daily intake of goats derived from pasture on pasture
- j. Fraction of year beef cattle are on pasture
- k. Fraction of daily intake of beef cattle derived from pasture while on pasture.

If default values were used, so state.

- E5.4-4 Provide Special Location Parameters, if any additional to Tables 2.7-117 and 5.4-11 A in the environmental report.
- E5.4-5 Provide Reconcentration data used as input for LADTAP runs to include: 1) effluent discharge rate from impoundment receiving water body; 2) total impoundment volume; 3) model used (completely mixed, plug-flow or partially-mixed).
- E5.4-6 Provide ALARA Analysis Information used in LADTAP runs to include: shore-width factor, dilution factors and transit times.
- E5.4-7 Provide Population Usage information used in LADTAP runs for determining population dose estimates in Table 5.4-10 of the Environmental Report. This information should include annual usage estimates (person-h/y), dilution factors and transit times for the drinking water, shoreline, swimming and boating pathways.
- E5.4-8 For biota dose calculation in LADTAP, provide the dilution factor and transit time to the release location used in LADTAP runs.

Section 5.8, Socioeconomic Impacts

- E5.8-1 **Section 5.8.3, Reference 3.** Mosby, Waldron A, GGNS Unit 1, 2003, Distribution of GGNS Employees, Email to Michael D. Bourgeois, Entergy Nuclear Potomac, Inc., April 3, 2003. Provide a copy of the record of this communication.
- E5.8-2 **General.** Provide the basis for the assumption in the ER that 50% of the plant workforce at a new nuclear plant at the Grand Gulf site would come from the 50 miles surrounding Grand Gulf.

Section 7.1, Design Basis Accidents

E7.1-1 **Section 7.1, p. 7.1-1.** This section of the ER stated that:

“...doses from postulated design basis accidents are calculated for hypothetical individuals, located at the closest point on the exclusion boundary for a two-hour period,.....”

Verify that the statement should read “.....for any two-hour period with greatest EAB doses”.

Verify that in Section 7.1.2 that for the Exclusion Area boundary “0-2 hours”, that this time period is also for any two-hour period with greatest EAB doses.

E.7.1-2 **Section 7.1.3, p. 7.1-2.** This section of the ER stated that time-dependent activities released to the environs were used in dose estimates and they are provided in tables in Chapter 7 for certain design basis accidents (DBAs). Provide time-dependent activities released to the environs in curies for all DBAs. Please provide the references and the methodology used to determine the time-dependent activity release values in these tables providing a sample dose calculation. Also, please ensure the values in these tables appropriately reflect the certified AP-1000 design χ/Qs as discussed in RAI 7.1-4.

E7.1-3 **Section 7.1.3, p. 7.1-2.** This section of the ER stated that the ABWR accident evaluation (other than LOCA) used the alternative source term methodology in accordance with Regulatory guide 1.183. Because the ABWR design is certified with TID-14844 source term and with the radiological consequence dose criteria in thyroid and whole body doses, provide a justification for the use of the alternative source term methodology.

E7.1-4 **Section 7.1.3, p. 7.1-2.** This section of the ER stated that the AP-1000 accident evaluation used alternative source term methodology in accordance with Regulatory guide 1.183. Westinghouse has revised its χ/Qs in the AP-1000 design certification control document since submittal of the Grand Gulf ESP application. Please use the certified χ/Qs in the Westinghouse AP-1000 Design Control Document and revise the site-specific doses and fission product releases for all DBAs in ER Chapter 7 accordingly, or note that the AP1000 values used in the ER have been revised but the applicant has elected not to use the updated values in the accident analyses.

E7.1-5 **Table 7.1-2.** Provide χ/Q values used for evaluating the radiological consequences for ACR-700 LOCA in Table 7.1-1.

E7.1-6 **Section 7.1.3, p.7.1-2.** This section of the ER stated that the reactor accident source term for the ACR-700 design uses a non-mechanistic approach based on TID-14844 and they are provided by the reactor vendor. Provide the reactor accident source term used for the ACR-700 design.

E7.1-7 **Table 7.1-1.** This table summarizes the resulting doses at the ESP site for postulated design basis accidents using the AP-1000, the ABWR, and the ACR-700 as surrogate reactor designs. Please update the table for each design basis accident to include 1) AP-1000, ABWR, and ACR-700 χ/Q values and doses used for the EAB and LPZ, and 2) the ratios of site-specific χ/Q s to design certification χ/Q s used.

E7.1-8 **Various Chapter 7.** Several tables in ER Chapter 7 present doses for ABWR design basis accidents in total effective dose equivalent (TEDE) units. Please revise these tables to show doses in thyroid and whole body doses, because the General Electric ABWR design is certified with the thyroid and whole body doses.

Section 7.2, Severe Accidents

E7.2-1 **Section 7.2.2.** Please provide an up-to-date, site-specific assessment of the adverse health effects from fallout onto open bodies of water, considering the ESP site parameters (e.g., water flow rates and contaminant residence times). Justify that the generic conclusion with respect to such matters that was reached in NUREG-1437 is valid for a future reactor at the ESP site.

E7.2-2 **Section 7.2.2.** Please provide an up-to-date, site-specific assessment of the adverse health effects from potential releases to groundwater, considering the ESP site parameters. Justify that the generic conclusion with respect to such matters that was reached in NUREG-1437 is valid for a future reactor at the ESP site.

E7.2-3 **Section 7.2.** Provide a site-specific analysis of the environmental consequences of a potential severe accident at a new reactor located on the ESP site using a Level 3 probabilistic risk assessment (PRA) consequence code such as the MACCS2 code. This could involve characterizing the spectrum of credible releases from candidate future plant designs, in terms of representative source terms and their respective frequencies, and using these release characteristics in conjunction with site-specific population and meteorology to determine site-specific risk impacts for the potential design. Release characteristics could be developed through a survey of severe accident analyses for previously certified advanced LWRs and/or operating reactors. The following information should be provided as part of this analysis:

- a. a description of the computer code used as the basis for the calculations, including any modifications to the officially released version of the code and important deviations from recommended or default code input values;

- b. a description of the site-specific meteorology data used in the calculation, including the treatment of rain/precipitation events and the degree to which the data represents or bounds year-to-year variations in weather at the ESP site;
- c. a description of the site-specific population data used in the calculation and justification that this data is representative of the time period through which new unit operations could extend;
- d. a description of the major input assumptions for modeling economic impacts, including farm and non-farm values, evacuation costs, value of crops and milk contaminated or condemned, costs of decontamination of property, and costs associated with loss of use of property as a result of the accident (including contamination and condemnation of property);
- e. a description of the protective actions considered in the evaluation, including criteria for sheltering and evacuation, criteria for interdiction and condemnation of property and/or crops and the assumed level of medical support to aid the exposed population;
- f. a description of the source terms used to represent the reference or surrogate plant design(s), including the radionuclide inventory and the release frequency and characteristics for each release category, including release fractions for the major radionuclide groups, release times and durations, and elevation and energy of release,
- g. the results of the calculations in terms of probabilistically-weighted population dose, early and latent fatalities, economic costs, and contaminated and condemned land areas, for the reference or surrogate plant design(s) (Sufficient information should be provided to enable results to be displayed in a manner similar to later final environmental statements [FESs, e.g., Tables 5.10 through 5.13 in NUREG-0921].); and
- h. a listing of the input file for the ESP site (including weather data).

E7.2-4

Section 7.2. Provide a comparison of the (probabilistically weighted) environmental risk of severe accidents for a future reactor at the ESP site with:

- a. the risks (doses) associated with normal and anticipated operational releases from a future reactor at the ESP site; and
- b. the risk of severe accidents for the current generation of operating plants (at their respective sites), as characterized in such studies as NUREG-1150, *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants*, and the plant-specific risk study for Grand Gulf Nuclear Station.

Section 9.0, Alternative Sites

- E.9.0-1 **General.** Provide ENTERGY corporate structure information sufficient to identify relationships among the Grand Gulf and alternate site operators and land owners, and basis for selection of alternate sites in northeast and south.
- E.9.0-2 **General.** Provide the rationale for the regional approach to screening for alternative sites.
- E.9.0-3 **General.** Provide the rational for scoring system that was used to reduce candidate sites to the set identified as alternative sites.
- E9.0-4 **General.** Provide a table showing the current number of plant workers for River Bend, FitzPatrick, and Pilgrim plants by zip code or city.
- E9.0-5 **General.** Provide tables showing local taxes paid to each local jurisdiction and the proportion these taxes are of those local governments' budgets at the River Bend, FitzPatrick, and Pilgrim plants, for the most recent tax year available.
- E9.2-1 **Section 9.2.1.3.** The issue of conservation is important to many members of the public and was raised at the scoping meeting. Section 9.2.2.8 of the ER acknowledges the potential role of conservation by stating that "conservation measures could provide a partial offset of the need for power that would be supplied by the proposed project." Provide a description of the current conservation programs operated by Entergy in regions that might be served by a new generating plant sited at Grand Gulf; the success or lack of success of such conservation programs; and the potential for further conservation.
- E9.2-2 **Section 9.2.2.5.2.** Would disposal of wastes from a coal plant on the Grand Gulf property be feasible and acceptable given the close proximity of floodplain and the Mississippi River?
- E9.2-3 **Section 9.2.2.6.1.** The ESP application states that the closest natural gas line is 4.75 miles from the Grand Gulf site. Does this line carry sufficient natural gas to provide fuel for a 2000 MWe natural gas-fired plant sited at Grand Gulf? If not, how far would it be to the nearest source of an adequate natural gas supply?
- E9.3-1 **Section 9.3.** During the onsite visit at Grand Gulf of April 13, Entergy Environmental Specialist, Don Crawley, referred to the Entergy Forester, Jim Monk (in Jackson), regarding to the possibility that he and/or his forestry staff may have incidentally observed black bears on the River Bend site. If such anecdotal sightings have been made, please provide any of the following information, if available (i.e. who made the observation, the date, and specific location). Please indicate whether sighting information is typically reported to the U.S. Fish and Wildlife Service or state Natural Heritage Program office.

- E9.3-2 **Section 9.3.** During the onsite visit at River Bend of April 15, Entergy Environmental Specialist, Buddy Michure, reported that he and/or his staff had seen one or more black bear and panther on the River Bend site, and requested that he be contacted for the specific sighting information. Provide any of the following from these sightings, if available (i.e. the species, who made the observation, the date, and specific location). Please indicate whether sighting information is typically reported to the U.S. Fish and Wildlife Service or the state Natural Heritage Program office.
- E9.3-3 **Section 9.3.** Provide copies of the two Site Selection Committee Meeting reports, one from September and one from December 2001.
- E9.3-3 **Section 9.3.4.** During the NRC site visit, Entergy personnel indicated they could provide a summary flow chart showing how its various siting screening criteria were applied to eliminate candidate sites. Provide this chart if possible.
- E9.3-4 **Section 9.3.4.** During the NRC site visit, Entergy personnel explained that the company's original intention was to submit an early site permit application for both a northern and a southern site and that, consequently, both northern and southern sites were included in the region of interest. Subsequently, Entergy decided to apply for an early site permit only for a southern site, with Grand Gulf as the company's preferred site. Nevertheless, two northern plants (FitzPatrick and Pilgrim) were included as candidate sites in the site screening process. Provide further rationale why the two northern sites were included as candidate sites, given the company's decision to only submit one early site permit application for a southern site.
- E9.3-5 **Section 9.3.4.** The results of Entergy's preliminary site screening are shown in Table 2 of Section 1 of the Entergy "Early Site Permit Selection Committee Notebook." The Arkansas Nuclear One and the Waterford 3 sites had a higher composite rating than the Pilgrim site, yet both Arkansas Nuclear One and Waterford were eliminated at the preliminary screening stage. The Pilgrim site was retained for detailed site screening in spite of its lower composite rating and even though Entergy found "that population data for Pilgrim indicates that there may be population densities around the site that exceed the NRC guideline of 500 persons/square mile within 20 miles of the plant." Provide further rationale, beyond the fact that Entergy originally intended to submit an ESP application for both a northern and southern site, for including Pilgrim in the detailed site screening while excluding the Arkansas Nuclear One and Waterford 3 sites.

E9.3-6 **Section 9.3.** ESRP Sections 9.3 and 9.4.3 identify the need for information regarding presence of habitats, including wetlands, on each of the alternate sites and their transmission line corridors, and potential impacts to the same for each of the alternate sites. None of this information is currently provided in Section 9.3 of the ER . Please provide an estimate of the number of acres of each habitat type that would be disturbed at each alternate site. (Alternatively, provide electronic versions of aerial photos that display the habitats on each alternate site and a GIS layer of polygons representing Grand Gulf ESP facilities and laydown yards, etc. that can be superimposed on the aerial photos to derive the above estimates.)

Safety Analysis Report, Environmental Issues

S2.1-1 **Section 2.1.2.3 of Site Safety Analysis Report (Mineral Rights).** It appears that a minor share of mineral rights within the exclusion area are not owned or controlled by the applicant or related entities. Although exploitation or exploration of those rights "appears unlikely," more information is needed. What is the exact ownership of the mineral rights in the exclusion area? What documentation can be provided to support the claim of a *de minimis* exception to total control of the exclusion area? As committed to during the site audit, this information should be docketed.

S2.1-2 **Section 2.1.2.3 of Site Safety Analysis Report (Mineral Rights).** This section states "There is no activity at the GGNS plant site to explore for, drill for, or otherwise extract minerals. Past unsuccessful exploratory activities on or near the GGNS plant site and the geological character of the subsurface structure in the vicinity of the GGNS plant site indicate that commercial mineral production within or near the exclusion area appears unlikely in the foreseeable future. This has been confirmed in a geological appraisal, dated January 1987." As committed to during the site audit, this information should be docketed.

Grand Gulf Expanded Service List

cc:

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