

November 20, 2006

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
 )  
SYSTEM ENERGY RESOURCES, INC. ) Docket No. 52-009-ESP  
 )  
(Early Site Permit for Grand Gulf ESP Site) )

NRC STAFF PRE-FILED TESTIMONY CONCERNING HEARING ISSUE E:  
THE ALTERNATIVE ANALYSES FOR THE GRAND GULF ESP PROCEEDING

Q.1. Please state your name, occupation, by whom you are employed and your professional qualifications.

A.1. (JW) James H. Wilson. I am employed as a Senior Project Manager in the New Reactor Environmental Projects Branch, Division of New Reactor Licensing, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

A.1. (PH) Paul L. Hendrickson. I am employed as a Staff Scientist with the Engineered Systems Group at the Department of Energy's Pacific Northwest National Laboratory, operated by Battelle. I am providing testimony under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

A.1. (LV) Lance W. Vail. I am employed as a Senior Research Engineer II with the Hydrology Group at the Department of Energy's Pacific Northwest National Laboratory, operated by Battelle. I am providing testimony under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

Q.2. Please describe your professional responsibilities with regard to the review of the application by System Energy Resources, Inc. ("SERI" or "Applicant"), pursuant to 10 C.F.R. Part 52, Subpart A, for an early site permit ("ESP") for a site within the existing site of the Grand Gulf Nuclear Station property.

A.2. (JW) I am the NRC Senior Project Manager for the environmental review of SERI's Grand Gulf ESP application. I was responsible for overseeing the preparation of NUREG-1817, the "Environmental Impact Statement for an Early Site Permit (ESP) at the Grand Gulf ESP Site: Final Report," April 2006 ("FEIS").

A.2. (PH) As part of the NRC staff's environmental review of SERI's ESP application, documented in the FEIS, I assisted the NRC staff in its analysis of the aspects of the Applicant's Environmental Report that concerned alternative power generation and alternative sites.

A.2. (LV) As part of the NRC staff's environmental review of SERI's ESP application, documented in the FEIS, I assisted the NRC staff in its analysis of the aspects of the Applicant's Environmental Report that concerned plant design alternatives.

Q.3. In its Order of November 6, 2006, the Atomic Safety and Licensing Board ("Board") identified certain issues to be addressed in connection with the mandatory hearing. With regard to the NRC staff's alternative analyses, the Board asked the NRC staff to "discuss why the alternative analyses included in the FEIS do or do not evaluate potential site impacts from the construction and operation of the proposed plant(s) and how future construction may affect the environmental factors that might conflict with the issuance of an ESP." Does the FEIS evaluate potential site impacts from the construction and operation of the proposed plant(s) and how future construction may affect the environmental factors that might conflict with the issuance of an ESP, and if so, why?

A.3. (JW) Yes. The alternative analyses included in the FEIS evaluated potential site impacts from the construction and operation of the proposed plant(s); in addition, Chapter 10 of the FEIS discusses how future construction may affect the environmental factors that might conflict with the issuance of an ESP, one of the factors being consideration of alternatives to the proposed action. The alternative analyses include potential site impacts from the construction and operation of the proposed plant(s) based on the requirements of the National Environmental Policy Act (NEPA). NEPA requires that the NRC prepare a detailed statement on alternatives to the proposed action for every major Federal action significantly affecting the quality of the human environment. 42 USC § 4332(2)(C).

As the Board observed, if considered in isolation, the Grand Gulf ESP decision will not authorize any construction, and as a result, will not directly result in an environmental impact. However, in determining the "significance" of a Federal action, Council on Environmental Quality (CEQ) regulations state that an agency should consider "[w]hether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts." 40 C.F.R. § 1508.27(b)(7). The fact that the licensing action concerning the Grand Gulf ESP is separate from any potential licensing action concerning the construction and operation of proposed plant(s) does not excuse the NRC from evaluating the potential site impacts from the construction and operation of proposed plant(s) and how future construction may affect the environmental factors that might conflict with the issuance of an ESP when the NRC performs its alternative analyses. It is for this reason that the NRC considered alternative power generating sources and plant design alternatives in addition to alternative sites.

I. Alternative Power Generating Sources

Q.4. In its Order of November 6, 2006, the Atomic Safety and Licensing Board ("Board") identified certain issues to be addressed in connection with the mandatory hearing. With regard to the NRC staff's alternative analyses, the Board asked for a discussion of the review of alternative power generation analysis. Would you address this issue?

A.4. (PH) Yes. The Staff addressed alternative power generating sources, including alternatives not requiring new generating capacity and alternatives that would require new generating capacity. In assessing these alternatives, the Staff used a target value of 2000 MW(e) for the electrical output of a new nuclear generating facility at the ESP site, which was also the value SERI used in its application. FEIS at 8-3.

The Staff considered four alternatives that would not involve new generating capacity. These consisted of purchase of the needed electric power from other suppliers, reactivation of retired power plants, extension of the operating life of existing power plants, and implementation of conservation or demand-side management programs. The Staff concluded that conservation or demand-side management was not a reasonable alternative to an ESP directed at base load electricity generation, and did not further consider this alternative. FEIS at 8-3.

Because of uncertainty concerning factors such as the timing for the construction of a new nuclear generating facility at the Grand Gulf ESP site and whether the plant would be a merchant or a regulated facility – factors which significantly impact the viability of options not involving new generating capacity – the Staff did not evaluate the remaining non-new-generating-capacity alternatives in great detail. With respect to the purchased power alternative, the Staff noted that the environmental impacts of power production would still occur, but would be located elsewhere within the region, nation, or in another country. FEIS at 8-4. The impacts would depend on the generation technology and location of the generation site

and, therefore, are unknown. FEIS at 8-4. Finally, depending on whether new transmission lines and rights-of-way are necessary to receive the purchased power, the Staff concluded that the local environmental impacts could range from SMALL to LARGE.<sup>1</sup> With respect to extension of the life of existing nuclear power plants, the Staff found that although the environmental impacts are significantly less than new construction, continued operation does not provide additional generation capacity. FEIS at 8-5. With respect to refurbishment, the Staff noted that most fossil plants available for refurbishment are older and would require extensive and expensive work to meet current environmental standards. FEIS at 8-5. The Staff concluded that these three alternatives are not reasonable alternatives to providing new base load power generation capacity, and noted that it would be unreasonable for an applicant to proceed with development of a nuclear power plant if the electrical power sought could be reasonably purchased, or could be obtained through reactivation or life extension of existing plants. FEIS at 8-5.

The Staff next considered alternatives involving new generating capacity. These consisted only of sources the Staff considered to be technically reasonable and commercially viable for base load power generation, which were limited to coal-fired and natural gas-fired generation. FEIS at 8-5.

The Applicant evaluated the construction of four 509 MW(e) coal-fired units at the Grand Gulf ESP site in its environmental report. In its evaluation, the Staff also used this assumption.

---

<sup>1</sup> To guide its assessment of environmental impacts of a proposed action or alternative actions, the NRC established a standard for quantifying environmental impacts using the Council on Environmental Quality guidance (40 C.F.R. § 1508.27). FEIS at 1-5, 1-6. Using this approach, the NRC established three significance levels -- SMALL, MODERATE, or LARGE -- that the Staff applied to its findings throughout the FEIS. The NRC Staff's definitions of these significance levels are as follows:

SMALL -- Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE -- Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE -- Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

FEIS at 8-7. The Applicant estimated that the coal-fired plant would consume approximately 6 million MT/yr (6.6 million tons/yr) of pulverized bituminous coal with an ash content of approximately 11.9 percent, and that approximately 223,000 MT (246,000 tons) of lime would be used annually for flue gas desulfurization. FEIS at 8-7.

In terms of air quality, the Applicant estimated the coal-fired plant's annual emissions, including those for sulfur oxides (SO<sub>x</sub>) (12,100 MT (13,340 tons)), nitrogen oxides (NO<sub>x</sub>) (11,600 MT (12,800 tons)), carbon monoxide (CO) (1500 MT (1650 tons)), and particulate matter (PM) (350 MT (390 tons)). FEIS at 8-7. A coal-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming. FEIS at 8-7. The plant would also be subject to emissions caps and the owner/operator would have to obtain pollution credits, certain permits pursuant to the Clean Air Act, and comply with other source performance and visibility standards. FEIS at 8-7, 8-8. The Staff concluded that air quality impacts from coal-fired generation would be MODERATE, noting the analysis in the GEIS on License Renewal (NUREG-1437) that implied substantial air quality impacts and global warming risks from coal-fired plants, as well as the human health effects associated with coal combustion. FEIS at 8-8.

In terms of waste management, the Applicant estimated that a 2000 MW(e) coal-fired plant would generate approximately 711,000 MT (784,000 tons) of ash and spent catalyst and an additional 660,000 MT (728,000 tons) of scrubber sludge annually. FEIS at 8-9. The Staff concluded that the impacts from waste generated at a coal-fired plant would be MODERATE, noting discussion in the GEIS of coal combustion waste products, recent EPA endorsement of regulations to address such products because of health concerns, and the potential land use and groundwater quality impacts of waste disposal. FEIS at 8-9.

With respect to human health impacts, the Staff noted that coal-fired power generation introduces risks from mining, transportation, waste, emissions, and in some circumstances

radiological doses. FEIS at 8-9. However, the Staff concluded that because of regulatory oversight exercised by the EPA and by State agencies, the human health impacts from radiological doses and inhaled toxins and particulates generated from coal-fired generation would be SMALL. FEIS at 8-9, 8-10.

In terms of other environmental impacts, the Applicant stated that a coal-fired plant would require approximately 1085 ha (2680 ac), including approximately 610 ha (1500 ac) to be converted to industrial use for the power block, infrastructure and support facilities, coal and limestone storage and handling, and landfill disposal of ash and scrubber sludge. FEIS at 8-10. Land use changes would also occur offsite in an undetermined coal-mining area to supply coal for the plant. The Staff concluded that the land-use impacts would be MODERATE. FEIS at 8-10. As a result of construction and operations, including coal and limestone mining, construction of a rail spur, and fly ash disposal, the Staff concluded that the ecological impacts could be MODERATE to LARGE. FEIS at 8-10. The Staff found that impacts on water use and quality would be SMALL and comparable to the impacts associated with a new nuclear facility, including the use of cooling water, cooling towers, blowdown, and waste discharge. FEIS at 8-10.

The Staff found that socioeconomic impacts from the coal-fired plant would be SMALL to MODERATE, based on the proximity to the surrounding population area and the relatively small number of workers (about 300) needed to operate the plant. FEIS at 8-11. The Staff also concluded that tax revenues would have a LARGE beneficial impact for Claiborne County. FEIS at 8-11. The Staff also concluded that the visual and aesthetic impacts of a coal-fired generation plant would be MODERATE, based on the presence of power block units and exhaust stacks visible offsite, cooling towers and associated plumes, and mechanical noise audible offsite (particularly rail delivery of fuel), though some of these impacts are intermittent or could be visually mitigated. FEIS at 8-11, 8-12. The Staff found that the historic and cultural

resource impacts would be SMALL (in light of the impacts from construction and operation of the existing GGNS), that environmental justice impacts would be LARGE and beneficial (given high property tax revenues), and that other construction and operation impacts would be SMALL. FEIS at 8-12.

The Applicant also evaluated natural gas-fired generation in its environmental report using combined-cycle combustion turbines and employing four units with a net capacity of 508 MW(e) per unit. In its evaluation, the Staff also used these assumptions. FEIS at 8-14.

In terms of air quality, the Staff found that compared with a coal-fired plant, a natural gas-fired plant would release similar types of emissions but in lower quantities. FEIS at 8-14. The Applicant estimated that a natural gas-fired plant equipped with appropriate pollution control technology would annually emit approximately 109 MT (120 tons) of SO<sub>x</sub>, 417 MT (460 tons) of NO<sub>x</sub>, 553 MT (610 tons) of CO, and 63 MT (70 tons) of PM<sub>10</sub> (particulate matter having an aerodynamic diameter less than or equal to 10 µm). FEIS at 8-15. The owner/operator would also have to obtain certain permits pursuant to the Clean Air Act, and comply with other stationary source and visibility standards. FEIS at 8-14. The Staff concluded that air quality impacts from new natural gas-fired power generation at the ESP site would be SMALL to MODERATE. FEIS at 8-15.

With respect to waste management, the Staff noted the finding in the GEIS that waste generation from natural gas is minimal; the Staff thus concluded that waste impacts from natural gas-fired power generation would be SMALL. FEIS at 8-15. With respect to human health risks, while the Staff noted its finding in the GEIS analysis that cancer and emphysema are potential health risks from natural gas-fired plants, it noted Mississippi Department of Environmental Quality (MDEQ) regulation of the ESP site and concluded that the impacts would be SMALL. FEIS at 8-15, 8-16.

In terms of other environmental impacts, the Applicant estimated that a natural gas plant would need approximately 91 ha (225 ac), including the power block and support facilities, cooling towers and support systems, and a natural gas pipeline. FEIS at 8-16. For any new natural gas-fired power plant, additional land would be necessary for natural gas wells and collection stations. FEIS at 8-16. In light of this relatively small land disturbance, the Staff concluded that land-use impacts from new natural gas-fired power generation would be SMALL, and ecological impacts would be SMALL to MODERATE. FEIS at 8-16. Based on the analysis in the GEIS, the Staff concluded that impacts on water use and quality would be SMALL. FEIS at 8-16.

With respect to socioeconomic impacts, the Staff concluded that based on the proximity to the surrounding population area and the relatively small number of workers (approximately 150) needed to construct and operate the plant in comparison to nuclear and coal-fired generation, the impacts would be SMALL. FEIS at 8-16, 8-17. The Staff concluded that the tax revenues would have a MODERATE beneficial impact on Claiborne County. FEIS at 8-17.

Although the turbine buildings, exhaust stacks (and emissions), cooling towers and associated plumes, and gas pipeline compressors would be visible offsite, and some noise would be audible offsite, the Staff concluded that the visual and aesthetic impacts of a natural gas-fired generation plant would be SMALL. FEIS at 8-17. Some of these impacts would be mitigated by the industrial and rural location and relatively smaller land use. FEIS at 8-17. The Staff found that the historic and cultural resource impacts would be SMALL (in light of the existing GGNS), that environmental justice impacts would be MODERATE and beneficial (given moderate property tax revenues), and that other construction and operation impacts would be SMALL. FEIS at 8-17.

SERI's application also identified other energy alternatives. However, as new nuclear units at the ESP site would constitute a base load generation plant, and the Applicant

determined that these alternatives either could not generate base load power or could not do so economically, it concluded that these alternatives were not reasonable. FEIS at 8-19. These alternatives included oil-fired generation, wind, solar, hydroelectric, geothermal, wood waste, municipal solid waste, biomass-derived fuels, and fuel cells. FEIS at 8-19 to 8-22. Based on its independent review (including, for some issues, reliance on the analysis in the GEIS), the Staff determined that SERI's conclusion – that these alternatives are not reasonable – is acceptable. FEIS at 8-19.

The Staff concluded that oil-fired generation has become more expensive than nuclear or coal-fired generation options and is likely to become even less economical in the future, particularly as a fuel source for a base load plant. FEIS at 8-19. The Staff found that Mississippi does not have sufficient wind resources to use large-scale wind turbines and that wind turbines typically do not operate at a capacity factor comparable to a base load plant, making them an uneconomical alternative. FEIS at 8-19, 8-20. With respect to solar power, the Staff found that it would be uneconomical because of solar power's higher capital cost per kilowatt of capacity, high energy storage requirements (limiting its use as a base load supply), and high land requirements. FEIS at 8-20.

Similarly, because of the relatively low amount of undeveloped hydropower resources in Mississippi and the large land and related environmental and ecological resource impacts (flooding, destruction of natural habitat, and alteration of natural river courses) associated with siting hydroelectric facilities large enough to produce 2000 MW(e), the Staff concluded that local hydropower was not a feasible alternative. FEIS at 8-20, 8-21. Although geothermal energy has an average capacity factor of 90 percent and can be used for base load power where available, the Staff found that no feasible eastern location for geothermal capacity can serve as an alternative to a base load nuclear power plant, making it an unreasonable alternative to the proposed ESP site. FEIS at 8-21.

Because of uncertainties associated with obtaining sufficient wood and wood waste to fuel a base load power plant (larger wood-waste power plants are typically only 40 to 50 MW(e) in size), the ecological impacts of large-scale timber cutting (for example, soil erosion and loss of wildlife habitat), and high inefficiency, the Staff concluded that wood waste is not a feasible alternative. FEIS at 8-21. Similarly, with respect to use of municipal solid waste, only about 89 waste-to-energy plants are operating in the United States, with an average output of approximately 28 MW(e) per plant; the Staff concluded that this would not constitute a feasible base load alternative to the proposed ESP site. FEIS at 8-22.

With respect to other biomass-derived fuels, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste), the Staff concluded, based on the analysis in the GEIS, that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a large base load plant, and thus they do not represent reasonable alternatives. FEIS at 8-22. Finally, with respect to fuel cells, although significant efforts have been made to develop more practical and affordable fuel cell designs for stationary power applications, the Staff concluded that fuel cells currently are not economically or technologically competitive with other alternatives for base load electricity generation, and their future competitiveness compared to other fuels is speculative. FEIS at 8-22, 8-23. The Staff therefore concluded that fuel cells are not a reasonable alternative to nuclear generation at the proposed ESP site. FEIS at 8-23.

The Staff also considered the possibility that some combination of alternatives might be more economical than the construction of a new base load plant at the proposed ESP site. Of the many possible combinations, the Staff evaluated the environmental impacts of an assumed combination of three 508 MW(e) natural gas combined-cycle generating units at the Grand Gulf ESP site using closed-cycle cooling with cooling towers, 30 MW of wind energy, 30 MW of hydropower, 90 MW from biomass sources including municipal solid waste, and 326 MW from

conservation and demand-side management programs. FEIS at 8-23, 8-24. However, after comparing the environmental impacts with those assessed for the proposed plant at the ESP site, the Staff concluded that, from an environmental perspective, none of the viable energy alternatives were clearly preferable to construction of a new base load nuclear power generation plant. FEIS at 8-24 to 8-26.

## II. Plant Design Alternatives

Q.5. In its Order of November 6, 2006, the Atomic Safety and Licensing Board ("Board") identified certain issues to be addressed in connection with the mandatory hearing. With regard to the NRC staff's alternative analyses, the Board asked for a summary of the plant design alternatives analysis. Would you address this issue?

A.5. (LV) Yes. In its environmental report, SERI described the process behind its decision to propose natural or mechanical draft cooling towers or both with a makeup water intake in the Mississippi River and a blowdown discharge outfall downstream of the intake. FEIS at 8-24. SERI considered seven heat-dissipation alternatives in its environmental report, including once-through cooling, wet mechanical draft cooling towers, wet natural draft cooling towers, wet-dry cooling towers, dry cooling towers, a cooling pond, and spray canals. FEIS at 8-26, 8-27. After ruling out other options for various reasons, SERI only included wet natural draft and wet mechanical draft cooling towers in its PPE. FEIS at 8-27. Based on its independent review - including a determination that the Mississippi River is not suited for once-through cooling, that land limitations make the site unsuitable for cooling pond or spray canal heat-dissipation designs, and that dry cooling technology has some detrimental effects on electricity production by reducing the energy efficiency of steam turbines - the Staff agreed that the other options were not suitable and concluded that wet mechanical draft cooling towers and wet natural draft cooling towers are suitable for the site. FEIS at 8-27, 8-28. However, system

design alternatives would be discussed at the CP or COL stage, because a specific cooling system design for the Grand Gulf ESP site has not been selected. FEIS at 8-28, 8-29.

For its intake system, SERI proposed to withdraw makeup water for the heat-dissipation system and the circulating water system directly from the Mississippi River through a shoreline embayment and intake constructed on the bank of the river. FEIS at 8-29. SERI considered two alternative types of water intake - either a direct intake from the river with a structure located on the riverbed and a pipeline connecting it to the bank, or a channel directing water to the intake structure on the shoreline - and the Staff found no basis to suggest that these alternatives would be environmentally preferable to SERI's proposed intake system. FEIS at 8-29.

For its discharge system, SERI stated that the thermal effluent from a new facility would also be released to the river through a new outfall structure that would be located downstream of the existing outfall. FEIS at 8-30. The Staff evaluated a shoreline diffuser outfall and a submerged single-point discharge, but it found no basis to suggest that the two discharge alternatives would be environmentally preferable to SERI's proposed discharge system. FEIS at 8-30.

In terms of water supply, the Staff did not identify any other water supply environmentally preferable to the Mississippi River and wells in the alluvial aquifer. FEIS at 8-30. Finally, with respect to water treatment, the Staff noted that although the water treatment requirements and water system effluents are not known, all chemical and thermal discharges would be regulated by the MDEQ through the National Pollutant Discharge Elimination System (NPDES) process. FEIS at 8-30.

### III. Alternative Sites

Q.6. In its Order of November 6, 2006, the Atomic Safety and Licensing Board ("Board") identified certain issues to be addressed in connection with the mandatory hearing.

With regard to the NRC staff's alternative analyses, the Board asked for a summary of the alternative sites analysis, including (i) site screening procedures; (ii) impact assessment for ESP's unresolved issues; and (iii) summary of alternative site comparison. Please address these issues.

A. Alternative Site Screening Selection Process

A.6. (PH) Regarding the site screening procedures, the Staff examined Entergy's region of interest ("ROI") for possible siting of a new nuclear power plant, as well as its alternative site selection process. (Entergy Nuclear, a division of Entergy Corporation, conducted the alternative site selection process for the Grand Gulf ESP application). FEIS at 8-31. Entergy Nuclear selected its ROI for examining potential ESP sites as the locations of seven existing Entergy sites with operating nuclear power plants licensed by the NRC at the time of its application for an ESP: Arkansas Nuclear One, Grand Gulf Nuclear Station, James A. FitzPatrick Nuclear Power Plant, Indian Point Energy Center, Pilgrim Nuclear Station, River Bend Station, and Waterford-3. FEIS at 8-31. The application explained that these sites were identified for several reasons. For example, NRC has approved the sites for nuclear plant construction and operation, site characterization data have been collected and are available, the operational impact of the existing nuclear plants is documented, and the sites and related facilities are controlled by Entergy. FEIS at 8-32. The Staff concluded that the criteria used to identify the ROI were reasonable for consideration and analysis of potential ESP sites. FEIS at 8-32.

The application next explained how Entergy Nuclear further screened its site list. It first removed Indian Point due to greater population density in the site vicinity. FEIS at 8-33. It then ranked the remaining sites with respect to 11 weighted screening criteria, including pricing, seismic evaluation, water availability, exclusion area, and spent fuel storage. FEIS at 8-33, 8-34. In the interest of regional and market diversity and to gain ESP experience in

different environments, Entergy removed Waterford and Arkansas-One (its 4th and 5th ranked sites), but retained Pilgrim for further evaluation, along with Grand Gulf, River Bend, and FitzPatrick, its top three sites. FEIS at 8-33. The Staff concluded this was a reasonable basis for narrowing the sites for examination. FEIS at 8-34.

To narrow its site selection to a final site, Entergy Nuclear ranked the sites using a final set of 34 weighted screening criteria, including flooding, accident effects, radionuclide pathways, socioeconomics, highway and rail access, and labor rates. FEIS at 8-35 to 8-37. This resulted in an ordered ranking of Grand Gulf, FitzPatrick, River Bend, and Pilgrim. The Staff concluded that the overall site selection process for alternative sites was reasonable and that the identification of the Grand Gulf ESP site was consistent with that approach. FEIS at 8-37.

B. Comparison of Impacts (Including Impacts for Unresolved Issues) for the Proposed and Alternative Sites

In its environmental report, the Applicant examined the River Bend, Pilgrim, and FitzPatrick alternative sites in detail. The Staff conducted its own independent examination, including visiting each of the three alternative sites to collect additional reconnaissance-level information. The Staff also visited the Grand Gulf ESP site. FEIS at 8-37, 8-38. The Staff found that SERI reasonably identified alternative sites, adequately evaluated the environmental impacts of construction and operation, and used a logical means of comparing sites. FEIS at 9-2. To compare the proposed action with the alternatives, the Staff weighed the impact significance levels (SMALL, MODERATE, or LARGE) it had determined with respect to the Grand Gulf ESP site for each major impact area with the corresponding levels for each of the three identified alternative sites. FEIS at 9-2. Where the Staff had been unable to reach a single determination level for the Grand Gulf ESP site due to insufficient information, the Staff

indicated a likely impact level for unresolved issues – so that a comparison could be made – based on professional judgment, experience, and consideration of controls likely to be imposed under required Federal, State, or local permits that would not be acquired until an application for a construction permit or combined license is underway. FEIS at 9-2. The Staff believes that the impact levels that were assigned in these areas are sufficiently defined for the purposes of comparison between the proposed and the alternative sites. The final impact assessment of construction and operation of new nuclear units at the Grand Gulf ESP site would be performed at the CP or COL stage for issues that were not resolved during the review of the ESP application. The alternative sites do not have unresolved impacts because impacts at alternative sites were evaluated using reconnaissance-level information.

The Staff determined that the impact level from construction would be SMALL for most of the environmental issues at each of the sites. See FEIS at Table 9-1. The Staff's issue-by-issue construction impact determinations are explained more fully in Chapter 4 of the FEIS for the Grand Gulf ESP site and in Chapter 8 for the alternative sites. The Staff found that construction of transmission corridors at the Pilgrim and FitzPatrick sites would have SMALL to MODERATE land use impacts. FEIS at 9-5. For terrestrial ecosystems, the Staff determined that impacts would likely be MODERATE at Grand Gulf and River Bend and as much as LARGE at FitzPatrick because of probable impacts to forests and wetlands and associated habitats. FEIS at 9-5. For threatened and endangered species, the Staff determined that impacts would likely be SMALL to MODERATE at River Bend and MODERATE TO LARGE at Pilgrim because of potential impacts to protected species. FEIS at 9-5. The Staff found socioeconomic and environmental justice impacts ranging from SMALL to MODERATE adverse impacts in some aspects, and up to LARGE beneficial impacts in other aspects, such as social and economic benefits because of tax revenue. FEIS at 9-5.

Similarly, the Staff determined that the impact level from operations would be SMALL for most of the environmental issues at each site. See FEIS Table 9-2. Once again, the Staff's issue-by-issue operational impact determinations are explained more fully in Chapter 5 of the FEIS for the Grand Gulf ESP site and in Chapter 8 for the alternative sites. Exceptions to the Staff's findings of SMALL impacts from operations included aquatic and terrestrial ecosystems and threatened and endangered species at the Pilgrim site, arising from potential impacts to the winter flounder larvae and on the redbelly turtle. FEIS at 9-5. Additionally, the Staff's findings concerning social and economic impacts in socioeconomics at the alternative sites included LARGE to SMALL beneficial impacts, principally due to added tax revenue and beneficial impacts on the local economy. FEIS at 9-5. The Staff determined that social and economic impacts at the Grand Gulf ESP site would be LARGE and beneficial, while impacts on infrastructure and community services would be MODERATE adverse at the Grand Gulf ESP site and SMALL to MODERATE adverse at the alternative sites. FEIS at 9-5. Finally, the Staff found that environmental justice impacts would be SMALL at the alternative sites, but up to LARGE and beneficial at the Grand Gulf ESP site. FEIS at 9-5, 9-6.

C. Summary of Alternative Site Comparison

The Staff then analyzed whether any of the alternative sites are environmentally preferable to the Grand Gulf site. First, with respect to construction impacts, while the Staff concluded that impacts were generally SMALL for all four analyzed sites, the Staff identified several differences between the environmental impacts of construction at the proposed and alternative ESP sites. FEIS at 9-6. However, while the Grand Gulf site had some higher adverse impacts with respect to demographics, terrestrial ecosystems and infrastructure and community services (as well as one area, social and economic benefits from tax revenues, of significantly higher beneficial impacts), the Staff found that each alternative site had higher adverse impacts for the same issues or in other respects. FEIS at 9-6. The Staff concluded

that none of the differences were sufficient to determine that any of the alternative sites is environmentally preferable to the Grand Gulf ESP site. FEIS at 9-6.

Second, with respect to operational impacts, the Staff again noted that impacts were generally SMALL for all four analyzed sites, and identified several differences between the environmental impacts at the proposed and alternative ESP sites. FEIS at 9-7. However, while the Grand Gulf site again had some higher adverse impacts with respect to demographics and infrastructure and community services (and also had significantly higher potential social and economic benefits), the Staff found that the alternative sites had, on the whole, either closely comparable impacts or slightly less beneficial impacts than the Grand Gulf site. FEIS at 9-7. The Staff again concluded that none of the differences were sufficient to determine that any of the alternative sites is environmentally preferable to the Grand Gulf ESP site. FEIS at 9-7.

Because the Staff determined that none of the alternative sites was environmentally preferable to the Grand Gulf ESP site, it concluded by extension that none of the alternative sites is obviously superior to the Grand Gulf ESP site. FEIS at 9-7.

Finally, the Staff compared the proposed action with the no-action alternative. The Staff noted that denial of the ESP application would prevent early resolution of safety and environmental issues for the site, and it further found that although SERI could follow any of several paths to satisfy its electric power needs, each of the paths would have associated environmental impacts. FEIS at 9-7, 9-8. The Staff additionally concluded that no significant environmental impacts would be avoided by the no-action alternative because no such impacts are caused by a site-suitability determination. FEIS at 9-8.