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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)	)	ASLBP No. 04-823-03-ESP

PRE-FILED TESTIMONY OF GEORGE A. ZINKE, MARVIN MORRIS, JOHN G. CESARE, WILLIAM R. LETTIS, AND JEFFREY L. BACHHUBER ON BEHALF OF APPLICANT CONCERNING HEARING ISSUE H (CONTINUITY BETWEEN THE ESP STAGE AND COL STAGE)

Q1. Please state your name, current position, and by whom you are employed.

A1. My name is George A. Zinke ("GAZ"). I am employed as the Project Manager, Business Development, for Entergy Nuclear, Inc.

A1. My name is Marvin Morris ("MM"). I am employed as a consulting engineer and analyst for ENERCON Services, Inc.

A1. My name is John G. Cesare ("JGC"). I am employed as Lead Licensing Project Engineer for ENERCON Services, Inc.

A1. My name is William R. Lettis ("WRL"). I am employed as the President and Principal Geologist of William Lettis & Associates, Inc.

A1. My name is Jeffrey L. Bachhuber ("JLB"). I am employed as the Vice President, Senior Principal Engineering Geologist of William Lettis & Associates, Inc.

Q2. On whose behalf are you testifying in this proceeding?

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SECY-02

A2. (GAZ, MM, JGC, WRL, JLB) We are providing testimony on behalf of the applicant in this early site permit ("ESP") proceeding, System Energy Resources, Inc. ("SERI" or the "Applicant").

Q3. Please describe your professional qualifications.

A3. (GAZ) I hold a B.S. degree in Electrical Engineering from Wichita State University. I have over 30 years of technical and management experience in the commercial nuclear power industry. Since joining Entergy Nuclear, Inc. as a Project Manager in 1997, I have focused principally on business development matters involving the company's Grand Gulf Nuclear Station ("GGNS") ESP and combined operating license ("COL") Development projects, as well as the NuStart COL Development Project. Prior to that, I held various managerial and supervisory positions at the Maine Yankee and GGNS facilities, where I was responsible for overseeing various licensing, system engineering, quality assurance, worker concerns, emergency preparedness, and environmental programs related to facility operation and decommissioning. A full statement of my professional qualifications is contained in SERI Exhibit 1.

A3. (MM) I hold a B.S. degree in Mathematics from the University of Texas, Pan American, and an M.S. degree in Physics from Sam Houston State University. I have over 30 years of experience in the nuclear industry in areas of design, analysis, licensing and operations support. A full statement of my professional qualifications is contained in SERI Exhibit 1.

A3. (JGC) I hold a B.S. degree in Chemical Engineering and an M.S. degree in Nuclear Engineering from Mississippi State University. I have over 24 years of experience in the nuclear power industry, including experience in the areas of new reactor, operational and decommissioning licensing; special projects; organizational assessment; and management

support. This includes ten years of supervisory and management experience at a Boiling Water Reactor ("BWR") facility. A full statement of my professional qualifications is contained in SERI Exhibit 1.

A3. (WRL) I hold a Ph.D. and an M.S degree in Geology from the University of California, Berkeley, and a B.S. degree in Geology and a B.S. degree in Forestry from Humboldt State University. I have over 20 of years experience performing regional and site investigations to assess geologic and seismic hazards for large engineered facilities, including bridges, dams, nuclear and fossil fuel plants, pipelines, and Liquid Natural Gas ("LNG") terminals. A full statement of my professional qualifications is contained in SERI Exhibit 1.

A3. (JLB) I hold an M.S. and B.A. degrees in Geology from San Jose State University. I am a Certified Engineering Geologist in California with over 20 years of professional experience performing geologic/geotechnical studies for nuclear and other critical facilities throughout the United States, Peru, Dominican Republic, Puerto Rico, Korea, Indonesia, Japan, and Turkey. I have performed detailed site investigations in a variety of geologic settings, in addition to regional hazard mapping and facility siting and routing studies. These projects involved assessment of earthquake hazard and sources, fault rupture and ground failure analysis, slope stability analysis and mitigation design, karst and void identification and treatment, foundation characterization with borings and geophysical techniques, laboratory testing, failure mode assessment, and development of foundation criteria for detailed static and dynamic stability and site response analyses (including soil-structure interaction) A full statement of my professional qualifications is contained in SERI Exhibit 1.

Q4. Please describe your professional responsibilities with regard to the Grand Gulf ESP application, including the basis for your familiarity with that application.

A4. (GAZ) As the Project Manager, Business Development, for Entergy Nuclear, Inc., I have two different but complementary roles. Namely, I am both the NuStart Licensing Lead and the Entergy Nuclear New Plant Licensing Lead. In the former capacity, I am responsible for regulatory affairs associated with the NuStart COL Development Project. Entergy is a member of NuStart Energy Development, LLC, a consortium formed in 2004 that is seeking to facilitate the licensing, construction, and operation of new, advanced nuclear power plants in the United States. In the latter capacity, I am responsible for regulatory affairs and quality assurance associated with the Entergy COL Development Process. The acquisition of an ESP for the GGNS site is a preliminary and integral step in the Entergy COL Development Process. As such, I have overall responsibility for regulatory and engineering matters related to the Grand Gulf ESP application.

A4. (MM) As part of a larger ENERCON team, I served as a consultant to SERI and supported the development of the ESP application that seeks to demonstrate site suitability for a new commercial nuclear power plant at the GGNS site. As a senior engineer, I was responsible for analyses supporting the application in the areas of offsite hazards, atmospheric dispersion, design basis accidents, and severe accidents. My responsibilities included Sections 2.3, 3.2, and 3.3 of the SSAR and Sections 2.7, 5.4, and 7.1 of the ER.

A4. (JGC) As part of a larger ENERCON team, I served as a consultant to SERI and supported the development of the ESP application that seeks to demonstrate site suitability for a new commercial nuclear power plant at the GGNS site. As the lead licensing project engineer, I coordinated and supported the development of the safety analyses, environmental report, and emergency planning assessment for the ESP application. I also participated in site safety and environmental visits, the development of applicant responses to Nuclear Regulatory Commission

("NRC") Staff requests for additional information ("RAIs"), and the Advisory Committee on Reactor Safeguards ("ACRS") review process. My work also involved active participation in the industry ESP task force and numerous licensing-related interactions with the NRC Staff.

A4. (WRL) As Project Manager for the seismic and geotechnical work in support of the Entergy Grand Gulf ESP, my responsibilities included preparation of Sections of 2.5.1 through 2.5.6 of the Site Safety Analysis Report ("SSAR"), including seismic source characterization and probabilistic seismic hazard analysis used to develop the Safe Shutdown Earthquake ("SSE") design ground motion in compliance with Regulatory Guide 1.165, and geotechnical characterization of the site in partial compliance with Regulatory Guides 1.138 and 1.132.

A4. (JLB) I was responsible for developing detailed site geotechnical characterization for the Grand Gulf ESP site. My work regarding the Grand Gulf ESP included developing Quality Assurance/Quality Control ("QA/QC") technical procedures and workplans to guide all field and laboratory activities, directing field investigations consisting of geologic mapping, deep mud rotary borings, Cone Penetrometer Test ("CPT") soundings, borehole P-S velocity surveys, and SASW surface surveys. I also prepared Sections 2.5.4 to 2.5.6 for the SAR, responded to NRC RAIs, and presented the project to the ACRS in a formal meeting.

Q5. In an Order (Requesting Specific Summary Exhibits and Supplemental Briefs; Identifying Hearing Issues and Requesting Evidentiary Presentations on Specific Issues) of November 6, 2006, the Atomic Safety and Licensing Board ("Board") identified a series of hearing issues on which the Board has required testimony and presentations from the NRC Staff. The Staff submitted its pre-filed testimony on November 20, 2006. *See* NRC Staff Pre-Filed

Testimony Concerning Hearing Issue H: "Continuity Between The Esp Stage And Col Stage" (Nov. 20, 2006). Have you reviewed the Staff's testimony on Hearing Issue H?

A5. (GAZ, MM, JGC, WRL, JLB) Yes.

Q6. During the October 31, 2006, pre-hearing conference, the Board expressly authorized the Applicant, as appropriate, to submit supplemental pre-filed testimony for the limited purpose of clarifying and/or providing additional factual information that may inform the Board's mandatory hearing review and decision-making process. *See* Transcript of October 31, 2006, Pre-hearing Conference at 8. Do you wish to provide any such supplemental testimony at this time?

A6. (JGC) Yes. I am offering supplemental testimony with respect to Answer 4 and Exhibit 8 of the Staff's pre-filed testimony.

A6. (WRL, JLB) Yes. We are offering supplemental testimony with respect to Answer 5 of the Staff's pre-filed testimony.

A6. (GAZ, MM) No. We are prepared, however, to respond orally to any questions germane to Hearing Issue H that the Board may ask of us during the evidentiary hearing.

Q7. Turning to Answer 4 and Exhibit 8 of the Staff's pre-filed testimony, please provide any additional information that you believe is necessary.

A7. (JGC) In Answer 4 and Exhibit 8, the Staff states that COL Action Items "call for a set of design information to be provided by any future applicant referencing the ESP" (emphasis added). By way of clarification, COL Action Items directly or indirectly deal with design-related issues and information. Some COL Action Items call for obtaining site characterization information at COL that would subsequently be used to confirm the adequacy of design or used in an analysis of a design related matter. For example, COL Action Item 2.3-2

requires the applicant to evaluate dispersion of airborne radioactive materials to the control room. Control room X/Q is a site characteristic, but is dependent on design information and site meteorological information (FSER 2.3.4.3 at 2-57). Moreover, these items constitute information requirements only and an applicant may depart from or omit COL Action Items, provided that the departure or omission is identified and justified in the FSAR. *See* FSER at A-4.

Q8. Turning to Answer 5 of the Staff's pre-filed testimony, please provide any additional information that you believe is necessary.

A8. (JLB, WRL) In Answer 5 of the Staff's pre-filed testimony, the Staff states that a reactor referencing the ESP would be about 140 ft. below grade (Elevation -5 feet), and that soil above Elevation -5 ft. needs to be removed to allow the construction of the foundation mat. This response provides additional clarification of this statement.

Foundation Depth

The Environmental Report plant parameters envelope (PPE; Table 3.0-1) lists the ESP bounding foundation embedment depth as 140 feet. This depth is the maximum depth of the bottom of the foundation basemat, as measured from the finished plant grade (assumed at approximately elevation 133 feet above mean sea level (MSL)) for any reactor design considered in the ESP Application. The relative location and elevation of this bounding depth with respect to the existing ground surface is shown on SSAR Figures 2.5-75 through 2.5-77 (geologic cross sections A-A', B-B', and C-C'), and labeled as "likely maximum foundation depth range within Proposed PPBA" (Proposed Power Block Area). The corresponding elevation of this maximum bounding embedment depth is approximately elevation (-)7 feet MSL.

Other plant technologies considered in the ESP Application have basemat elevations that are shallower than the bounding embedment depth, typically within the range of about 30 to 70 feet below finished plant grade. The stability and foundation suitability of subsurface materials that occur between assumed finished plant grade and the bounding maximum foundation depth range (and below this depth range throughout the likely range of foundation influence) were specifically evaluated with respect to the varying technologies and possible embedment depths. This evaluation included compilation and review of about twenty existing borings from the Unit 1 Updated Final Safety Analysis Report ("UFSAR") that are within and adjacent to the ESP reactor building envelope (*See* SERI Exhibit 3; SSAR Figure 2.5-69), drilling and sampling of three ESP borings, four ESP cone penetrometer soundings, seismic velocity surveys in the ESP borings, and laboratory static and dynamic testing of ESP borehole samples. On the basis of this evaluation, Section 2.5.4.6 of the SSAR recommends that the plant foundations be founded in Upland Complex alluvium at, or below, the bottom of loess deposits at approximately elevation 97 feet MSL (depth of 36 feet) or lower where the average shear wave velocity exceeds 1,000 feet per second and materials consist of dense alluvium.

Responses provided by the NRC staff in pre-filed testimony on this hearing issue reference foundation embedment depths of between 120 and 140 feet (average depth of 130 feet). This depth correlates to the PPE bounding embedment depth for ESP foundations, rather than a minimum or design depth that could be at shallower depths according to the ESP evaluation.

Shear Wave Velocity

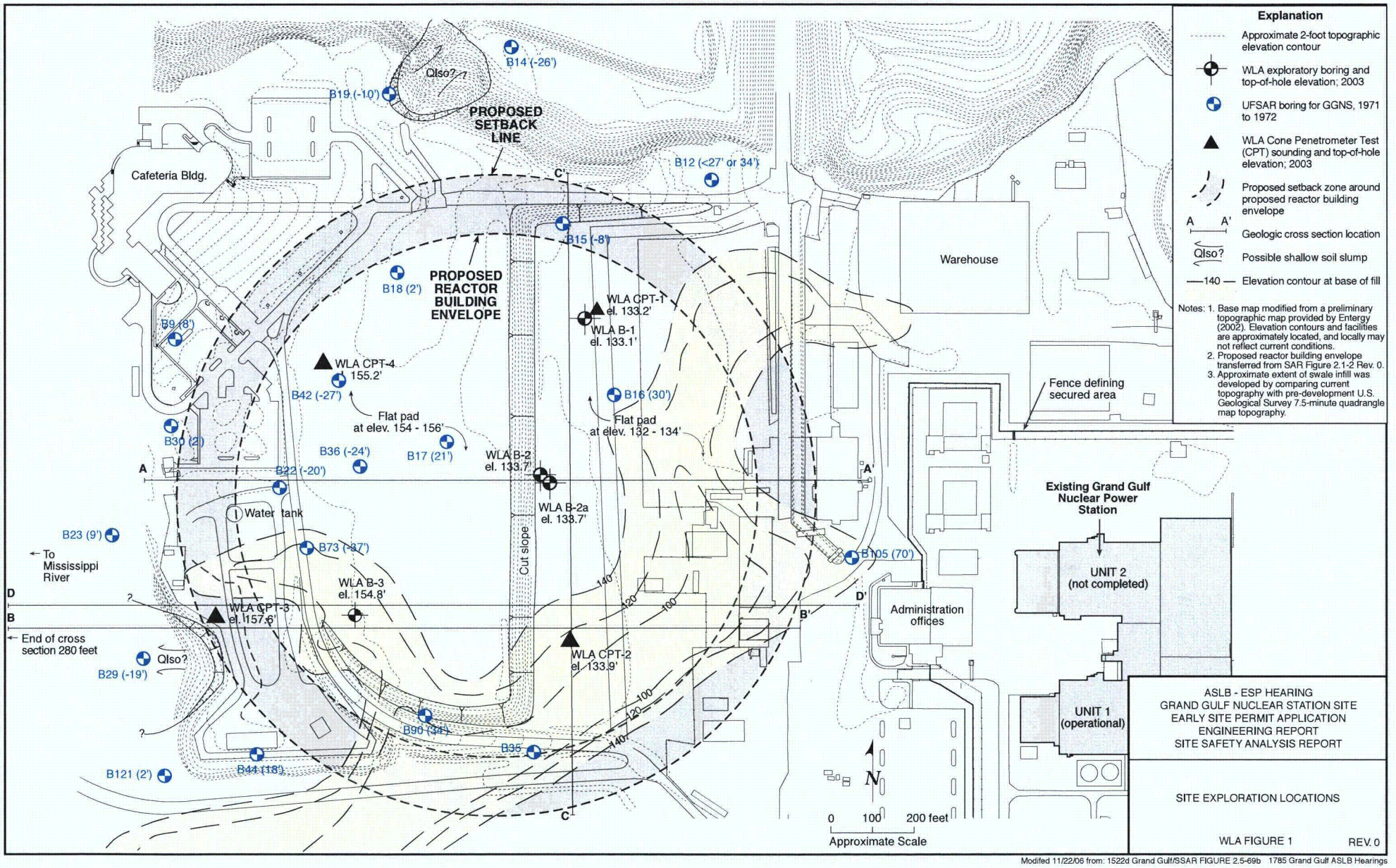
Some plant designs considered in the ESP Application reference a minimum 1,000 feet-per-second ("fps") shear wave velocity ("Vs") requirement for soils below the safety-related

plant foundation basemat. Shear wave measurements of site subsurface materials were obtained by borehole P-S suspension surveys in each of the three ESP borings distributed within the proposed reactor building envelope (SSAR Figure 2.5-80). Based on the results from the ESP velocity surveys, Section 2.5.4.6 of the SSAR states that the average Vs exceeds 1,000 fps (in Upland Complex Alluvium) at, and below, approximately elevation 97 feet MSL (depth of about 36 feet below assumed finished plant grade elevation 133 feet MSL). Plant basemat (foundation) elevations above this level would require overexcavation of soils down to material exhibiting an average shear wave velocity of 1,000 fps, or alternatively in-situ improvement (e.g. grouting). Excavated soils would be replaced with engineered fill (e.g., lean concrete) that exhibits an average Vs of 1,000 fps or greater.

The shear wave velocity criteria and foundation engineering approaches presented in the ESP SSAR permit plant foundation basemat embedment in Upland Complex alluvium at depths substantially less than the depth range of 120 to 140 feet referenced by the NRC Staff in their responses.

Q.9 Does this conclude your testimony?

A.9 (JGC, WRL, JLB) Yes.



Modifed 11/22/06 from: 1522d Grand Gulf/SSAR FIGURE 2.5-69b 1785 Grand Gulf ASLB Hearings

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CERTIFICATE OF SERVICE

I hereby certify that copies of System Energy Resources Inc. Prefiled Testimony Concerning Hearing Issue [A Through I], with associated exhibits, in the above captioned proceeding have been served as shown below by deposit in the United States Mail, first class, this 22nd day of November, 2006. Additional service has also been made this same day by electronic mail as shown below.

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