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Supplement 5

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 67 Related to ESBWR Design Certification Application – Design Of Structures, Components, Equipment, and Systems - RAI Number 3.9-35 S01**

Enclosure 1 contains GEH's response to the subject NRC RAI transmitted via e-mail on May 24, 2007. GE's original response was provided in the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 06-464, Letter from David Hinds to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 67 Related to ESBWR Design Certification Application –DCD Section 3.9 – RAI Numbers 3.9-4 through 3.9-11, 3.9-17, 3.9-18,3.9-23, 3.9-26, 3.9-27, 3.9-29, 3.9-32, 3.9-34 through 3.9-36, 3.9-38 through 3.9-40, 3.9-44, 3.9-46 through 3.9-55, 3.9-57, 3.9-59, 3.9-60, 3.9-67, 3.9-72 through 3.9-76, 3.9-79, 3.9-80, 3.9-91 through 3.9-94, 3.9-96 through 3.9-99, 3.9-101, 3.9-102, 3.9-104, 3.9-105, 3.9-108, 3.9-110, 3.9-132, 3.9-140, 3.9-142, 3.9-147, 3.9-150, 3.9-151, and 3.9-153*, dated November 22, 2006

Enclosure:

1. MFN 06-464. Supplement 5 - Response to Portion of NRC Request for Additional Information Letter No. 67 Related to ESBWR Design Certification – Design of Structures, Components, Equipment, and Systems - RAI Number 3.9-35 S01

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	eDRF	0000-0075-1661

Enclosure 1

MFN 06-464, Supplement 5

Response to Portion of NRC Request for

Additional Information Letter No. 67

Related to ESBWR Design Certification Application -

Design Of Structures, Components, Equipment, and Systems

RAI Number 3.9-35 S01

The Original Responses to RAI 3.9-35 and RAI 3.12-32 (revised) that were previously submitted under MFN 06-464 and MFN 06-119, Supplement 1 are included to provide historical continuity during review.

NRC RAI 3.9-35

In DCD Tier 2, Section 3.7.2.3, for seismic analysis modeling, the amplified response spectra are generally specified at discrete building nodal points. No discussion is provided for the incorporation of any additional flexibility between these points and the pipe support (e.g., supplementary steel) in the piping analysis model. Provide a general discussion on the effects of this additional flexibility on the amplified response spectra, considering different varieties of pipe supports.

GEH Response

Pipe supports are designed and qualified to satisfy stiffness values that are used in the pipe analysis. For struts and snubbers, the stiffness to consider is the combined stiffness of strut, snubber, pipe clamp and pipe support steel. For other type of supports, it is demonstrated that the support is dynamic rigid to preclude amplification. Also see response to RAI 3.12.32(2).

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 3.12-32

DCD Tier 2, Section 3.7.3.3.1, provides some limited information about modeling the stiffness of guides and snubbers by using representative stiffness values. Some additional information about snubbers is provided in DCD Tier 2, Section 3.9.3.7.1, which describes the procedures to ensure that the spring constant achieved by the snubber supplier matches the spring constant used in the piping system model. However, the DCD does not adequately describe how the representative stiffness values are developed for all supports other than snubbers. Therefore, describe (1) the approach used to develop the representative stiffness values, (2) the procedure that will be imposed to ensure that the final designed supports match the stiffness values assumed in the piping analysis, (3) the procedure used to consider the mass (along with the support stiffness) if the pipe support is not dynamically rigid, and (4) the same information [(1), (2), and (3) above] for the building steel/structure (i.e., beyond the NF jurisdictional boundary) and for equipment to which the piping may be connected to.

GE Revised Response

(1) Standard stiffness values developed for a ABWR project will be used.

(2) Pipe supports will be designed and qualified to satisfy stiffness values used in the piping analysis. For struts, snubbers, the stiffness to consider is the combined stiffness of strut, snubber, pipe clamp and piping support steel.

(3) In general, pipe support component weights, which are directly attached to a pipe such as a Clamp, Strut, Snubber and Trapeze are considered in piping analysis. Frame type supports will be designed to carry it's own mass and will be subjected to deflection requirements. A maximum deflection of 1/16 inch is used for normal operating conditions, and 1/8 inch is used for abnormal conditions. For other types of supports, either demonstrate that the support is dynamically rigid, or demonstrate that one half of the support mass is less than 10% of the mass of the straight pipe segment of the span at the support location, to preclude amplification. Otherwise, the contribution of the support weight amplification is added into the piping analysis.

(4) The stiffness for the building steel/structure (i.e., beyond the NF jurisdictional boundary) are not considered in pipe support overall stiffness. Response spectra input to the piping system includes flexibility of the building structure. When attachment to a major building structure is not possible, any intermediate structures included in the analysis of the pipe support.

DCD/LTR Impact

DCD Tier 2 Subsection 3.7.3.3.1 has been revised as noted in the attached markup.

NRC RAI 3.9-35 S01

RAI 3.9-35 S01: Comment on response to RAI 3.9-35:

In ESBWR RAI 3.9-35, the staff requested that the applicant discuss the effects of the additional flexibility between the building nodal points and the pipe support in the piping analysis model. In its response dated November 22, 2006, the applicant stated that with the exception of snubber, pipe clamp and pipe support steel, the support is demonstrated to be dynamically rigid in the seismic analysis to preclude amplification. Though reflecting a common industry practice of assuming rigid and fixed attachments between the seismic subsystems (i.e., equipment and piping) and the supporting seismic systems (i.e., structures), this response may allow the influence of the anchorage system stiffness on the dynamic response to be neglected, as stated in SRP 3.9.2, Section III.2.A. The staff, therefore, requests that the applicant provide supplemental information to address the following issues:

(1) Discuss the effects of the dynamic characteristics of the support anchorages to the building structure, including anchor base plate and anchor bolts or through-bolts, on the seismic and dynamic response of piping, equipment, and components, especially heavy equipment. Verify that appropriate assumptions have been made with regard to the stiffness of the subsystem anchorage in the seismic and dynamic analyses. In light of IE Bulletin 79-02 requirements, discuss how base plate flexibility may cause the anchorage system stiffness to be different from the assumed rigid condition. Discuss how the

reduction of natural frequencies, as a result, would potentially affect the seismic and dynamic response calculations for the piping, equipment, and components.

(2) Certain degree of anchor bolt torque relaxation may occur after years of operation causing reduction in the natural frequencies of piping, equipment, and components. This, in turn, may lead to higher seismic responses of the piping, equipment, and components than originally analyzed. Provide the plant-specific compensatory measures or quality control/quality assurance program to be relied on prior to, during, and after the installation of the anchorage systems, in order to alleviate the effects of anchor bolt torque relaxation.

(3) Discuss the statement made in the response to RAI 3.12-31(1), where it is stated that expansion anchor bolts shall not be used for any safety-related system components. Provide a sample list of such safety-related system components, and their associated loading environments.

GEH Response

Item 1

The surface mounted anchor base plate with drilled in anchor bolts or through bolts will not be considered as a rigid attachment for piping support frame. The base plate Flexibility / Stiffness will be evaluated based on plate thickness, and anchor bolt type & size. The anchor base plate Stiffness / Flexibility will be used to determine the overall frequency, stiffness and deflection of the piping support frame. The combined stiffness / frequency will be used for seismic and dynamic response calculation for piping, equipment and components.

Item 2

All anchor bolts, which require a specific installation torque, will be provided with a locking device such as double lock nut to prevent relaxation of torque. This will be included in the installation and inspection guidelines for anchor bolts.

Item 3

The supporting frame for piping component systems identified, as seismic category I and/or safety related shall not use expansion bolts as an anchoring device. The associated load environments for such system components are as shown in DCD Table 3.9-2. Component classification, which includes safety related components are identified in DCD Table 3.2-1.

DCD Impact

No DCD changes will be made in response to this RAI.