Enclosure 1

MFN 08-973

Response to Portion of NRC Request for

Additional Information Letter No. 249

Related to ESBWR Design Certification Application

Classification of Structures, Systems and Components

RAI Numbers 3.2-67, 3.2-68

NRC RAI 3.2-67

DCD Table 3.2-1 does not specifically identify the seismic classification of the Dryer/Separator Pools, however, both the Reactor Building Structure and the Containment Vessel are identified as Seismic Category I. As stated in DCD Appendix 3G.1, the Reactor Building (RB) encloses the concrete containment and its internal structures and components. In addition, the RB contains the Isolation Condenser/ Passive Containment Cooling (IC/PCC) pools and the service pools for storage of Dryer/Separator on the top of the concrete containment. Further, DCD subsection 3.8.1.1.1 describes the top slab of the containment as an integral part of the Isolation Condenser/Passive Containment Cooling (IC/PCC) pools and the services pools for the storage of Dryer/Separator and other uses. The applicant is requested to confirm that the Dryer/Separator pools are Seismic Category I and are either considered part of the Reactor Building and Containment or include the Dryer/Separator pools as a separate item in Table 3.2-1.

GEH Response

The Dryer/Separator pool, which has been renamed as the equipment storage pool in DCD Rev. 5, is Seismic Category I. In Table 3.2-1 the equipment storage pool is considered to be part of System U71 (Reactor Building Structure), Item 1 – Main building.

The dryer is stored in the buffer pool and the separator is stored in the equipment storage pool as described in Rev. 5 of DCD Tier 2 Subsection 3.8.1.1.1. See also DCD Tier 2 Subsections 3.8.4.1.1 and 3G.1.3.1.1, where it is stated that the buffer pool and the equipment storage pool are included in the Reactor Building Structure.

DCD Impact

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

NRC RAI 3.2-68

The definition of Seismic Category II in DCD subsections 3.2.1 and 3.7 does not account for long term functionality for RTNSS Criterion B SSCs. Subsection 19A.8.3 identifies that RTNSS B components are required to function following a seismic event and they are designed to Seismic Category II, at a minimum. However, the definition of Seismic Category II in DCD subsection 3.2.1 and 3.7 does not include functionality requirements and identifies that their operational performance is not required. For RTNSS B Category II SSCs, such as the CRHAVS air handling units, that are required to function following a seismic event, explain how the classification as Seismic Category II ensures that the SSCs will be functional following a seismic event. The applicant is requested to identify an augmented seismic classification and/or revise the definition of Seismic Category II in DCD 3.2.1 and 3.7 accordingly.

GEH Response

GEH will revise the definition of Seismic Category II to clarify that RTNSS B SSCs are required to remain functional following a seismic event.

GEH is not relying solely on the classification of RTNSS Criterion B SSCs as Seismic Category II to ensure their functionality following a seismic event. The functionality of RTNSS Criterion B SSCs following a seismic event is ensured through classifying them as Quality Class S (Special) in accordance with the ESBWR Quality Assurance Program as discussed in NEDO-33181, Revision 5, which is attached to the response to RAI 3.2-6 S01 Rev 1 in MFN 06-308 S17 and MFN 06-224 S04. Additional details on how the QA program requirements assure functionality of RTNSS Criterion B SSCs are being prepared and will be provided separately in response to RAI 3.2-6 S02. The response to RAI 3.2-6 S02 will also modify DCD Table 3.2-1 to replace the QA Req classification column with a Quality Class column.

DCD Impact

DCD Tier 2, Subsection 3.2.1 and Section 3.7 will be revised in Revision 6 as noted in the attached markup.

The change in the last paragraph of Section 3.2.1 corrects the referenced table number (19A-2 instead of 19A-1) and adds a reference to Subsection 19A.8.3 where seismic requirements for RTNSS SSCs are addressed in more detail. These are considered to be editorial changes only.

The change in the first paragraph of Section 3.7 is an editorial correction to make it consistent with the seismic classification nomenclature as defined in Subsection 3.2.1.

3.2 CLASSIFICATION OF STRUCTURES, SYSTEMS AND COMPONENTS

ESBWR structures, systems and components (SSCs) are categorized as safety-related (as defined in 10 CFR 50.2) or nonsafety-related. The safety-related SSCs are those relied upon to remain functional during and following design basis events to ensure:

- The integrity of the reactor coolant pressure boundary (RCPB);
- The capability to shut down the reactor and maintain it in a safe condition; or
- The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the applicable guidelines exposure set forth in 10 CFR 50.34(a)(1).

Safety-related SSCs conform to the quality assurance requirements of Appendix B to 10 CFR 50. Nonsafety-Related SSCs have quality assurance requirements applied commensurate with the importance of the item's function. The quality assurance program is described in Chapter 17.

The ESBWR complies with 10 CFR 50, Appendix A, General Design Criterion (GDC) 2, as the safety-related SSCs are designed to withstand the effects of earthquakes without loss of capability to perform their safety-related functions. Specific requirements for seismic design and quality group classifications are identified for these ESBWR items commensurate with their safety classification. Table 3.2-1 identifies these classifications for ESBWR SSCs.

3.2.1 Seismic Classification

The ESBWR meets the acceptance criteria of Standard Review Plan (SRP) 3.2.1 (Reference 3.2-1). Structures that must remain integral with systems and components (including their foundations and supports) that must remain functional or retain their pressure integrity in the event of a safe shutdown earthquake (SSE) are designated Seismic Category I. These include safety-related items and fuel storage racks.

The Seismic Category I structures, systems, and components are designed to withstand the appropriate seismic loads (as discussed in Section 3.7) in combination with other appropriate loads without loss of function or pressure integrity. The seismic classifications indicated in Table 3.2-1 are consistent with the guidelines of Regulatory Guide (RG) 1.29 (Reference 3.2-2).

SSCs that perform no safety-related function, but whose structural failure or interaction could degrade the functioning of a Seismic Category I item to an unacceptable level of safety or could result in incapacitating injury to occupants of the main control room, are designated Seismic Category II. These items are designed to structurally withstand the effects of an SSE. Seismic Category II SSCs that are also classified as RTNSS Criterion B in Tables 19A-2 and 19A-3 are required to remain functional following a seismic event.

Structures, systems, and components that are not categorized as Seismic Category I or II are designated Seismic Category NS.

Seismic Category NS structures and equipment are designed for seismic requirements in accordance with the International Building Code (IBC) Reference 3.2-6. The building structures are classified as Category IV (Power Generating Stations) with an Occupancy Importance Factor of 1.5. Either of the methods permitted by the IBC, simplified analysis or dynamic analysis, is acceptable for determination of seismic loads on Seismic Category NS structures and

equipment~~,~~. Refer to Subsection 19A.8.3 for seismic design requirements applicable to Seismic Category NS SSCs ~~including those~~ designated as ~~Regulatory Treatment of Non Safety Systems (~~RTNSS~~)~~, and~~.~~ ~~Refer~~ to ~~Appendix 19A,~~ Table 19A-~~1~~2 for a list of RTNSS SSCs.

3.2.2 System Quality Group Classification

The ESBWR meets the acceptance criteria of SRP 3.2.2 (Reference 3.2-3). NRC RG 1.26 (Reference 3.2-4) describes a quality group classification method for fluid systems and relates it to industry codes. Items are classified by Quality Group A, B, C or D, as indicated in Table 3.2-3. Table 3.2-3 tabulates the design and fabrication requirements for each quality group, as defined in RG 1.26.

Table 3.2-1 shows the quality group classifications for ESBWR components. Although not within the scope of RG 1.26, the containment boundaries that are within the scope of ASME Code, Section III, are assigned quality group classifications in accordance with Table 3.2-2.

Due to the use of many passive safety-related systems in ESBWR, the definitions of the quality groups provided in RG 1.26 can be somewhat misleading when trying to apply them directly to the ESBWR design. The following definitions in this section are consistent with the definitions in RG 1.26, but have been modified to more accurately describe their application to the ESBWR design.

3.2.2.1 Quality Group A

Quality Group A applies to pressure-retaining portions and supports of mechanical items that form part of the RCPB and whose failure could cause a loss of reactor coolant in excess of the reactor coolant normal makeup capability. These items are designed to meet the ASME Boiler and Pressure Vessel (B&PV) Code, Section III. Remaining portions of the RCPB are classified in accordance with Subsection 3.2.2.2.

3.2.2.2 Quality Group B

Quality Group B applies to pressure-retaining portions and supports of containment and other mechanical items, requirements for which are within the scope of ASME B&PV Code, Section III. These items are not assigned to Quality Group A and are relied upon to accomplish one or more of the following safety-related functions:

- Maintain the pressure integrity of RCPB items that are not Quality Group A.
- During or following design basis accidents whose consequences could result in potential offsite exposures comparable to the guidelines of 10 CFR 50.34(a)(1). These items include those that:
  - Maintain the pressure integrity of the containment, containment isolation, or extension of containment.
  - Maintain the pressure integrity of items that are (1) exterior to the containment; (2) communicate with the RCPB or containment interior; and (3) are not isolated normally, cannot be automatically isolated, or are not isolated following a design basis accident or anticipated operation occurrence (transient).

3.7 SEISMIC DESIGN

For seismic design purposes, all structures, systems, and components of the ESBWR standard plant are classified into Seismic Category I, Seismic Category II, or ~~non-seismic~~Seismic Category NS in accordance with the requirements to withstand the effects of the Safe Shutdown Earthquake (SSE) as defined in Section 3.2. For those Seismic Category I and Seismic Category II structures, systems and components (SSCs) in the Reactor Building (RB) complex, the effects of other dynamic loads caused by Reactor Building vibration (RBV) caused by suppression pool dynamics are also considered in the design. Although this section addresses seismic aspects of design and analysis in accordance with Regulatory Guide (RG) 1.70, the methods of this section are also applicable to RBV dynamic loadings, unless noted otherwise. [JD516]

The SSE is that earthquake which is based upon an evaluation of the maximum earthquake potential considering the regional and local geology, seismology, and specific characteristics of local subsurface material. It is the earthquake that produces the maximum vibratory ground motion for which Seismic Category I SSCs are designed to remain functional and within applicable stress, strain, and deformation limits. These systems and components are those necessary to ensure the following:

- The integrity of the reactor coolant pressure boundary;
- The capability to shut down the reactor and maintain it in a safe condition; or
- The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guidelines exposures set forth in 10 CFR 100 (10 CFR 50.34(a)).

ESBWR response to an earthquake up to SSE may achieve shutdown of the reactor and maintenance of it in a safe condition using the Automatic Depressurization System and Gravity Driven Cooling System as described in the Probabilistic Risk Assessment. In this case, depressurization is accomplished in part with Depressurization Valves that remain open in order for the Gravity Driven Cooling System and the Passive Containment Cooling System to perform their safety functions.

Seismic Category II includes all plant SSCs which perform no safety-related function, and whose continued function is not required, but whose structural failure or interaction could degrade the functioning of a Seismic Category I structure, system or component to an unacceptable safety level, or could result in incapacitating injury to occupants of the control room. Thus, this category includes the SSCs whose structural integrity, not their operational performance, is required. Seismic Category II SSCs that are also classified as RTNSS Criterion B in Tables 19A-2 and 19A-3 are required to remain functional following a seismic event. The methods of seismic analysis and design acceptance criteria for Seismic Category II SSCs are the same as Seismic Category I; however, the procurement, fabrication and construction requirements for Seismic Category II SSCs are in accordance with industry practices. Seismic Category II items are those corresponding to position C.2 of RG 1.29.[JD519]

The Operating Basis Earthquake (OBE) is a design requirement. For the ESBWR OBE ground motion is chosen to be one-third of the SSE ground motion. Therefore, no explicit response or design analysis is required to show that OBE design requirements are met. This is consistent with Appendix S to 10 CFR 50. The effects of low-level earthquakes (lesser magnitude than the