



GE Energy

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**Subject: Response to NRC Request for Additional Information Letter No. 58 –
Engineered Safety Features – RAI Numbers 6.6-1 through 6.6-7**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter. This completes GE's response to RAI Letter No. 58.

If you have any questions about the information provided here, please let me know.

Sincerely,

A handwritten signature in cursive script that reads "Kathy Sedney for".

David H. Hinds
Manager, ESBWR

Handwritten initials "D068" in a stylized, cursive font.

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Reference:

1. MFN 06-328, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 58 Related to ESBWR Design Certification Application*, September 13, 2006

Enclosure:

1. MFN 06-369 – Response to NRC Request for Additional Information Letter No. 58 – Engineered Safety Features – RAI Numbers 6.6-1 through 6.6-7

cc: AE Cabbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 0059-1826

ENCLOSURE 1

MFN 06-369

**Response to NRC Request for
Additional Information Letter No. 58
Related to ESBWR Design Certification Application
Engineered Safety Features
RAI Numbers 6.6-1 through 6.6-7**

NRC RAI 6.6-1

DCD Tier 2, Section 6.6.2 states that all items within the Class 2 and 3 boundary are designed to provide access for examinations required by ASME Code Section XI, IWC-2500 and IWD-2500. However, the following sentence indicates that accessibility for preservice inspection (PSI) and inservice inspection (ISI) is the responsibility of the COL holder. Please address this potential conflict and provide verification that the ESBWR design provides accessibility for complete inspection in accordance with ASME Code, Section XI, Subarticle IWA-1500, and the requirements of 10 CFR 50.55a(g)(3)(ii). Verify that these requirements are incorporated in the design process for Class 2 and 3 piping and components.

GE Response:

Subsection 6.6.2 states unambiguously “All items within the Class 2 and 3 boundaries are designed to provide access for the examinations required by IWC-2500 and IWD-2500.” The reference in Subsection 6.6.2 that access for PSI and ISI is the responsibility of the COL holder is only a restatement of the ASME Code requirement IWA-1400 (Owner’s Responsibility), item (b). As indicated in the comment Subsection IWA-1500 provides general requirement statements for design and Subsection 6.6.2 addresses specific access issues. Insofar as the task of ensuring access is delegated to the design organization, there is no conflict with the statements made in Subsection 6.6.2. However, because the Code does not relieve the Owner from this responsibility, it would be incorrect to state it otherwise.

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

NRC RAI 6.6-2

Clarify whether all austenitic to austenitic welds that require an ultrasonic examination provide access for full ISI coverage from both the near and far side of the weld side. If not, discuss how a qualified UT examination will be performed.

GE Response:

Access for examination from both sides of austenitic welds for UT will be provided wherever practical. It is understood that UT is the method of choice for ISI; therefore, unless a design constraint or prohibitive cost would make two-sided access impractical, it will be provided. Where the spool length provision is not met, a case-by-case evaluation is performed. If two-sided access is not available for UT, the RT method may be used alone or in conjunction with UT as allowed by IWA-2231. The recent development of Digital RT offers reduced exposure times and greater latitude than film radiography, making RT a more practical alternative to UT than in the past. In Tier 2 Subsection 6.6.3.2, before the paragraph on "Alternative Examinations" the following paragraph will be inserted: "Radiographic Examination ASME Section XI, IWA-2230 includes radiographic examination as a volumetric examination method. Section XI requires that the requirements of Article 2 of Section V be used for methodology. Radiography may be accomplished with x-rays or gamma rays and has historically been performed using film as the recording media. Due to ALARA, personnel access limitations in the work area when radiography is performed, radiography is not used as often as ultrasonic examination for Inservice Inspection. Use of computed and digital radiographic systems can result in greater latitude and reduced overall exposure times and make radiography a more practical examination method for Inservice Inspection. For the ESBWR, radiography may be used alone as a volumetric method or it may be used to supplement ultrasonic examination to improve coverage of the required examination volume."

DCD Tier 2, Subsection 6.6.3.2 will be revised as noted in the attached markup of page 6.6-5.

NRC RAI 6.6-3

Describe all dissimilar metal welds within the Class 2 system that require volumetric examination as part of the PSI and/or ISI program. Confirm that all configurations will provide access from both the near and far sides of the weld.

GE Response:

At this stage in design, all of the dissimilar metal weld locations are not known. If two-sided access is not available for UT, the RT method may be used alone or in conjunction with UT as allowed by IWA-2231. The recent development of Digital RT offers reduced exposure times and greater latitude than film radiography, making RT a more practical alternative to UT than in the past. In DCD Subsection 6.6.3.2, before the paragraph on "Alternative Examinations" the following paragraph will be inserted: "Radiographic Examination ASME Section XI, IWA-2230 includes radiographic examination as a volumetric examination method. Section XI requires that the requirements of Article 2 of Section V be used for methodology. Radiography may be accomplished with x-rays or gamma rays and has historically been performed using film as the recording media. Due to ALARA, personnel access limitations in the work area when radiography is performed, radiography is not used as often as ultrasonic examination for Inservice Inspection. Use of computed and digital radiographic systems can result in greater latitude and reduced overall exposure times and make radiography a more practical examination method for Inservice Inspection. For the ESBWR, radiography may be used alone as a volumetric method or it may be used to supplement ultrasonic examination to improve coverage of the required examination volume."

DCD Tier 2, Subsection 6.6.3.2 will be revised as noted in the attached markup of page 6.6-5.

NRC RAI 6.6-4

Clarify whether there are any cast components within the Class 2 system that will require a PSI and/or ISI volumetric inspection. If so, clarify if these components will have a specification that requires a casting process that strictly controls grain size to make ultrasonic examination less difficult and more reliable than castings with a large grain structure.

GE Response:

At this stage of design, the number of cast components is not known. However, the issue with UT of castings is generally acknowledged to be limited to austenitic castings. Therefore, where austenitic castings must be used, the issue of qualified UT access from only the wrought side of the weld will be addressed using RT alone or as a supplement to UT. If two-sided access is not available for UT, the RT method may be used alone or in conjunction with UT as allowed by IWA-2231. The recent development of Digital RT offers reduced exposure times and greater latitude than film radiography, making RT a more practical alternative to UT than in the past. In DCD Subsection 6.6.3.2, before the paragraph on "Alternative Examinations" the following paragraph will be inserted: "Radiographic Examination ASME Section XI, IWA-2230 includes radiographic examination as a volumetric examination method. Section XI requires that the requirements of Article 2 of Section V be used for methodology. Radiography may be accomplished with x-rays or gamma rays and has historically been performed using film as the recording media. Due to ALARA, personnel access limitations in the work area when radiography is performed, radiography is not used as often as ultrasonic examination for Inservice Inspection. Use of computed and digital radiographic systems can result in greater latitude and reduced overall exposure times and make radiography a more practical examination method for Inservice Inspection. For the ESBWR, radiography may be used alone as a volumetric method or it may be used to supplement ultrasonic examination to improve coverage of the required examination volume."

Note that not only are austenitic stainless steel castings acknowledged to be a low risk for IGSCC in general (similar to stainless steel weld metal) but also low carbon CF-3 and CF-3M with supplemental ferrite controls will be used. Also, the wrought side of stainless steel welds will utilize low carbon grades, e.g., 316L. Therefore, as ESBWRs approach ISI in the future, relatively few of these welds will probably be examined under a risk-based ISI program.

DCD Tier 2, Subsection 6.6.3.2 will be revised as noted in the attached markup of page 6.6-5.

NRC RAI 6.6-5

The DCD indicates that the design to perform preservice inspection is based on the requirements of the ASME Code, Section XI, 2001 Edition with the 2003 Addenda. Clarify whether the ESBWR design is such that the COL applicant will be able to meet all of the ASME Section XI requirements including any limitations and modifications currently listed in 10CFR50.55a.

GE Response:

The ESBWR design allows for the examination of all applicable components to the requirements of ASME Section XI, as clarified by 10 CFR 50 and IN 98-42. Based on a review of 10 CFR 50.55a, none of its limitations or modifications to the ASME Code requirements impact the compliance of the ESBWR design with respect to PSI and ISI in ways not addressed previously in these responses.

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

NRC RAI 6.6-6

DCD Tier 2, Subsection 6.6, page 6.6-1, indicates that the requirements presented in this section are based on the 2001 Edition of ASME XI with the 2003 Addenda. However, page 6.6-7 indicates that information presented in Subsection 6.6 is based on the 1989 Edition of ASME Section XI. Provide clarification.

GE Response:

The citation of the 1989 Edition in section 6.6.10 on page 6.6-7 is incorrect. Since the information in the first paragraph of Subsection 6.6.10 is redundant with Subsection 6.6 on page 6.6-1, it will be deleted. This eliminates the inconsistency as well.

DCD Tier 2, Subsection 6.6.10 will be revised as noted in the attached markup of page 6.6-7.

NRC RAI 6.6-7

DCD Tier 2, Subsection 6.6.7 discusses single-phase erosion-corrosion inspections. Please identify any systems in the ESBWR design that may be susceptible to two-phase erosion-corrosion. Also, Subsection 6.6.7 references the NUMARC Program. Please change the reference to be consistent with staff's current recommendation to implement a flow-assisted corrosion (FAC) program, described by the EPRI guidelines in NSAC-202L-R2.

GE Response:

Specific systems, if any, remaining with possible susceptibility to two-phase erosion-corrosion would be nonsafety-related, but will not be identified until the detailed design and final material selection and ordering is complete. While we do not find a reference in the current SRP or the draft SRP, we will change the reference from the NUMARC program to the EPRI guidelines in NSAC-202L-R2.

DCD Tier 2, Subsection 6.6.7 will be revised as noted in the attached markup of page 6.6-7.

6.6.3.2.3 Radiographic Examination

Radiographic Examination ASME Section XI, IWA-2230 includes radiographic examination as a volumetric examination method. Section XI requires that the requirements of Article 2 of Section V be used for methodology. Radiography may be accomplished with x-rays or gamma rays and has historically been performed using film as the recording media. Due to ALARA, personnel access limitations in the work area when radiography is performed, radiography is not used as often as ultrasonic examination for Inservice Inspection. Use of computed and digital radiographic systems can result in greater latitude and reduced overall exposure times and make radiography a more practical examination method for Inservice Inspection. For the ESBWR, radiography may be used alone as a volumetric method or it may be used to supplement ultrasonic examination to improve coverage of the required examination volume.

6.6.3.2.4 Alternative Examination Techniques

As provided by ASME Section XI, IWA-2240, alternative examination methods, a combination of methods, or newly developed techniques may be substituted for the methods specified for a given item in this section, provided that they are demonstrated to be equivalent or superior to the specified method. This provision allows for the use of newly developed examination methods, techniques, etc., which may result in improvements in examination reliability and reductions in personnel exposure. IWA-2240 as written in the 1997 Addenda of ASME Section XI must be used when applying these provisions.

6.6.3.2.4 Data Recording

Manual data recording is performed where manual ultrasonic examinations are performed. If automated systems are used, electronic data recording and comparison analysis are to be employed with the automated ultrasonic examination equipment. Signals from each ultrasonic transducer would be fed into a data acquisition system in which the key parameters of any reflectors are recorded. The data to be recorded for manual and automated methods are:

- Location;
- Position;
- Depth below the scanning surface;
- Length of the reflector;
- Transducer data including angle and frequency; and
- Calibration data.

The data for recorded indications are compared with the results of subsequent examinations to determine the behavior of the reflector.

6.6.3.2.5 Qualification of Personnel and Examination Systems for Ultrasonic Examination

Personnel performing examinations are qualified in accordance with ASME Section XI, Appendix VII. Ultrasonic examination systems shall be qualified in accordance with an industry accepted program for implementation of ASME Section XI, Appendix VIII.

6.6.7 Augmented Inservice Inspections

High Energy Piping

High energy piping (defined within Subsection 3.6.2 and associated tables) between the containment isolation valves is subject to the following additional inspection requirements.

Circumferential welds shall be 100 percent volumetrically examined each inspection interval as defined within Subsections 6.6.3.2 and 6.6.4. Accessibility, examination requirements, and procedures shall be as discussed in Subsections 6.6.2, 6.6.3 and 6.6.5, respectively. Piping in these areas is seamless, thereby eliminating longitudinal welds.

Erosion-Corrosion

Piping systems determined to be susceptible to single-phase erosion-corrosion shall be subject to a system program of nondestructive examinations to verify the system structural integrity. The examination schedule and examination methods shall be determined in accordance with the EPRI guidelines in NSAC-202L-R2 (or equally effective program), and applicable rules of ASME Section XI.

6.6.8 Code Exemptions

As provided in ASME Section XI, IWC-1220 and IWD-1220, certain portions of Class 2 and 3 systems are exempt from the volumetric, surface and visual examination requirements of IWC-2500 and IWD-2500.

6.6.9 Code Cases

As applicable, the provisions of the Code Cases listed in Table 5.2-1 may be used for preservice and inservice inspections, evaluations, and repair and replacement activities.

6.6.10 Plant Specific PSI/ISI Program Information

- Identify the specific areas where the applicable ASME Code requirements cannot be met after the initial examinations are performed and provide supporting technical justification for this request for relief.
- Include references to the edition and addenda of ASME Section XI Code that will be used for the selection of components for examination, lists of the components subject to examination, and a description of the components exempt from examination. Information will be included in sufficient detail such that the Program and Inspection Plans form a complete and comprehensive document.

6.6.11 COL Information

The unit specific PSI/ISI Plan includes the detailed plant information and is the responsibility of the COL applicant.