GE Energy

James C. Kinsey
Project Manager, ESBWR Licensing

PO Box 780 M/C J-70
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 69 – Integrity of the Reactor Coolant Pressure Boundary – RAI Numbers 5.2-51 S01, 5.2-53 S01 through 5.2-55 S01, 5.2-57 S01 and Related Responses for RAI 6.6-7 S01 and 20.0-6**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via 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
Project Manager, ESBWR Licensing

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Reference:

1. MFN 06-220, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 41 Related to the ESBWR Design Certification Application*, July 10, 2006
2. MFN 06-328, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 58 Related to the ESBWR Design Certification Application*, September 13, 2006
3. MFN 06-516, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 83 Related to the ESBWR Design Certification Application*, December 7, 2006

Enclosures:

1. MFN 06-290, Supplement 1 – Response to Portion of NRC Request for Additional Information Letter No. 41 – Integrity of Reactor Coolant Pressure Boundary – RAI Numbers 5.2-51 S01, 5.2-53 S01 through 5.2-55 S01, 5.2-57 S01 and Related Responses for RAI 6.6-7 S01 and 20.0-6

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 0063-0627

Enclosure 1

MFN 06-290, Supplement 1

Response to Portion of NRC Request for Additional Information Letter No. 41 Related to ESBWR Design Certification Application

Integrity of Reactor Coolant Pressure Boundary

RAIs 5.2-51 S01, 5.2-53 S01 through 5.2-55 S01, 5.2-57S01 and Related Responses for RAIs 6.6-7 S01 and 20.0-6

NRC RAI 5.2-51:

Supplemental RAI: In GE's response to RAI 5.2-51 (MFN 06-290), GE stated that it is the responsibility of the owner per IWA-1400 (b), to design and arrange system components to include allowances for adequate access and clearances for conduct of the examination and tests. However, the staff expects that any new reactor design facilitates the use of PDI qualified UT examinations on those components requiring a volumetric examination for PSI and ISI. Provide verification that the provisions of IWA-1500 regarding accessibility, are incorporated into the ESBWR design.

GE Response:

The following response applies to Supplemental RAIs 5.2-51, 53, 54, and 57, and RAI 6.6-1, 6.6-2, 6.6-3, 6.6-4 responses that were submitted to the Staff on October 6, 2006 via MFN 06-339.

(1) The statement in the Supplemental RAI that "the staff expects that any new reactor design facilitates the use of PDI qualified UT examinations on those components requiring a volumetric examination for PSI and ISI" is in direct conflict with 10CFR50 which allows RT as a volumetric method for ISI.

(2) The GE Response to the RAIs stated that where access was restricted to one side of a weld for ultrasonic examination that RT would be used to supplement or replace UT for those items. That RAI response is in full compliance with 10CFR50. Note that RT is currently used periodically on existing plants for ISI, and also for PSI on modifications.

(3) Redesign of all valves and fittings and requiring all the ESBWR vendors to retool to produce these new products would cost hundreds of millions of dollars to the ESBWR projects. While incorporating RT into the outage plan for inservice inspection might be an inconvenience, the cost pales in comparison to redesigning and retooling the entire supply chain. During the teleconference on 12-18-06, the staff suggested that pup-pieces could be added to valves and the assemblies be solution annealed as an alternative to redesign and retooling. Unfortunately, the solution annealed pup-piece approach would not exempt the valve to pup-piece welds from examination under current ASME Section XI rules and so would not resolve the issue and would result in even more welds subject to ISI.

(4) If radiography for inservice inspection is subject to a new performance demonstration program in the future, such as through ASME Section XI Code changes, that program will be imposed through the 10CFR50 requirements in effect at the time of the issuance of the construction permit and/or the operating license. Note that the NRC-approved AP-1000 DCD not only included the possibility of using radiography as a volumetric examination method, but also allowed for the possibility that relief requests might be needed in response to future changes in Code requirements (such as a performance demonstration program for radiography).

(5) Radiography is a reliable volumetric examination method sanctioned by 10CFR50 and approved for use by the NRC for the competing AP-1000 advanced reactor design and should be permitted for use in the ESBWR as well.

(6) Capabilities and advantages of radiography have been acknowledged by the NRC in the commentary on Code Case N659 in FR Vol. 71, No. 208, beginning on Page 62948. The

FR Notice describes an NRC-proposed requirement that a performance demonstration program for ultrasonic examination be implemented to prove that UT is suitable as an alternative to radiography for construction. The FR Notice states that radiography is capable of detecting lack of fusion, a planar flaw. Although the notice refers specifically to the capability to RT to detect planar flaws with large openings, lack of fusion does not necessarily have a large opening since it is, by definition, only adjacent layers of metal that have not been melted together. From that standpoint, the lack of fusion flaw presents challenges to detection similar to that of service-induced cracks, yet the NRC does not question the capability of radiography to detect the lack-of-fusion planar defects and has accepted radiography for many years as the predominant volumetric examination method for welds in Section III of the ASME Code. The NRC's faith in radiography is reinforced by the fact that there have been no nuclear component failures attributed to defects missed by radiography. In contrast, service induced flaws missed by ultrasonic examination resulted in through-wall leaks as documented in IN 82-39 and resulted in the initial EPRI performance demonstration programs responding to Bulletins 82-03 and 83-02, leading eventually to the development of Appendix VIII of Section XI and the implementing Performance Demonstration Initiative (PDI) program for ultrasonic examination.

DCD Impact:

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

NRC RAI 5.2-53:

Supplemental RAI: In GE's response to RAI 5.2-53 (MFN 06-290), GE states that access for examination from both sides of austenitic welds for UT will be provided wherever practical. It is the staff's position that ALL RCPB welds requiring a volumetric ISI examination be accessible to perform a PDI qualified UT examination. Given that it has been shown that a PDI qualified UT examination is far more likely to accurately detect and size fabrication and service induced flaws, provide a justification for designing a component in a fashion that does not allow adequate access to perform a PDI qualified UT examination. Further, provide information regarding the reliability of computed and digital radiographic systems in detecting and sizing construction and service induced flaws compared to the reliability of PDI qualified ultrasonic examinations.

GE Response:

See Response to RAI 5.2-51 (This response also applies to RAI 6.6-2).

DCD Impact:

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

NRC RAI 5.2-54:

Describe all dissimilar metal welds within the Class 1 system that require volumetric examination as part of the PSI and/or ISI program. Confirm that all configurations will allow for access from both the near and far sides of the weld.

GE Response:

The entire list of possible dissimilar metal welds will not be available until the detailed design is complete. With regard to access, see the response to RAI 5.2-51. (This response also applies to 6.6-3).

DCD Impact:

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

NRC RAI 5.2-55:

In RAI 5.2-55 (MFN 06-290), GE responded that the reason for less than 100% NDE coverage for nozzle-to-vessel welds was primarily based on NRC's understanding and acceptance of this similar approach during the licensing of the ABWR design. This information does not provide justification for less than 100% NDE coverage. Staff expects all components be designed in a manner that facilitates their inspection in accordance with ASME Section XI and 10CFR 50.55a. Provide a complete set of drawings of the nozzle to vessel weld joints and provide a clear technical justification for less than 100% NDE coverage. The drawings and discussion should provide a clear understanding of the areas that the applicant states cannot be inspected and should explain the effort put forward by the applicant to redesign the weld joint configuration or explore new UT examination methods or techniques to attain 100% NDE coverage.

GE Response:

The provisions of Code Case N-613-1, which was approved by the NRC in RG 1.147, has relieved issues associated with the nozzle examination volume for inservice inspection. The N-613-1 nozzle examination volume will be accessible for inservice inspection.

DCD Impact:

Revision 3 to DCD Tier 2, Subsection 5.2.4.2 will reflect the attached markup.

NRC RAI 5.2-57:

Concerning GE's response to RAI 5.2-57 (MFN 06-290), the staff expects that ALL cast components that require volumetric ISI inspections are designed in a manner, geometrically and metallurgically, that facilitates PDI qualified UT examinations. The staff also notes that risk-informed ISI requirements that MAY apply in the future do not provide justification for limited inspection coverage of RCPB components. Provide an in-depth discussion that explains why some components may be designed in a manner that does not facilitate access from both sides to perform a PDI qualified UT.

GE Response:

See Response to RAI 5.2-51. (This response also applies to 6.6-4).

DCD Impact:

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

NRC RAI 6.6-7 S01:

The NRC staff communicated this supplemental RAI verbally during the 12-18-06 teleconference. In addressing RAI 6.6-7, GE incorporated the NRC request to change the reference document to NSAC-202L-R2 in DCD 6.6.7. Please revise paragraph 6.6.7 to reinstate the reference to NUREG-1344 (GL 89-08) to clarify that the FAC program is applicable to both single-phase and two-phase conditions.

NRC RAI 20.0-6:

An acceptable flow-accelerated corrosion (FAC) program was originally outlined in NUREG-1344 "Erosion/Corrosion-Induced Pipe Wall Thinning in U.S. Nuclear Power Plants" and was further described in Generic Letter 89-08 "Erosion/Corrosion Induced Pipe Wall Thinning."NUREG-1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report" provides a description of an effective FAC program. Per the guidance of GL 89-08, an FAC program must include all high-energy (two phase as well as single phase) carbon steel systems. The staff's current position is that a licensee should adhere to the guidance provided in GL 89-08 and implement Electric Power Research Institute (EPRI) guidelines in the Nuclear Safety Analysis Center (NSAC)-202L-R2 for an effective FAC program. The staff requests that GE revise the applicable portions of the ESBWR DCD, Tier 2, Chapters 6, 5, and 10 to indicate that the COL applicant is responsible for submitting an FAC program following the guidance of GL 89-08 and meeting the guidelines of NSAC-202L-R2 (or other program deemed acceptable by the NRC.) It should be clear that all systems potentially susceptible to single phase and or two phase erosion-corrosion (ASME Class 1, 2, 3 and non-safety related) are included".

GE Response:

The reference to GL 89-08 will be reinstated in DCD Subsection 6.6.7 and it will be clarified that the FAC program applies to single-phase and two-phase conditions for Class 1, 2, and 3 components and non-safety piping and components per GL 89-08. (This response also applies to RAI 20.0-6).

DCD Impact:

Revision 3 to DCD Tier 2, Subsection 6.6.7 will reflect the attached markup.

ONLY THE FIRST PARAGRAPH OF SECTION 5.2.4.2 IS SHOWN

5.2.4.2 Accessibility

All items within the Class 1 boundary are designed to provide access for the examinations required by ASME Section XI, IWB-2500. Responsibility for designing components for accessibility for preservice and inservice inspection is the responsibility of the COL holder. Items such as nozzle-to-vessel welds often may have inherent access restrictions when vessel internals are installed. Therefore, preservice examination shall be performed as necessary ***to achieve the required examination volume*** on these items prior to installation of internals which would interfere with examination. ***Access is sufficient for the inservice examination of the volume described in Code Case N-613-1.***

ONLY PARAGRAPH 6.6.7 IS SHOWN

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 shall be 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* ~~NUMARC Program~~ (or equally effective program, submitted by the COL applicant), ~~as discussed in~~ *which satisfies* NRC Generic Letter 89-08, and applicable rules of ASME Section XI.