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MFN 07-270 Supplement 1

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U.S. Nuclear Regulatory Commission
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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application - Containment Hydrogen and Oxygen Monitors - RAI Numbers 6.2-136 S01 and 6.2-137 S01**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAIs originally transmitted via the Reference 1 letter and supplemented by NRC requests for clarification in Reference 2.

If you have any questions or require additional information, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 06-393, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application*, October 11, 2006
2. E-Mail from Shawn Williams, U.S. Nuclear Regulatory Commission, to George Wadkins, GE Hitachi Nuclear Energy, dated July 24, 2007 (ADAMS Accession Number ML072050032)

Enclosure:

1. MFN 07-270 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application - Containment Hydrogen and Oxygen Monitors - RAI Numbers 6.2-136 S01 and 6.2-137 S01

cc:

AE Cubbage	USNRC (with enclosures)
GB Stramback	GEH/San Jose (with enclosures)
RE Brown	GEH/Wilmington (with enclosures)
eDRF	RAI 6.2-136S01: 0000-0078-0348
	RAI 6.2-137S01: 0000-0078-0707

Enclosure 1

MFN 07-270 Supplement 1

Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application

Containment Hydrogen and Oxygen Monitors

RAI Numbers 6.2-136 S01 and 6.2-137 S01

NRC RAI 6.2-136 S01:

The response to this RAI is not specific enough to allow the staff to draw conclusions as to the acceptability of the design of the hydrogen monitors. Also, the information contained in the responses to the RAI and its supplement(s) needs to be put into the DCD, Tier 2. Here is a detailed description of the additional requested information:

Item (A) a) of the RAI response states that the instrument range will be met under "the specified pressure conditions" for the ESBWR design, yet the response did not include any specified pressure conditions. It is not clear if the "specified pressure conditions" means containment design pressure, pressures resulting from significant beyond design-basis accidents, or something else. Provide the "specified pressure conditions."

Item (A) b) gives numbers for the instrument accuracies, but the numbers are enclosed in square brackets. Staff is not clear on the meaning of the enclosed square brackets. The conventional meaning of square brackets is that the numbers are suggested or typical values, but that individual plants may choose different numbers based on various design considerations. Provide specific accuracies for the hydrogen monitors and justify that they are adequate for their intended function, or develop a COL Action Item to require COL applicants to do so, subject to NRC review and approval during COL reviews.

Also in item (A) b), the staff had asked the applicant to provide the placement of the monitor's sampling points, and to justify that this placement is adequate for their intended function. This information was not provided. Instead, the response stated that sampling points "will be selected" according to certain criteria. Provide the specific information that was originally requested, or develop a COL Action Item to require COL applicants to do so, subject to NRC review and approval during COL reviews.

The Item (B) response stated that the equipment warmup time "will be evaluated" during the specification and procurement process to ensure that the warmup time noted in Regulatory Guide 1.7, Revision 3, is not exceeded. Develop a COL Action Item to require COL applicants to do this, subject to NRC review and approval during COL reviews.

For Item (C), the staff had asked whether the monitoring system would remain functional and reliable when exposed internally to the temperature, pressure, humidity, and radioactivity of containment atmosphere during a significant beyond design-basis accident. The response stated that the equipment chosen "will be specified" and "will be evaluated" in accordance with certain general criteria. Provide an evaluation of the system's functionality and reliability against ESBWR-specific containment temperature, pressure, humidity, and radioactivity conditions during significant beyond design-basis accidents, or develop a COL Action Item to require COL applicants to do so, subject to NRC review and approval during COL reviews.

The staff cautions the applicant that the recommended design provisions for oxygen monitors in the final issue of RG 1.7, Revision 3, section 2.2, are significantly different from those in draft Revision 3, at least in form. If the applicant cites RG 1.7 in the future, the applicant should specify which version (draft or final) is being used.

GEH Response:

Item A (a) - As noted in DCD Tier 2, Revision 4, Subsections 6.2.1 and 6.2.5, the hydrogen monitoring discussed here is used for containment monitoring purposes. Specified containment conditions for temperature, pressure, and humidity are provided in DCD Tier 2, Revision 4, Subsection 6.2.1, and in Tables 6.2-1 (Containment Design Parameters), 6.2-2 (Containment Conditions During Normal Operation), and Table 6.2-5 (Summary of Containment - LOCA Performance Analysis). The monitor will be qualified to meet or exceed containment design pressure; specific values for instrument ranges will be determined during the Human Factors Engineering (HFE) design process in accordance with the Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) noted in DCD Tier 1, Revision 4, Section 3.3, Table 3.3-1, Items 2, 3, and 6.

An ITAAC for verification of equipment environmental qualification requirements, including radiation qualification requirements, is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 7, and in DCD Tier 1, Revision 4, Section 3.8, Table 3.8-1.

Item A (b) - Numbers in brackets "[ ]" previously indicated preliminary values subject to final design verification. Brackets now are used only within DCD Tier 2, Chapter 16 Technical Specifications and Chapter 16B Technical Specification Bases, as described in the Introduction to Chapter 16. Specific values for setpoints and instrument ranges will be determined during the HFE design process in accordance with the ITAAC noted in DCD Tier 1, Revision 4, Section 3.3, Table 3.3-1, Items 2, 3, and 6. DCD Tier 2, Table 7.5-4, will be revised to eliminate the use of brackets for preliminary values.

An ITAAC for measured parameters and setpoints is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 3. An ITAAC for setpoint requirements in accordance with IEEE-603 requirements is contained in DCD Tier 1, Revision 4, Section 2.2.15, Table 2.2.15-2, Item 10. Equipment uncertainties will be determined in accordance with GE Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology", NEDE-33304P-A, Class III (Proprietary), October 2007.

Equipment monitoring containment hydrogen concentrations will obtain samples from the drywell and wetwell under post-accident conditions. An ITAAC to ensure that the functional arrangements for equipment sampling points meet DCD Tier 2 requirements is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 1.

Item B - An ITAAC for equipment warm-up time is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 4.

Item C - An ITAAC for equipment environmental requirements is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 7, and in DCD Tier 1, Revision 4, Section 3.8, Table 3.8-1.

USNRC Regulatory Guide 1.7, Revision 3, was used as the reference for the original response to RAI 6.2-136.

DCD Impact:

DCD Tier 2, Table 7.5-4, will be revised as shown in the attached markup.

NRC RAI 6.2-137 S01:

The response to this RAI is not specific enough to allow the staff to draw conclusions as to the acceptability of the design of the oxygen monitors. Also, the information contained in the responses to the RAI and its supplement(s) needs to be put into the DCD, Tier 2. Here is a detailed description of the additional requested information:

Item (1) of the RAI response states that the instrument range will be met under "the specified pressure conditions" for the ESBWR design, yet the response did not include any specified pressure conditions. It is not clear if the "specified pressure conditions" means containment design pressure, pressures resulting from significant beyond design-basis accidents, or something else. Provide the "specified pressure conditions."

Item (2) gives numbers for the instrument accuracies, but the numbers are enclosed in square brackets. What does this mean? A conventional meaning of square brackets is that the numbers are suggested or typical values, but that individual plants may choose different numbers based on various design considerations. Provide specific accuracies for the oxygen monitors and justify that they are adequate for their intended function, or develop a COL Action Item to require COL applicants to do so, subject to NRC review and approval during COL reviews.

Also in item (2), the staff had asked the applicant to provide the placement of the monitor's sampling points, and to justify that this placement is adequate for their intended function. This information was not provided. Instead, the response stated that sampling points "will be selected" according to certain criteria. Provide the specific information which was requested, or develop a COL Action Item to require COL applicants to do so, subject to NRC review and approval during COL reviews.

For Item (3), the staff had asked whether the monitoring system would remain functional and reliable when exposed internally to the temperature, pressure, humidity, and radioactivity of containment atmosphere during a significant beyond design-basis accident. The response stated that the equipment chosen "will be specified" and "will be evaluated" in accordance with certain general criteria. Provide an evaluation of the system's functionality and reliability against ESBWR-specific containment temperature, pressure, humidity, and radioactivity conditions during significant beyond design-basis accidents, or develop a COL Action Item to require COL applicants to do so, subject to NRC review and approval during COL reviews.

The staff cautions the applicant that the recommended design provisions for oxygen monitors in the final issue of RG 1.7, Revision 3, section 2.2, are significantly different from those in draft Revision 3, at least in form. If the applicant cites RG 1.7 in the future, the applicant should specify which version (draft or final) is being used.

GEH Response:

Item (1) - As noted in DCD Tier 2, Revision 4, Subsections 6.2.1 and 6.2.5, the oxygen monitoring discussed here is used for containment monitoring purposes. Specified containment pressure conditions are provided in DCD Tier 2, Revision 4, Subsection 6.2.1, and in Table 6.2-1 (Containment Design Parameters), Table 6.2-2 (Containment Conditions During Normal Operation), and Table 6.2-5 (Summary of

Containment - LOCA Performance Analysis). The monitor will be qualified to meet or exceed containment design pressure; specific values for instrument ranges will be determined during the HFE design process in accordance with the ITAAC noted in DCD Tier 1, Revision 4, Section 3.3, Table 3.3-1, Items 2, 3, and 6.

Item (2) - Numbers in brackets "[ ]" previously indicated preliminary values subject to final design verification. Brackets now are used only within DCD Tier 2, Chapter 16 Technical Specifications and Chapter 16B Technical Specification Bases, as described in the Introduction to Chapter 16. Specific values for setpoints and instrument ranges will be determined during the HFE design process in accordance with the ITAAC noted in DCD Tier 1, Revision 4, Section 3.3, Table 3.3-1, Items 2, 3, and 6. DCD Tier 2, Table 7.5-4, will be revised to eliminate the use of brackets for preliminary values.

An ITAAC for measured parameters and setpoints is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 3. An ITAAC for setpoint requirements in accordance with IEEE-603 requirements is contained in DCD Tier 1, Revision 4, Section 2.2.15, Table 2.2.15-2, Item 10. Equipment uncertainties will be determined in accordance with GE Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology", NEDE-33304P-A, Class III (Proprietary), October 2007.

Equipment monitoring containment oxygen concentrations will obtain samples from the drywell and wetwell under post-accident conditions. An ITAAC for equipment sampling points is contained in DCD Tier 1, Revision 4, Subsection 2.15.7. An ITAAC to ensure that the functional arrangements for equipment sampling points meet DCD Tier 2 requirements is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 1.

Item (3) - As noted in DCD Tier 2, Revision 4, Subsections 6.2.1 and 6.2.5, the oxygen monitoring discussed here is used for containment monitoring purposes. Specified containment conditions for temperature, pressure, and humidity are provided in DCD Tier 2, Revision 4, Subsection 6.2.1, and in Table 6.2-1 (Containment Design Parameters), Table 6.2-2 (Containment Conditions During Normal Operation), and Table 6.2-5 (Summary of Containment - LOCA Performance Analysis). An ITAAC for equipment environmental requirements and radiation qualifications is contained in DCD Tier 1, Revision 4, Subsection 2.15.7, Table 2.15.7-2, Item 7, and in DCD Tier 1, Revision 4, Section 3.8, Table 3.8-1.

USNRC Regulatory Guide 1.7, Revision 3, was used as the reference for the original response to RAI 6.2-137.

DCD Impact:

DCD Tier 2, Table 7.5-4, will be revised as shown in the attached markup.

Table 7.5-4

CMS Testing and Inspection Requirements

Specified Channel Calibration - Each oxygen and hydrogen gas sampling channel	~~[~~0%~~]~~ gas concentration and nominal level approximately from ~~[~~20%~~]~~ to ~~[~~5%~~]~~ ~~from calibrated sources~~
Sample Gas Leakage Test - Sample lines and associated gas analyzer panel	Less than 0.01cc/sec at peak sample pressure