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Supplement 1

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-110 S01**

Enclosure 1 contains the subject supplemental RAI response resulting from a March 27, 2007 e-mail from the NRC. 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
Project Manager, ESBWR Licensing

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NRO

Reference:

1. MFN 07-025, Letter from Jim Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-110*, January 18, 2007

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-110 S01

cc:

AE Cubbage	USNRC (with enclosures)
DH Hinds	GHNEA (with enclosures)
RE Brown	GHNEA (w/o enclosures)
eDRF	0000-0067-7313

Enclosure 1

MFN 07-025, Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 79

Related to ESBWR Design Certification Application

- Technical Specifications -

RAI Number 16.2-110 S01

NRC RAI 16.2-110

Proposed Technical Specification (TS) Section 3.6, Containment Systems, apparently does not have a TS for containment oxygen concentration. GE's response to RAI 16.0-1, dated August 8, 2006, in Enclosure 1, Attachment 2, item 27, asserts that an operating restriction on oxygen concentration (to less than 4% by volume) is not required as an initial condition in the analysis of any design-basis event, so it does not meet Criterion 2 of 10 CFR 50.36 and is not included in the proposed Technical Specifications.

However, both the NRC staff and the nuclear industry's Technical Specification Task Force have stated that such a TS is required.

(A) When 10 CFR 50.44, "Combustible Gas Control in Containment," was revised in 2003, the staff issued a model safety evaluation (SE) for implementation of the revised rule through the Consolidated Line Item Improvement Process (ADAMS Accession No. ML032600597, September 12, 2003). The model SE states, on page 13, that "...requirements for primary containment oxygen concentration will be retained in TS for plant designs with an inerted containment." Furthermore, the current standard TS for BWR/4 plants (NUREG-1433, Rev. 3.1) includes TS 3.6.3.2, Primary Containment Oxygen Concentration, which states that "The primary containment oxygen concentration shall be < 4.0 volume percent."

(B) Technical Specification Task Force Traveler TSTF-447, Rev. 1, dated July 18, 2003, "Elimination of Hydrogen Recombiners and Change to Hydrogen and Oxygen Monitors," which has been accepted by the staff, states: "For plant designs with an inerted containment, the requirement for primary containment oxygen concentration will be retained in Technical Specifications."

In light of these positions, add a TS limiting containment oxygen concentration to less than 4% by volume.

GE Response

As stated in the model safety evaluation for implementation of the revised 10 CFR 50.44, "Combustible Gas Control In Containment," dated September 12, 2003, the basis for retention of this requirement in Technical Specifications (TS) is that it meets Criterion 2 of 10 CFR 50.36(c)(2)(ii) in that it is a process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. This is based on the fact that calculations typically included in Chapter 6 of Updated Final Safety Analysis Reports assume that the primary containment is inerted, that is, oxygen concentration < 4.0 volume percent, when a design basis LOCA occurs.

Design Control Document (DCD), Tier 2, Subsection 6.2.5.5, "Post Accident Radiolytic Oxygen Generation," states that for a design basis loss of coolant accident (LOCA) in the ESBWR, the Automatic Depressurization System (ADS) would depressurize the reactor vessel and the Gravity Driven Cooling System (GDCS) would provide gravity driven flow into the vessel for emergency core cooling. The safety analyses show that the core does not uncover during this event and as a result, there is no fuel damage or fuel clad-coolant interaction that would result in the release of fission products or hydrogen. Thus,

for the ESBWR Design Basis Accident (DBA), the generation of post accident oxygen would not result in a combustible gas condition and a design basis LOCA does not have to be considered in this regard. Therefore, GE's response to RAI 16.0-1, dated August 8, 2006, in Enclosure 1, Attachment 2, item 27, concluded that containment oxygen assumptions do not meet Criterion 2 of 10 CFR 50.36 and are not included in the proposed Technical Specifications.

This conclusion, that Criterion 2 is not applicable, is also consistent with the existing Industry proposal to revise the Bases for those plants committed to retaining a Specification on oxygen concentration to reflect retention based on Criterion 4 of 10 CFR 50.36 (i.e., TSTF-478, "BWR Technical Specification Changes that Implement the Revised Rule for Combustible Gas Control").

Furthermore, from the Statements of Considerations (SOCs) for the Final Rule adopting the revisions to 10 CFR 50.44 (68FR54123, September 16, 2003) combustible gas control is clearly a beyond design basis accident (i.e., severe accident) issue. Limitations for these beyond design basis accidents have not been applied to evaluations against the criteria of 10 CFR 50.36(c)(2)(ii). Regarding the Technical Specification requirement for inerting, these SOCs acknowledge that for the existing BWR plants: "Retaining the requirement maintains the current level of public protection." This, in effect, mandates applicability of 10 CFR 50.36(c)(2)(ii), Criterion 4, on existing plants.

The ESBWR design certification does not fall under this discussion and reasoning for existing plants (i.e., there is no "current level of public protection" standard to evaluate). Furthermore, 50.36(c)(2)(ii)(D), Criterion 4, does not apply to a process variable or initial condition (e.g., as Criterion 2 does). Criterion 4 is restricted to SSCs. However, because the basis of the ESBWR severe accident analysis assumes containment inerting, GE commits to include an Availability Control, similar to other Regulatory Treatment of Non-Safety Systems (RTNSS) Availability Controls, in an Appendix to DCD Chapter 19. The Availability Control will be modeled after the BWR4 NUREG-1433, LCO 3.6.3.2, "Primary Containment Oxygen Concentration," and will be incorporated in DCD Chapter 19, Revision 3.

DCD Impact

An Availability Control for containment oxygen concentration will be included in an Appendix to DCD, Tier 2, Chapter 19 Revision 3.

NRC RAI 16.2-110, Supplement 1

RAI 16.2-110 requested that GE add a Technical Specification (TS) limiting containment oxygen concentration to less than 4%.

GE has responded that the four criteria of 10 CFR 50.36(c)(2)(ii) do not require it. Criterion 2 covers process variables and operating restrictions, but only those which are related to design basis accidents. They argue that the requirements of 10 CFR 50.44, combustible gas control, are derived from beyond-design-basis or severe accidents, so Criterion 2 does not apply.

They further argue that Criterion 4 does not apply: "A structure, system, or component [SSC] which operating experience or probabilistic risk assessment has shown to be significant to public health and safety." They point out that Criterion 4 does not apply to process variables or initial conditions, but rather is restricted to SSCs.

The staff asserts that the fundamental basis for ESBWR's compliance with 50.44 depends on the containment being inerted. The Federal Register Notice for the final 10 CFR 50.44 rulemaking stated that combustible gases produced by beyond design-basis accidents involving both fuel-cladding oxidation and core-concrete interaction would be risk-significant for plants with inerted containments, if not for the inerted containment atmosphere. If not inerted, the ESBWR containment will not be protected from combustible gas events and will not be safe enough to allow reactor operation. The public would not have the protection required by the regulation. The staff's position is that there must be a license requirement limiting containment oxygen concentration to less than 4%. If necessary, the TS on containment operability could be enhanced by adding an oxygen concentration limit or surveillance requirement as being necessary for containment operability (a system, per Criterion 4). An explicit TS limit would seem to be prudent for a future licensee; if the TS were silent on oxygen concentration, then an uninerted containment could be declared an inoperable containment, and ESBWR proposed LCO 3.6.1.1 ("Containment shall be OPERABLE.") would allow only one hour before requiring initiation of shutdown. Plant operation with an uninerted containment would result in noncompliance with the requirements of 50.44, which could, at the least, lead to violations, citations, enforcement action, and an over-all less stable regulatory environment, without appropriate surveillance requirements, limiting conditions, and associated actions.

One approach could be to create a TS safety limit for oxygen concentration. 10 CFR 50.36(c)(1) says that "Safety limits for nuclear reactors are limits upon important process variables [e.g., oxygen concentration] that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity [e.g., containment]. If any safety limit is exceeded, the reactor must be shut down."

Alternately, a license condition could be imposed to prohibit plant operation if oxygen concentration is greater than or equal to 4%. This would be outside the purview of 50.36.

These approaches to place a regulatory limit on containment oxygen concentration during operation of ESBWR plants would need to be further developed.

The point the staff wishes to make is that it is essential to have a regulatory limit on containment oxygen concentration in ESBWR licenses. Various mechanisms are available, but a separate TS on oxygen concentration, similar to TS 3.6.3.2 in the BWR/4 STS, would allow 24 hours before requiring initiation of shutdown, as well as leeway on inerting and de-inerting during start-up and shut down.

Please propose a regulatory limit requiring containment oxygen concentration to be less than 4%.

GE Response

As stated in the Staff's comment, ESBWR compliance with 10CFR 50.44 requires the containment be inerted. Supporting that regulatory requirement, DCD Tier 2, Revision 3, subsections 6.2.5.1 and 9.4.9.1 state the design basis for the ESBWR is for an inerted containment. Since Tier 2 is incorporated by reference in the Regulations upon design certification, there are ESBWR-specific regulatory limitations imposed to assure the containment is inerted.

GE recognizes the benefit of proposing a regulatory allowance for a limited time to operate with the containment oxygen concentration below the limit. Such a control was proposed in the previous response by way of the inclusion of an Availability Control within the Regulatory Treatment of Non-Safety Systems (RTNSS) Controls to be included in DCD, Tier 2, Chapter 19.

This Availability Control, imposing a limiting condition for containment oxygen concentration, will also provide for the appropriate compensatory actions and restoration timeframes for operation with the containment atmosphere not inerted to within limits. Appropriate surveillance requirements to monitor this condition will also be provided.

The original GE action to include an Availability Control, similar to other RTNSS Availability Controls, modeled after the BWR4 NUREG-1433, LCO 3.6.3.2, "Primary Containment Oxygen Concentration," will provide the limit on containment oxygen concentration as well as the leeway on inerting and de-inerting during start-up and shut down that the Staff discusses above.

DCD Impact

An Availability Control for containment oxygen concentration will be included in an Appendix to DCD, Tier 2, Chapter 19 Revision 4.