

GE-Hitachi Nuclear Energy Americas LLC

James C. Kinsey
Project Manager, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

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

MFN 07-194
Supplement 1

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Subject: **Response to RAIs 3.9-61 S01, 3.9-136 S01, 3.9-139 S01, Related
to ESBWR Design Certification Application – DCD Section 3.9**

Enclosure 1 contains GE-Hitachi Nuclear Energy Americas LLC (GEH)'s
response to the subject NRC RAI 3.9-61 S01, 3.9-136 S01, 3.9-139 S01, which
were transmitted via Reference 1.

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

Sincerely,



James C. Kinsey
Project Manager, ESBWR Licensing

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Reference:

1. Email from Chandu Patel (NRC) to John Leatherman (GEH), "Supplemental RAls on ESBWR Section 3.9", dated 06/21/07
2. MFN 07-194, *Response to Portion of NRC Request for Additional Information Letter No. 67 Related to ESBWR Design Certification Application – Nuclear Steam Supply Systems – RAI Numbers 3.9-58, 3.9-61 through 3.9-64, 3.9-66, 3.9-71, 3.9-133, 3.9-135 through 3.9-139, 3.9-141, 3.9- 146*, dated April 2, 2007

Enclosure:

1. MFN 06-194, Supplement 1, RAI Response to RAIs 3.9-61 S01, 3.9-136 S01, 3.9-139 S01

cc: AE Cabbage USNRC (with enclosures)
RE Brown GEH/Wilmington (with enclosures)
GB Stramback GEH/San Jose (with enclosures)
eDRF 0000-0071-3573 for RAI 3.9-61
0000-0063-5731 for RAI 3.9-136
0000-0063-5732 for RAI 3.9-139

MFN 07-194, Supplement 1

Enclosure 1

**RAI Response to RAIs 3.9-61 S01, 3.9-136 S01 and
3.9-139 S01**

For historical purposes, the original text of RAI 3.9-61 S01, 3.9-136 S01, and 3.9-139 S01 and the GE responses are included. The attachments are not included from the original response to avoid confusion.

NRC RAI 3.9-61

It is stated in DCD Tier 2, Section 3.9.2.4 that accelerometers are provided with double integration signal conditioning to give a displacement output. A partial list of the sensor locations has been provided. It is not clear from the list whether or not instrumentation will be mounted directly on the steam dryer at all significant locations including the outer hood, skirt and all potential high stress areas. Provide this additional information.

GE Response

The steam dryer will be instrumented with strain gauges and accelerometers to provide vibration measurements during startup testing. In addition, the steam dryer will be instrumented with dynamic pressure sensors to confirm the acoustic load definition used in the structural analysis.

The steam dryer instrumentation and startup testing process is described in Subsection 3L.4.6 of DCD, Tier 2, Appendix 3L.

DCD Impact

DCD Tier 2, Subsection 3.9.2.4 was revised as noted in the attached DCD Tier 2 Rev. 3 markup.

NRC RAI 3.9-61 S01

Email from Chandu Patel to John Leatherman, "Supplemental RAIs on ESBWR Section 3.9", 06/21/07

Comment on response to RAI 3.9-61 through 64, 66, and 71 (MFN 07-194, April 2, 2007):

GE's response to RAIs 3.9-61 through 64, 66, and 71, references or the applicable sections for DCD Appendix 3L relied on References 3L-5, 6, and 7 that are not scheduled for submittal until October 2007. In addition, Appendix 3L references GE SIL 644, Rev. 2, for steam dryer inspections although GE SIL 644 does not include the new ESBWR steam dryer design.

Our review of the responses to RAIs 3.9-61 to 64, 66, and 71 cannot be closed until receiving the referenced documents. Also, GE should update its steam dryer inspection guidance to include the ESBWR steam dryer design.

GEH Response

Specific steam dryer inspection recommendations for the ESBWR steam dryer design will be developed based on the final as-built design and structural analysis results. The steam dryer inspection recommendations will be consistent with the recommendations in DCD Reference 3L-2, and consistent with Boiling Water Reactor Vessel Internals Program (BWRVIP) guidance.

DCD Impact

The last paragraph of DCD Tier #2, Section 3L.4.6 will be revised as noted below.

Specific steam dryer inspection recommendations for the ESBWR steam dryer design will be developed based on the final as-built design and structural analysis results. The steam dryer inspection recommendations will be consistent with the recommendations in Reference 3L-2, and consistent with Boiling Water Reactor Vessel Internals Program (BWRVIP) guidance.

NRC RAI 3.9-136

GE describes its procedure for assessing the integrity of the ESBWR steam dryer in Section 3L.4 of DCD, Tier 2, Appendix 3L. The procedure for defining the fluctuating pressure loads acting on the steam dryer is described in Section 3L.4.4, and uses a 'Load Interpolation Algorithm' (LIA) to compute a fine discretization of pressure time histories over the steam dryer surfaces based on measurements made in GE's scale model test (SMT) facility in Sunol, CA. The LIA includes acoustic finite element models as part of its load estimating process.

(a) GE is requested to submit the LIA method for review (including the Acoustic Finite Element modeling (AFEM) procedures), along with any data measured in the SMT that substantiates the method. Also, the documentation of uncertainties and bias errors in the LIA and AFEM is requested.

(b) GE asserts that the BWR/3 configuration of the SMT facility has been benchmarked against plant data acquired from an instrumented dryer that confirms its capability to predict steam dryer acoustic load definitions. Per SRP Section 3.9.2, Draft Revision 3, April 1996, GE is requested to submit this benchmarking information, along with an assessment of the SMT uncertainties and bias errors. Particular emphasis should be placed on confirming that the SMT can be used to predict the frequency content of the forcing functions associated with acoustic flow tones (or singing) caused by flow over the branch lines for MSL safety and relief valves.

GE Response

The ESBWR steam dryer evaluations are discussed in Section 3L.4 of DCD, Tier 2, Appendix 3L. A more detailed discussion of the source of the load definition and validation of the load definition methodology will be provided in a future report: General Electric Company, "Steam Dryer - Acoustic Load Definition," NEDC-33312P, Class III (Proprietary), and NEDO-33312, Class I (Non-Proprietary).

DCD Impact

DCD Tier 2, Subsections 3L.4.4, 3L.4.6 and Section 3L.6 were revised as noted in the attached DCD Tier 2 Rev. 3 markup.

NRC RAI 3.9-136 S01:

In its response to RAI 3.9-136, the applicant refers to a future report - Reference 3L-5: General Electric Company, "Steam Dryer - Acoustic Load Definition," NEDC-33312P, Class III (Proprietary) - to address parts (a) and (b) of this RAI. The applicant is requested to submit Reference 3L-5 (NEDC-33312P) so that the staff can evaluate its response to RAI 3.9-136.

GEH Response

The report: General Electric Company, "Steam Dryer - Acoustic Load Definition," NEDC-33312P, Class III (Proprietary), and NEDO-33312, Class I (Non-Proprietary) is scheduled to be submitted by October 31, 2007, reference MFN 07-265, June 1, 2007.

DCD Impact

No DCD changes are being made in response to this RAI.

NRC RAI 3.9-139

In Section 3L.4 of DCD, Tier 2, Appendix 3L, GE explains how the steam dryer instrumentation (strain gages, accelerometers, and pressure transducers) will be monitored against established limits.

(a) GE is requested to explain the determination of those limits for each type of instrumentation, particularly for the pressure transducers.

(b) Per SRP Section 3.9.2, Draft Revision 3, April 1996, GE is requested to list the corrective actions to be taken if the limit curves are exceeded, and the steam dryer stresses are deemed not acceptable for higher plant power operation.

GE Response

(a) The methodology for developing the strain gauge and accelerometer response acceptance criteria are described in Subsection 3L.5.2.2 of DCD, Tier 2, Appendix 3L. The acceptance criteria will be based on the steam dryer structural analysis results. The acceptance criteria for the pressure sensor data are based on the frequency and amplitude content of the design load definition used in the structural analysis.

(b) The acceptability of the dryer for continued operation will be evaluated by revising the load definition based on the measured loading, repeating the structural analysis using the revised load definition, and determining revised operating limits based on the results of the structural analysis. If necessary, more detailed structural analyses of the high stress regions of the dryer will be performed. After reanalyzing the dryer structure with the measured loading and refined modeling, if it is determined that the stresses are not acceptable for higher plant power operation, further power ascension will be delayed until such time that modifications to the dryer could be designed and installed.

DCD Impact

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

NRC RAI 3.9-139 S01

In its response to RAI 3.9-139(a), the applicant states that the methodology for developing the strain gage and acceleration response acceptance criteria are described in Subsection 3L.5.2.2 of DCD, Tier 2, Appendix 3L. However, this response cannot be evaluated because the applicant has not provided Subsection 3L.5.2.2 as part of Appendix 3L. The applicant is requested to provide Subsection 3L.5.2.2 of DCD, Tier 2, Appendix 3L, so that the response to RAI 3.9-139(a) can be evaluated.

GEH Response

There was a typographical error in the response to RAI 3.9-139(a). The response should have referenced Subsection 3L.5.5.2. The corrected response to RAI 3.9-139(a) is provided below:

- (a) The methodology for developing the strain gauge and accelerometer response acceptance criteria are described in Section 3L.5.5.2 of DCD, Tier 2, Appendix 3L. The acceptance criteria is based on the steam dryer structural analysis results. The acceptance criteria for the pressure sensor data are based on the frequency and amplitude content of the design load definition used in the structural analysis.

DCD Impact

No DCD changes are being made in response to this RAI.