Enclosure 2

MFN 12-048, Revision 1

Final Response for RAI 3.9-276

Public Version

This is a non-proprietary version of Enclosure 1, from which the proprietary information has been removed. Portions of the document that have been removed are identified by white space within double brackets, as shown here [[ ]].

NRC RAI 3.9-276

GEH is requested to provide a specific analysis of the MSL nozzle location and size for the QC2 acoustic model and the SSES acoustic model, including the impact on the results of the analysis from the modeling errors in the location and size of the MSL nozzles.

GEH Response

Summary

GEH submitted a draft response to RAI 3.9-276 in MFN 12-048, July 18, 2012, and the final response is provided herein. The differences in the location of the main steam line (MSL) nozzles were very small and did not affect the PBLE methodology. In addition, although the differences in area of the nozzles from design to acoustic model (See Tables 1 and 2 below) are greater, the detailed response below shows that those differences [[ ]]. Although there is some effect on the [[ ]] is being removed from the ESBWR licensing basis (see GEH response to NRC RAI 3.9-270) and is not applicable to the revised benchmark that is provided in response to RAI 3.9-269. Therefore, [[

]] in the ESBWR design certification.

Because the nozzle location and size differences have no impact on the revised ESBWR licensing basis documents (which are described in response to other RAIs and compiled in response to RAI 3.9-292), there are no changes to those documents that result from this RAI 3.9-276.

Detailed Response

The differences in MSL nozzle location (elevation and circumferential distance) between the plant drawings and the FE acoustic models are very small and do not impact the results of the analysis for the QC2 acoustic model and the SSES acoustic model, from 2007 and 2008, respectively.

The results of the QC2 and SSES FE models, built in 2007 and 2008 respectively, when run in 2011 with correction of the nozzle areas using acoustic FRF scaling factors, are not affected by the differences between nozzle areas of the drawings and FE models.

Therefore, the differences in locations and areas of the nozzles of the QC2 and SSES acoustic models do not impact the validity of using the PBLE methodology to analyze acoustic stresses for the ESBWR steam dryer.

The differences in QC2 and SSES MSL nozzle locations and areas between the plant drawings and the FE acoustic models are summarized in Tables 1 and 2. The impact of the differences is also presented in these tables.

Based on the comparative results, the following conclusions are drawn:

1. The difference in MSL nozzle geometry between the plant drawings and the FE acoustic models is very small for both the elevation and circumferential distance. The maximum elevation differences are 1.46 inch for QC2 and 0.62 inch for SSES. The maximum differences in the circumferential direction are 0.02 inch for QC2 and 0.22 inch for SSES. These differences are much smaller than the acoustic wavelength up to [[ ]] and the acoustic FE element mesh size requirement [[ ]]. Consequently, the impact of these differences is insignificant for both of the acoustic model and PBLE results.

2. The original QC2 acoustic model built in 2007 has a [[ ]] in the nozzle areas relative to the plant drawing. The original SSES acoustic model built in 2008 has a [[ ]] of the nozzle area relative to the plant drawing.

   These deviations have no impact on the PBLE [[ ]] benchmark and loads definition results, because the nozzle area [[ ]] cancel with the [[ ]] as part of the Method 1 methodology.

   The effect of the nozzle area differences on the PBLE [[ ]] benchmark and loads definition is removed by scaling the [[ ]] calculated using the FE model with the ratios between drawing nozzle areas and FE model nozzle areas.

   - In the 2011 QC2 acoustic model, the nozzle areas were adjusted in the [[ ]] using the scaling factors. The [[ ]] and QC2 PBLE MSL benchmarks were then revised. The PBLE methodology was applied to the GGNS loads definition with the revised [[ ]]. That analysis supports the continued validity of using the PBLE methodology to predict acoustic stresses on steam dryers.

   - In the 2011 SSES acoustic model, the nozzle areas were adjusted in the [[ ]] using the scaling factors.

   With the scaled QC2 and SSES acoustic FRFs that were applied in 2011, there is no impact on QC2 and SSES PBLE results associated with the nozzle locations and areas mismatch.

Table 1:Summary of QC2 MSL Nozzle Differences (Drawings vs. FE Acoustic Model)

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Table 2:Summary of SSES MSL Nozzle Differences (Drawings vs. FE Acoustic Model)

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DCD/LTR Changes

No change is proposed for the ESBWR Licensing Basis Documents.