REQUEST FOR ADDITIONAL INFORMATION

EXTENDED POWER UPRATE

ROUND 19

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT (BFN), UNITS 1 AND 2

DOCKET NOS.50- 259 AND 50-260

EMCB

In response to a Nuclear Regulatory Commission letter dated June 16, 2008, Tennessee Valley Authority (TVA) provided main steam line (MSL) strain gage power spectral densities (PSDs) for current licensed thermal power (CLTP) (without low-flow noise removal) and for low-flow conditions (9-percent reactor power) at each of the Browns Ferry Nuclear Plant (BFN) Unit 1 MSL strain gage locations. The licensee has indicated that the low-flow conditions signals are caused by plant background noise and, therefore, filters them from the corresponding signals at CLTP. Then the filtered data is used for the stress analysis of Unit 1 dryer. Given this discussion:

(Unit 1 only)

181. Provide data and analysis to confirm that the Unit 1 low-flow signals are actually due to plant background noise events, and not the noise floors of the sensors and data acquisition systems.

182. The PSD comparisons of pressure measurements presented in the response to request for additional information (RAI) EMCB 172 (Figures EMCB 172-1 to 172-4) appear to contradict the comparisons presented in Continuum Dynamics Incorporated (CDI) Report 08-04P, *Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 1 Steam Dryer to 250 hertz* (*Hz*) (Figures 3.2-3.5). At frequencies above ~120 Hz, the response shows that the noise signals are lower than the corresponding signals at CLTP. However, CDI Report 08-04P shows the opposite. Explain why the information provided appears to be inconsistent. If the explanation for the inconsistency is that TVA chose a different plant MSL time history for the Unit 1 analysis, justify the change in time history.

183. The accumulated stress plots presented in response to RAI EMCB 170/138 show that the alternating stress amplitude increases little beyond 100 Hz. Please explain this observation. Provide similar stress plots when unfiltered MSL signals are used for the stress analysis of Unit 1 dryer. Please explain the differences between the plots for filtered and unfiltered signals.

(Unit 2 only)

147. Provide analysis and plots for Unit 2 similar to those provided for Unit 1 in response to RAI EMCB 172. Provide an explanation why the 19-percent power data shown in

Figures 3.2 through 3.5 in CDI Report No. 08-05P, *Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Browns Ferry Nuclear Unit 2 Steam Dryer to 250 Hz*, are higher than the data at CLTP for frequencies above about 120 Hz. Provide justification for removing any signal from the Unit 2 CLTP source strengths without reliable background noise signals. TVA should include stress and stress ratio tables in CDI Report 08-16P, *Stress Assessments of Browns Ferry Nuclear Unit 2 Steam Dryer with Tie Bar and Hood Modifications,* using unfiltered MSL signals.

(Unit 1/Unit 2)

184/148. Explain why two different power levels (9 percent in Unit 1 and 19 percent in Unit 2) are considered for pressure measurements at low-flow conditions.

185/149. In the event that noise removal from the MSL strain gage signals is not justifiable in Units 1 and 2, discuss what additional structural modifications to the Unit 1 and/or Unit 2 dryers would TVA consider that would lead to acceptable alternating stress ratios.

In the stress assessment of the BFN Unit 1 steam dryer, TVA has employed substructure modeling, as shown in Structural Integrity Associates calculation (File No. 0006982301), for estimating the complete 3-dimensional stress distribution at the two locations having the lowest alternating stress ratios: (1) the intersection between the bottom of the inner hood, stiffener and base plate, and (2) the bottom of the skirt/drain channel junction. For the first location, TVA simulates the stress profile of the full model analysis by applying static loading on a short section of the stiffener. For the second location, TVA applies the prescribed displacement at specific intervals along a vertical line in the drain channel and performs the 3-D analysis iteratively by changing the location of the vertical line until the stress profile matches the stress profile of the full model analysis. Then, for each location, TVA determines the largest ratio of the (Pm + Pb) stress intensity from the sub-model against that from the full model analysis and applies it to the stresses at the corresponding location in the steam dryer analysis. Given the above, provide a response to the following questions:

(Unit 1 only)

186. Justify the use of static sub-model analysis results for modifying the dynamic stress analysis results for the Unit 1 steam dryer, which is subjected to fluctuating pressure loads.

187. Figure 4.1 of the SIA calculations shows that 1,000 lb force is applied to the stiffener. Please explain why no loads are applied to Edges A, B, and C? TVA is requested to provide the final applied load to the sub-model and a comparison of the resulting sub-model stress profile and the full model stress profile.

188. Explain the application of the prescribed displacements at the skirt/drain channel junction. Also explain the iterative analysis approach for the sub-model of the skirt/drain channel junction.

189. Provide the final magnitude of imposed displacement along with the location and a comparison of the resulting sub-model stress profile and the full model stress profile.

190. Provide confirmation that the stress correction factors computed using sub-structure modeling are independent to the mesh sizes of the shell and the solid models.

191. In response to NRC RAI EMCB 171/139, TVA states that at a small number of frequencies, the [[_____]] damping actually increases the peak responses as shown in Figure EMCB 171/139-1. Explain how such increases are physically compatible with a displacement driven modal response.

(Units 1 and 2)

192/150. Provide the following information about the planned acoustic side branches (ASBs) for Units 1 and 2, including validation results:

(a) Identify which safety/relief valves the ASBs will be installed on;

(b) Provide the lengths of the various ASBs and the acoustic resonance frequencies associated with them;

(c) Describe the power level(s) at which these (new) acoustic resonances will be excited. If the new resonances are excited, discuss whether it will be locked in;

(d) Provide the estimated minimum alternating stress ratio of the dryer at flow conditions corresponding to the acoustic resonance of the standpipe-ASB combination; and,

(e) Address whether the ASBs will be designed by means of the scale-model test, if so provide the corresponding test results for review.

(Unit 2 only)

151. In the response to RAI EMCB 130/97, TVA provides a comparison between the Unit 3 MSL strain gage signals (with acoustic vibration suppressor (AVS)) with the corresponding Unit 1 signals (without AVS), which demonstrate the effectiveness of AVS in suppressing 218 Hz signal. Provide a similar comparison between Unit 3 and Unit 2 MSL signals so that the staff can further evaluate the effectiveness of AVS.

(Unit 1/Unit 2)

193/152. TVA presents the stress analyses of Unit 1 and Unit 2 steam dryer in CDI Reports 08-15P and 08-16P, respectively. In these reports, TVA has proposed several structural modifications to increase the alternating stress ratio. Describe the inspections that will be performed during the installation of the modifications. Specifically, confirm whether the root pass of the welds will be inspected. Additionally, provide confirmation whether any local stress relief heat treatment will be provided to the welds.