UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 2, 2008

Mr. William R. Campbell, Jr.
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 – REQUEST FOR ADDITIONAL INFORMATION FOR EXTENDED POWER UPRATE - ROUND 17 (TS-431 AND TS-418) (TAC NOS. MD5262, MD5263, AND MD5264)

Dear Mr. Campbell:

By letters dated June 28 and 24, 2004, the Tennessee Valley Authority (TVA, the licensee) submitted amendment requests for Browns Ferry Nuclear Plant (BFN), Unit 1 and Units 2 and 3, as supplemented by letters dated August 23, 2004, February 23, April 25, June 6, and December 19, 2005, February 1 and 28, March 7, 9, 23 and 31, April 13, May 5 and 11, June 12, 15, 23 and 27, July 6, 21, 24, 26, and 31, December 1, 5, 11 and 21, 2006, January 31, February 16, and 26, and April 6, 18 and 24, March 6, July 27, August 13, and 21, September 24, November 15 and 21, and December 14, 2007; January 25, February 11 and 21, March 6, and April 14, 2008. The proposed amendment would change the BFN operating licenses for all three units to increase the maximum authorized power level by approximately 15 percent.

A response to the enclosed Request for Additional Information is needed before the Nuclear Regulatory Commission staff can complete the review. This request was discussed with Mr. James Emens of your staff on April 23, 2008, and it was agreed that TVA would respond by June 16, 2008. Non-proprietary versions of these requests were provided in separate correspondence.

If you have any questions, please contact me at (301) 415-2315.

Sincerely,

for

Eva A. Brown, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Enclosure 2 transmitted herewith contains SUNSI. When separated from proprietary enclosure, this transmittal document is decontrolled.

Docket Nos. 50-259, 50-260, and 50-296

Enclosures:
1. Request for Additional Information - Non-proprietary
2. Request for Additional Information - Proprietary

cc w/enclosure 1: See next page

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OFFICE	LPL2-2/PM	LPL2-2/LA	DE/EMCB	LPL2-2/BC
NAME	EBrown MGV for	BClayton	KManoly	TBoyce
DATE	5/2/08	5/1/08	5/2/08	5/2/08

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REQUEST FOR ADDITIONAL INFORMATION

EXTENDED POWER UPRATE

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

DOCKET NOS. 50-259, 50-260, AND 50-296

EMCB

(Units 2 and 3 only)

135. TVA has indicated the intent to install main steam line (MSL) strain gages and Acoustic Vibration Suppressors in the blind flanges responsible for the 218 Hz tones currently present on Unit 3. Therefore, a revised stress analysis of the Unit 3 dryer, using Unit 3 loads, will need to be used to develop limit curves.

Provide information about the strain gage instrumentation, including number of strain gages at each of the eight MSL locations, as well as their connections (i.e., whether all the strain gages will be used simultaneously) and associated uncertainties. Address how a strain gage failure at a MSL location would affect the uncertainty.

(All units)

168./136. For the Browns Ferry Nuclear Plant (BFN) units:

(a) Describe the evolution of BFN tie bar design including the latest tie bar modification;

(b) Explain how the difference between the BFN and Susquehanna steam dryer designs (slanted hood versus curved hood) affect the amplitude of the 15 Hz frequency, which is the resonance frequency associated with the MSL dead legs, present in the MSL strain gage signal. Discuss the insights into the cause(s) of the 15 Hz tones which can be inferred from Unit 3 low power MSL measurements.

169./137. (a) The BFN operating experience reveals that the steam dryers have experienced high-cycle fatigue cracking at three locations: vertical weld of drain channel of all three units in 1988-to-1992 period, Unit 3 tie bar failure in 2003, and Unit 1 support beam welded connection to support ring in 2006. Generally, high-cycle fatigue failures take place in the first few months of operation. However, the fatigue cracking in BFN steam dryers has occurred after 12 to 30 years of operation.

Address why it took so long for the cracking to be observed.
Provide time histories of the stress intensities at these three failure locations and identify the frequencies of the highest alternating stress

intensities that may be responsible for the observed cracking. Additionally, provide the root cause analyses reports for these three failures.

(b) The justification for the high-cycle fatigue failure of the BFN drain channels, indicates that the original fillet welds on the channels may have had root defects. Therefore it appears that the high fatigue strength reduction factor (3.6) should be used. This factor is twice the one used in the stress analysis presented in Continuum Dynamics, Inc. (CDI) Report 07-06P.

Address why the higher fatigue strength reduction factor for the fillet welds, which might have root defects, is not used in the stress analyses of the dryers presented in CDI Reports 07-06P and 08-06P.

(c) Regarding the fatigue failure of Unit 3 tie bar in 2003, confirm whether fatigue failure has occurred through the base metal, away from the weld. Provide a description of the loading acting on the tie bar and of its design.

(d) As the purpose of the response to EMCB 134/101 was to assess the consistency of the stress analysis in lieu of support of the failure of the support beam; it appears that the observed failure of the support beam is not a fatigue failure. Explain the root cause of this failure, whether the fractured surface of the beam was flat, and if it revealed the presence of any plastic deformation.

170./138. (a) For the nodes listed in Table EMCB 138/105-1 of the TVA response to EMCB 138/105 and located on shell elements, identify the section location and orientation of these components. For Top Cover/Tie Bar Base locations, discuss whether the plotted stress components act along the length of the tie bar. For locations including tie bars, indicate whether the dominating alternating loads acting on the tie bars are tensile loads or bending moments.

(b) Provide accumulative power spectral density (PSD) curves of overall stress intensity, rather than individual stress components. Also, provide mode shapes (or unit MSL source driven dryer displacement response shapes) of the dryer at and near the peak stress frequencies of 34, 47, and 62 Hz. The mode shapes should show overall dryer vibration, as well as close-ups of smaller regions with strong vibration. For each mode shape, also show the motion of the perforated plates.

171./139. Expand the table in the response to EMCB 139/106-2 to include frequencies near 47 and 62 Hz. Also, explain why the stress ratio decreases from 2.00 to only 1.77 at node 76,452 (inner hood top cover plate/tie bar) in Tables EMCB 139/106-3 and 106-4, when Table EMCB 139/106-2 and Figure EMCB 139/106-2a show that the dominant 34 Hz peak stress decreases by 42 percent. Discuss what contributes to the major portion of stress near 34, 47 and 62 Hz frequencies to the peak alternating stresses at Node 76,452.

(Unit 1 only)

172. (a) Provide the following for Unit 1:

(i) Plots comparing MSL strain gage PSDs for current licensed thermal power (CLTP) (without low-flow background noise removal), low-flow conditions, and CLTP (with low-flow background noise removal).

(ii) Plots similar to those in (a), [[ ]]

In the above plots, annotate and discuss any significant reductions in amplitude over broad and narrow frequency ranges, particularly near frequencies associated with high stresses, like 34, 47, and 62 Hz.

(b) Comparing Tables 9b and 10b in CDI Report No. 08-06P, Rev. 0, dated March 2008, reveals that the alternating stress ratios at several locations in the Unit 1 dryer finite element (FE) model are improved significantly when plant and sensor background noise is removed from the MSL strain gage measurements.

Background noise removal reduces stresses by factors ranging from 1.03 to 1.40, and by an average of 22 percent. Explain how the background noise removal leads to the stress reductions, including which frequencies experience the strongest loading/stress reductions. The explanation should be consistent with the accumulative stress plots provided in the response to EMCB 138/105, which show that stresses are dominated by low frequency peaks at 34, 47, and 62 Hz.

(c) Describe the modeling simplifications made for the tie bar attachment to the steam dryer and explain why they are conservative.

(d) Since the strains due to non-acoustic piping structural bending modes will be filtered out by the MSL strain gages, explain how the piping structural modes can cause any other contamination of the strain gage signals.

(All units)

173./140. It was indicated that TVA plans to deviate from the FE modeling uncertainty used by PSEG for the Hope Creek dryer (25.26 percent), claiming that uncertainty in the loss factors inferred from the hammer tests reduces the FE modeling uncertainty to 21.5 percent. However, the uncertainty used in the Unit 1 limit curves (shown in Table 3 of CDI Technical Note 07-30P, Rev. 1) is 25.26 percent. Clarify the FE model uncertainty used in all BFN analyses, and provide more detail on how a 37 percent uncertainty in hammer test damping reduces FE modeling uncertainty from 25.26 percent to 21.5 percent.

174./141. In the response to EMCB 153/120, TVA uses another set of Quad Cities Unit 2 (QC2) data to validate the Acoustic Circuit Model (ACM) Rev. 4. According to the response to EMCB 154/121(a), the dipole source terms calculated from ACM Rev. 4 are stronger in BFN than in QC2. Provide a validation of the ACM Rev. 4 against additional dryer data where the low frequency loading on the dryer is more pronounced (i.e., higher than that of BFN).

175./142. [[ ]]

[[ ]]

176./143. [[ ]]

177./144. [[ ]]

(a) Explain where this pressure is measured;

(b) [[ ]]

(c) [[ ]]

178./145. The [[ ]] bias error associated with FE model displacement convergence should not be subsumed by the FE model uncertainty determined from the hammer test data. As the overall FE mesh convergence bias error reported in Table 3 of CDI Technical Note 07-30P, Rev. 1, appears to be [[ ]], address why [[ ]] percent is appropriate.

179./146. Provide plots to support the information submitted in the response to EMCB 166/133. Limit curves for all plants discussed should be plotted on the same graphs so that they may be easily compared.

(Unit 1 only)

180. CDI Report 08-06P, *Stress Assessment of Browns Ferry Nuclear Unit 1 Steam Dryer*, Revision 0, states that the minimum alternating stress ratio for the Unit 1 dryer is 1.56. This ratio takes into account the hydrodynamic damping due to perforated plates and the end-to-end uncertainties excluding the [[ ]] percent bias error associated with the convergence of the finite element displacement results.

The inclusion of the [[ ]] percent bias error reduces the minimum alternating stress ratio for Unit 1 steam dryer from [[ ]] This stress ratio will be further reduced to [[ ]] at the extended power uprate (115 percent of CLTP) provided no acoustic resonance appears during power ascension; otherwise it will be reduced further.

Given the response relies on the following: (a) [[ ]] (b) use of an ACM that may not include the sources that might be present in the reactor pressure vessel, and (c) [[ ]]