Proprietary Information
Withhold from Public Disclosure Under 10 CFR 2.390
This letter is decontrolled when separated from Enclosure 1

Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-16-094

June 9, 2016

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units 1, 2, and 3
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Proposed Technical Specifications (TS) Change TS-505 - Request for License Amendments - Extended Power Uprate (EPU) - Supplement 20, Responses to Requests for Additional Information**

References:
1. Letter from TVA to NRC, CNL-15-169, "Proposed Technical Specifications (TS) Change TS-505 - Request for License Amendments - Extended Power Uprate (EPU)," dated September 21, 2015 (ML15282A152)

2. Letter from NRC to TVA, “Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Request for Additional Information Related to License Amendment Request Regarding Extended Power Uprate (CAC Nos. MF6741, MF6742, and MF6743),” dated June 3, 2016 (ML1616144A645)

By the Reference 1 letter, Tennessee Valley Authority (TVA) submitted a license amendment request (LAR) for the Extended Power Uprate (EPU) of Browns Ferry Nuclear Plant (BFN) Units 1, 2 and 3. The proposed LAR modifies the renewed operating licenses to increase the maximum authorized core thermal power level from the current licensed thermal power of 3458 megawatts to 3952 megawatts. During the technical review of the LAR, the Nuclear Regulatory Commission (NRC) identified the need for additional information. The Reference 2 letter provided NRC Requests for Additional Information (RAIs) related to the replacement steam dryers. The due date, provided by the Reference 2 letter, for the responses to NRC RAIs EMCB-RSD-RAIs 2, 3, 9, 10, 11, 13, 17, 19, 22, 24,

26, 27, 29, 30, 32, 36, and 37 is June 10, 2016. The enclosures to this letter provide the responses to these RAIs from the Reference 2 letter. The responses to the remaining RAIs, with the exception of those associated with Safety Relief Valve (SRV) loading (i.e., NRC RAIs EMCB-RSD-RAIs 14, 15, 16, 18, and 21) will be submitted to the NRC by July 29, 2016. The RAI responses associated with SRV loading will be submitted to the NRC by August 26, 2016.

Enclosure 1 to this letter provides the responses to NRC RAIs EMCB-RSD-RAIs 2, 3, 9, 10, 11, 13, 17, 19, 22, 24, 26, 27, 29, 32, 36, and 37. GE-Hitachi Nuclear Energy Americas LLC (GEH) considers portions of the information provided in Enclosure 1 of this letter to be proprietary and, therefore, exempt from public disclosure pursuant to 10 CFR 2.390, Public inspections, exemptions, requests for withholding. An affidavit for withholding information, executed by GEH, is provided in Enclosure 3. Enclosure 2 to this letter provides a non-proprietary version of the responses to the RAIs provided in Enclosure 1. Therefore, on behalf of GEH, TVA requests that Enclosure 1 be withheld from public disclosure in accordance with the GEH affidavit and the provisions of 10 CFR 2.390.

Enclosure 4 provides the response to NRC RAI EMCB-RSD-RAI 30.

TVA has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the NRC in the Reference 1 letter. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. In addition, the supplemental information in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed license amendment. Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter to the Alabama State Department of Public Health.

There are no new regulatory commitments associated with this submittal. If there are any questions or if additional information is needed, please contact Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 9th day of June 2016.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosures

cc: See Page 3

Enclosures:

1. Responses to NRC Requests for Additional Information EMCB-RSD-RAIs 2, 3, 9, 10, 11, 13, 17, 19, 22, 24, 26, 27, 29, 32, 36, and 37 (Proprietary version)
2. Responses to NRC Requests for Additional Information EMCB-RSD-RAIs 2, 3, 9, 10, 11, 13, 17, 19, 22, 24, 26, 27, 29, 32, 36, and 37 (Non-proprietary version)
3. General Electric Hitachi Affidavit
4. Response to NRC Request for Additional Information EMCB-RSD-RAI 30

cc:

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant
State Health Officer, Alabama Department of Public Health (w/o Enclosure 1)

Withhold from Public Disclosure Under 10 CFR 2.390

ENCLOSURE 1
Responses to NRC Requests for Additional Information
EMCB-RSD-RAIs 2, 3, 9, 10, 11, 13, 17, 19, 22, 24, 26, 27, 29, 32, 36, and 37

(Proprietary version)

ENCLOSURE 2
Responses to NRC Requests for Additional Information
EMCB-RSD-RAIs 2, 3, 9, 10, 11, 13, 17, 19, 22, 24, 26, 27, 29, 32, 36, and 37

(Non-proprietary version)

ENCLOSURE 2

GE Letter No. 175528-016

GEH Response to EMCB RAIs in Support of TVA Browns Ferry Replacement Steam Dryer

Non-Proprietary Information – Class I (Public)

NON-PROPRIETARY NOTICE

This is a non-proprietary version of Enclosure 1 of GEH Letter No. 175528-016 which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

BFN EPU- EMCB- RSD-RAI-2

Main Steam Lines (MSLs) A and D appear to have [[ ]], according to Appendix B, pages B-16-17, and Figure 2.2-5 (Ref. 4). However the image from Figure 4.1-26 on page 4-44 (Ref. 2) appears to show that the dead legs are on MSLs B and C. Also, Figure 4.1-13 on page 4-16 (Ref. 2) shows peak loads adjacent to the B and C MSL inlets. Clarify which MSLs have the dead legs, and confirm that the [[ ]] analyses performed to date are associated with the proper MSL inputs.

GEH Response

The analysis methodology and results on the Flow Induced Vibration (FIV) evaluation for the Browns Ferry Nuclear Station (BFN) Replacement Steam Dryer (RSD) were discussed in NEDC-33824P. As shown in Figure 4.1-26 on page 4-44 (BFN MSL layout) and Figure 4.1-13 on page 4-16 (BFN dryer differential pressure Three-Dimensional (3D) contour plots at [[ ]]), BFN MSLs B and C each have a dead leg section to accommodate Safety Relief Valves (SRVs), which resulted in the [[ ]] adjacent to MSL "B" and "C" inlets.

NEDC-33824P Appendix B discussed the [[ ]] based load evaluation methodology and its application to the BWR/4 RSD, which is the prototype for the BFN RSD. The BWR/4 prototype MSL piping outline was provided in Figure 4.1-47 on page 4-85. As shown in Figure 4.1-47, the BWR/4 prototype MSLs A and D have dead leg sections, which is consistent with [[ ]] in Figure 2.2-5 on page B-17 as well as the description on page B-16.

In summary, the MSL labeling convention is different for BFN as compared to the BWR/4 prototype plant. The MSLs with dead legs in the BFN plant are called "B" and "C", while in the BWR/4 prototype plant, they are called "A" and "D".

The correct MSL inputs were used in BFN RSD [[ ]] load definition and analysis.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-3

Table 4.1-23 (page 4-88, Ref. 2) shows flow velocity in the BFN MSL [[ ]] while Table 4.1-6 (page 4-52) in Ref. 2 lists MSL flow velocities of [[ ]]. Please explain why the MSL flow velocity at EPU conditions listed in the two tables are not consistent, and which one is used in the steam dryer evaluations.

GEH Response

The Main Steam Line (MSL) flow velocities for Browns Ferry of [[

]]. These velocities are used for the Browns Ferry [[ ]]. These flow velocities were calculated using an MSL Inside Diameter (ID) of [[ ]], which is based on Browns Ferry MSL pipe measurements taken during the installation of the strain gauges on the MSLs.

The [[ ]] listed in Table 4.1-23 were only used for comparing the Browns Ferry plant operating conditions to the prototype plant operating conditions. The [[ ]] flow velocity [[ ]].

The MSL flow velocities of [[ ]] for Browns Ferry and [[ ]] shown in Table 4.1-23 were [[ ]]. The velocity was recalculated using inputs as presented in the table. The updated results are [[ ]].

The purpose of Table 4.1-23 is [[ ]]. The only difference in the operating conditions [[

]]. Because the MSL pipe [[

]]. The corrected flow velocities [[

]].

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

Table 4.1-23 entries for MSL velocity

[[			
			]]

BFN EPU- EMCB- RSD-RAI-9

Section 4.2.3.1 (p. 4-125 of Ref. 2) mentions using 1% structural damping and table 4.1-24 (p. 4-89) in section 4.1.7.3 shows [[ ]]. In addition to these, describe if there is any other damping utilized in the RSD evaluations. Clarify if the [[ ]] is a percentage of critical damping.

GEH Response

The [[ ]] (Section 4.1.7.3, Table 4.1-24) [[ ]] the 1% structural damping (Section 4.2.3.1) or to the critical damping in the structural Finite Element (FE).

- [[ ]]
- The 1% structural damping [[ ]].

The list of damping terms utilized in the Replacement Steam Dryer (RSD) evaluations is:

[[

]]

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-10

In Section 4.2.1.3, the licensee describes the use of [[ ]]. The licensee has identified the [[ ]]. The licensee is requested to explain whether these Masters properly represent the [[ ]]. Please show that the Masters preserve the natural frequencies [[ ]] and mode shapes of the corresponding [[ ]].

GEH Response

Various guidelines to select [[ ]] are published in the literature. An analytical selection of [[ ]] is provided in Reference 10-1. This analytical selection procedure preserves lower frequency dynamic responses of the model [[ ]]. This method provides guidance for selecting [[ ]] so that the dynamic characteristics and corresponding mode shapes [[ ]].

In the Boiling Water Reactor (BWR) steam dryer design, the [[ ]] are used to remove the [[

]]

In the dryer analysis, the [[ ]] in Reference 10-1 [[

]] Therefore, in the Browns Ferry Nuclear Plant (BFN) replacement dryer analysis [[

]] In addition, the nodes distributed along the outside of vane assemblies were also selected as Master DOFs in order to characterize the distributed mass (i.e., the external master node selection shown in Figure 4.2-6 of NEDC-33824P). In order to preserve the [[

]] assembly. Using the [[ ]], an evaluation was performed to determine the significance [[

]] The FIV analysis was performed using [[

]] (see Figure 10-1). The strains and acceleration obtained from [[

]] The
locations (and azimuth) of [[ ]]
Table 10-1. [[ ]] at these
sensor locations. Figure 10-2 shows the [[

]] Table 10-1.

The results show that the [[
]] The structural response showed [[

]] These results indicate that [[
]] For the locations where an [[

]] For example, the [[
]] This location also had the [[
]] Based on the results of
this study, it is concluded that [[

]] NEDC-33824P Figure 4.2-6.

For the [[ ]] (see
NEDC-33824P Figure 4.2-8) [[

]]

[[

]]

Figure 10-1: [[

]]

Table 10-1: [[ ]]

[[	
	]]

[[	
	]]

[[

]]

Figure 10-2: [[

]]

Reference

10-1. V. N. Shah and M. Raymunds, Analytical Selection of Masters for the Reduced Eigenvalue Problem, International Journal For Numerical Methods In Engineering, Volume 18, 89-98 (1982).

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-11

In Figure 4.2-2 of NEDC-33824P, Appendix A, Revision 0, it is stated that the range for applicability of [[
]]. Please discuss the significance of this statement and any impact on the stress concentration associated with an undersized weld. Explain if this condition of [[
]] is satisfied for BFN RSD fillet welds.

GEH Response

As the [[ ]] is such that it [[

]] Analytical studies have shown [[
]] when the [[ ]] then this becomes the case. For the Browns Ferry Nuclear Plant replacement steam dryer design, there are [[ ]] For further information regarding this [[ ]], refer to the response to the Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) related to the audit of the Economic Simplified Boiling Water Reactor (ESBWR) contained in Reference 11-1.

Reference

11-1. Letter, Jerald G. Head (GEH) to Document Control Desk (NRC), "NRC Requests for Additional Information Related to the Audit of the Economic Simplified Boiling Water Reactor (ESBWR) Steam Dryer Design Methodology Supporting Chapter 3 of the ESBWR Design Control Document – GEH Revised Response to RAI 3.9-285 and Response to RAI 3.9-285 S01," MFN 12-077, Revision 3, September 24, 2013 (ML13268A461).

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-13

Section 4.2.3.3 of NEDC-33824P, Page 4-126, states that: [[
]] This means that both the mesh size and nodes [[
]]. Provide additional details on the acoustic and structural mesh size and to explain [[
]].

GEH Response

As noted in NEDC-33824P, [[

]]

The next step in the process is to [[

]]

This process is the same as has been applied in previous replacement steam dryer evaluations. Pressure contour comparisons can be seen in NEDC-33824P, Figure 4.2-18 and Appendix A, Figure 5.3-2.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-17

In the [[ ]], Equation 4.1-14 on page 4-67 of NEDC-33824P (Ref. 2) is used to account for differences between the [[ ]] of both plants (BFN and RP). In this equation, the [[

]]. This seems to be inconsistent with the text given above equation 4.1-14, stating "[[ ]]". According to this statement, [[ ]]. Please explain the reasons for dividing, instead of multiplying, [[ ]].

GEH Response

The statement of "[[
]]" in Section 4.1.4.4.2, page 4-67 of NEDC-33824P assumes a constant acoustic velocity. The more complete statement would be "[[
]]"

As discussed on page 4-67 of NEDC-33824P, because of [[

]] was developed for this purpose.

In the [[ ]] method, [[

]] In other words, [[

]]

The total vessel response can then be reconstructed [[

]] Therefore, [[

]]

To use the [[

]]

This is consistent with the Equation 4.1-14 on page 4-67 in Section 4.1.4.4.2 of NEDC-33824P.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

The statement of "[[
]]" in Section 4.1.4.4.2, page 4-67 of NEDC-33824P is revised to be "[[

]]"

BFN EPU- EMCB- RSD-RAI-19

Clarify whether the [[ ]] comparison at test condition [[ ]] in Figure 4.1-56 and 4.1-57 (pages 4.104 & 4-105 of Ref. 2) is at previous CLTP conditions or current EPU conditions.

GEH Response

The test condition used in Figures 4.1-56 and 4.1-57 is at [[ ]], about [[ ]] of the current Extended Power Uprate (EPU). The Browns Ferry Nuclear Plant (BFN) Main Steam Line (MSL) velocity at EPU is [[ ]]. The [[ ]] MSL velocity at [[ ]] was used for BFN EPU loads trending. The trended BFN EPU loads are higher than that of a [[ ]] at the [[ ]] as shown in Figure 4.1-44 of NEDC-33824P Revision 0.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-22

Section 4.1.2.2 (page 4-17 of Ref. 2) discusses how [[
]]. Please explain if this [[ ]] is coherent (a sum over complex numbers), or incoherent (a sum over the absolute values of the differential pressures). If the sum is coherent, the [[ ]] may not be conservative, as it effectively filters the circumferentially varying loading which excites the low frequency dryer modes most likely to contribute to peak stresses. Provide an assessment of the impact on Minimum Alternating Stress Ratio (MASR) if a coherent sum was inappropriately chosen as the basis for [[ ]], and for computing [[ ]].

GEH Response

[[
]]

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-24

The [[ ]] which are plotted in Figures 3.2-2 to 3.2-7 of NEDC-33824P Appendix C (pages C-50 to C-52 of Ref. 5) are obtained from [[ ]]. The degree of variability between these plants can be evaluated by comparing the individual [[ ]] of the plants. Please provide overlaid plots comparing the values of each coefficient obtained from the three plants.

GEH Response

The [[ ]] were [[ ]] obtained from three separate sets of [[ ]] for each plant. More specifically, the process for obtaining the [[ ]] did not produce individual [[

]] Figures 3.2-8 through 3.2-13 in Appendix C are provided to indicate the [[ ]], as well as [[ ]]. In addition, Figure 3.2-1 in Appendix C is provided to indicate the variability in the coherence as a function of frequency.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-26

The licensee uses [[ ]] for estimating the pressures on the three BFN replacement steam dryers (RSDs). [[ ]] is used to assess the projected minimum alternating stress ratio (MASRs) at EPU for the proposed RSDs. [[ ]] will be applied for assessing the lead BFN Unit (BFN3) (instrumented dryer) after on-dryer measurements are acquired. Finally, [[ ]] will be used to monitor the MASRs of the BFN1 and BFN2 RSDs during power ascension. However, [[ ]]. Please explain the benefits of using [[ ]] instead of [[ ]] to assess the MASRs of the first RSD during power ascension.

GEH Response

[[ ]] It is the most straightforward approach to define the acoustic loads on a BWR steam dryer [[ ]] [Refer to NEDC-33824P Revision 0 Appendix B].

[[ ]] Several steps are involved in developing the steam dryer acoustic loads [[

]] Finally the steam dryer loads are calculated by combining [[ ]] [Refer to NEDC-33824P Revision 0 Appendix C].

Indeed, [[

]] allows faster analysis turnaround time [[ ]] reducing the steam dryer effect on the plant power ascension testing schedule.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-27

The pressure PSD plots in Figures 4.1-56 and 4.1-57 (pages 4-104 and 4-105 of Ref. 2) are in Pascals squared /Hz. Provide the pressure PSD plots in Figures 4.1-56 and 4.1-57 in English units (psid squared/Hz) also.

GEH Response

Pressure Power Spectral Density (PSD) plots in Figures 4.1-56 and 4.1-57 in English units (psid squared/Hz) are as follows:

[[

]]

Figure 4.1-56a: Browns Ferry [[ ]] PSD Loads to Industry Data Comparison [[ ]] (with English Units)

[[

]]

Figure 4.1-57a: Browns Ferry [[ ]] PSD Loads to Industry Data Comparison [[ ]] (with English Units)

The above plots in English units are already provided in NEDC-33824P in Metric units.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-29

Table C6-3 on page C-131 of Appendix C (Ref. 5) specifies a pressure to microstrain conversion of about [[ ]]. However, no units are provided for this conversion. Clarify if the conversion is in Pascals (Pa)/microstrain or pounds per square inch (psi)/microstrain.

GEH Response

The conversion is in pounds per square inch (psi)/strain.

This should be [[ ]] psi/strain.

[[

]]

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

Equation C6.6 should be:

[[ ]]

Table C6.3 should be:

Table C6-3: [[ ]]

[[							
							]]

BFN EPU- EMCB- RSD-RAI-32

GEH assesses the effects of Vane Passing Frequency (VPF) loads in [[

]] as described in section 4.1.5.4 (Ref. 2).

Provide the following information regarding the VPF tones.

a. Considering how the VPFs vary throughout a fuel cycle, (i) discuss what SRV resonances might the VPF tones align with, (ii) address the potential impact of this interaction on the amplitude of the SRV resonance.

b. There are two reactor Recirculation Pumps (RRPs). (i) Address how the VPF tones between the two pumps interact. (ii) Also address amplification of loads due to 'beating' phenomena between the tones. (iii) Provide any available data from the [[ ]] strain gages to address this request.

GEH Response

Part a:

(i): Safety Relief Valve (SRV) resonances will be measured during power ascension. [[

]]

(ii): The VPF and SRV resonance are [[

]]

With respect to the structural analysis, the [[

]]

Part b:

(i): The two recirculation pumps are operated at approximately the same speed. A slight mismatch in pump speeds can result in a beating phenomenon. This has been described in NRC Information Notice (IN) 95-16 (Reference 32-1) and GE Service Information Letter

(SIL) 600 (Reference 32-2), regarding increased containment noise and vibration that had been observed in some plants when operating at increased recirculation pump speeds.

(ii): Beating phenomenon is linear; the power of signals will add. [[

]] GE SIL 600 noted that the beat frequency noise and vibration were determined to be an insignificant component of the overall containment noise and vibration levels. [[

]]

(iii) The [[

]]

Table 32-1. [[ ]]

[[			
			]]

References

32-1. NRC Information Notice No. 95-16: "Vibration Caused by Increased Recirculation Flow in a Boiling Water Reactor," March 9, 1995.

32-2. GE Nuclear Energy Service Information Letter No. 600, "Increased Containment Noise and Vibration at Increased Recirculation Pump Speed," May 15, 1996.

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-36

Reconcile Figure 5.4.1 (NEDC 32824P, Appendix E), where loading frequencies do not seem to [[ ]], with Figure 5.4.2 in the same, where all [[ ]].

GEH Response

The [[ ]] are known from the [[ ]]. The [[ ]] do not change with minor differences [[ ]] recognizing that due to [[ ]] in the Finite Element (FE) analysis. This [[ ]] is performed in [[ ]].

Because the steam dryer analysis is [[ ]] The output response is simply [[ ]] Figure 5.4-1 of NEDC-32824P Appendix E provides the [[ ]]. The [[ ]] is used in [[ ]]

The [[ ]] provide [[ ]] Because the steam dryer FE model was [[ ]] Figure 5.4-2 of NEDC-32824P Appendix E shows [[ ]].

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

None

BFN EPU- EMCB- RSD-RAI-37

Clarify whether the y-axes in Figures 5.4.1 and 5.4.3 in NEDC 32824P, Appendix E, are microstrain, or millistrain.

GEH Response

Figures 5.4-1 and 5.4-3 in NEDC-33824P Appendix E are labeled [[ ]], however these plots should be labeled [[ ]]. Figures with the corrected units are shown below.

[[

]]

Figure 5.4-1: Browns Ferry [[ ]]

[[

]]

Figure 5.4-3: Browns Ferry [[

]]

Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

Corrected figures are provided as part of this RAI response.

Enclosure 3

General Electric Hitachi Affidavit

ENCLOSURE 3

GEH Letter No. 175528-016

GEH Affidavit for Enclosure 1

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Lisa K. Schichlein, state as follows:

(1) I am a Senior Project Manager, NPP/Services Licensing, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of GEH letter 175528-016, "First Set of GEH RAI Responses in Support of the Browns Ferry Steam Dryer Replacement," dated June 1, 2016. The GEH proprietary information in Enclosure 1, which is entitled "GEH Response to EMCB RAIs in Support of TVA Browns Ferry Replacement Steam Dryer," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] Figures and large objects are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the *Freedom of Information Act* ("FOIA"), 5 U.S.C. Sec. 552(b)(4), and the *Trade Secrets Act*, 18 U.S.C. Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F.2d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2d 1280 (D.C. Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary or confidentiality agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed GEH design information of the methodology used in the design and analysis of the steam dryers for the GEH Boiling Water Reactor (BWR). Development of these methods, techniques, and information and their application for the design, modification, and analyses methodologies and processes was achieved at a significant cost to GEH.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience and information databases that constitute a major GEH asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply

the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 1st day of June 2016.

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ENCLOSURE 4

Response to NRC Request for Additional Information EMCB-RSD-RAI 30

ENCLOSURE 4

EMCB-RSD-RAI-30

In Attachment 45 (Ref. 8) to TVA Letter No. CNL-15-169, the frequency range of valve monitoring is not indicated. Flow-excited resonances of the acoustic trapped modes inside the Main Steam Isolation valves (MSIVs) have been observed in other BWR plants consequent upon increasing the power beyond the CLTP value. The licensee should monitor the vibration of the MSIVs up to 1 kHz to assess the severity of acoustic resonances which may develop inside the MSIVs when the steam flow velocity is increased. Therefore, the licensee is requested to provide the frequency range for monitoring the vibration of MSIVs.

TVA Response:

The MSIVs, that will be monitored for flow induced vibration (FIV) at Browns Ferry Nuclear Plant (BFN), will be monitored for frequencies up to 1 kHz. However, as discussed below, the MSIVs at BFN are not susceptible to flow-excited resonances of acoustic trapped modes.

Based on a review of Reference 1, acoustic trapped modes in piping systems can be excited due to flow over axisymmetric shallow cavities. Per Reference 1, excitation of such modes has been identified in gate valves, which have seats that are axisymmetric shallow cavities for most of the pipe circumference. Therefore, excitation of acoustic trapped modes could potentially occur in MSIVs that are gate valves. The MSIVs at BFN are all globe valves of identical design, not gate valves. Therefore, the BFN MSIVs do not have seat designs or other features similar to axisymmetric shallow cavities that are susceptible to excitation of acoustic trapped modes. Globe valve-type MSIVs at other BWR plants have not developed resonance issues attributed to acoustic trapped modes at power levels above CLTP. Therefore, excitation of acoustic trapped modes in the BFN MSIVs at power levels above CLTP is not anticipated.

Reference

1. Aly, K., Ziada, S., "Flow-excited Resonance of Trapped Modes of Ducted Shallow Cavities," Journal of Fluids and Structures, 26 (2010), 92-120.