

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-16-161

October 13, 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 33, Revised Response to Request for Additional Information and Revised Replacement Steam Dryer Limit Curves**

- 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 (ML16144A643)
 3. Letter from TVA to NRC, CNL-16-145, "Proposed Technical Specifications (TS) Change TS-505 - Request for License Amendments - Extended Power Uprate (EPU) - Supplement 30, Revised Responses to Requests for Additional Information," dated September 23, 2016 (ML16269A001)

By the Reference 1 letter, the 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. The Reference 2 letter provided Nuclear Regulatory Commission (NRC) Requests for Additional Information (RAIs) related to the replacement steam dryers.

The Reference 3 letter provided, in part, a revision to the response to NRC RAI EMCB-RAI 25. This revised response to NRC RAI EMCB-RAI 25 stated that updated limit curves, based on the final stress analysis results as revised by RAI responses, would be submitted in a separate supplement to the BFN EPU LAR. In addition, as a result of additional reviews, the need to further revise the response to NRC RAI EMCB-RAI 25 was identified. Enclosure 1 to this letter provides the further revision to the response to NRC RAI EMCB-RAI 25 and the updated limit curves. 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 information 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.

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 Mr. Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 13th day of October 2016.

Respectfully,



J. W. Shea
Vice President, Nuclear Licensing

Enclosures

cc: See Page 3

U.S. Nuclear Regulatory Commission
CNL-16-161
Page 3
October 13, 2016

Enclosures:

1. Revised Response to NRC Request for Additional Information EMCB-RAI 25 and Revised Replacement Steam Dryer Limit Curves (Proprietary version)
2. Revised Response to NRC Request for Additional Information EMCB-RAI 25 and Revised Replacement Steam Dryer Limit Curves (Non-proprietary version)
3. General Electric Hitachi Affidavit

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

**Revised Response to NRC Request for Additional Information EMCB RAI 25
and
Revised Replacement Steam Dryer Limit Curves**

(Proprietary version)

ENCLOSURE 2
Revised Response to NRC Request for Additional Information EMCB RAI 25
and
Revised Replacement Steam Dryer Limit Curves
(Non-proprietary version)

EMCB-RAI-25

In Section 4.1.7.4 of NEDC-33824P (pages 4-89 to 4-101 of Reference 6), several features of the dryer acoustic loading of BFN are compared with those of other plants, including the [[]]. In these comparisons, the acoustic pressure characteristics are [[]].

[[]]. This type of comparison between averages does not reflect the degree of local differences and may result in underestimating the maximum dryer stress. Since the [[]] is considered to be the prototype for the BFN plant, it would be appropriate to first validate this assumption by comparing the individual acoustic sources at the MSL nozzles of both plants. This comparison is needed to substantiate the [[]].

[[]]. Therefore, the licensee is requested to compare the acoustic sources at the MSL inlets for BFN and the prototype plant at CLTP conditions. These sources can be estimated by means of MSL data based plant based load evaluation [[]] methodology. Please provide overlaid Power Spectral Density (PSDs) of the sources for each MSL separately.

GEH Response Revision 2

NOTE: Revision bars in the right margin indicate changes from, and additions to, GEH's Revision 0 and Revision 1 responses. This compiled response includes the Revision 0, Revision 1, and Revision 2 responses and thus stands on its own without need to refer to previous responses.

Response Revision 0

The intent of the comparisons [[]]

[[]]. The outcome from these comparisons was [[]]

NEDC-33824P Section 4.1.7 presented different ways to compare the acoustic characteristics of the two plants [[]]

It should be noted that the key [[]]

NEDC-33824P presented summaries of these comparisons [[]]

]]

In fact, a review of [[
]] is a good representation of the similarity of the acoustic pressure loads between the [[
]].

Note that the FIV stress analysis is performed by mapping the steam dryer acoustic nodal pressure (a total of [[
]] nodes) onto the structural Finite Element (FE) model. The FIV analysis is performed with a very fine degree of localization, [[
]]

The main concern raised by Request for Additional Information (RAI)-25 [[
]]

The following are additional discussions and comparison plots [[
]]

Also, this RAI response includes a discussion of the comparison between [[
]]

[[
]]
NEDC-33824P presented, in Figure 4.1-48, the BFN [[
]].

Figure 4.1-48 shows [[
]]. However, NEDC-33824P also presented, in Figures 4.1-49 and 4.1-50, the BFN vs. [[
]] Acoustic FRFs Pressure Distribution (3D plots) at several peak frequencies [[
]]. A large similarity is observed in these figures, particularly the large similarity over every local area of the BFN and [[
]] steam dryers.

More discussion is presented in NEDC-33824P Section 4.1.7.4.a.

[[
]]
NEDC-33824P Figure 4.1-52 presented a comparison of BFN Unit 1 [[
]].

It was preferred to present the MSL pressure PSD as [[
]]

The advantage of the measured MSL comparison [[
]]

The intent of the MSL pressure comparisons [[

]]

It was indicated that it would be appropriate to [[

]]

See the next sub-section (On-Dryer Pressure Loads) for the on-dryer pressure loads comparison and the noted degree of local similarities between the two plants. |

In addition to the [[]], the main body of NEDC-33824P and NEDC-33824P Appendix D did include several MSL pressure comparisons per [[]].

NEDC-33824P (Main Body):

[[

]]

NEDC-33824P Appendix D Figures 4-1 to 4-13:

[[

]]

[[]]

The on-dryer pressure loads comparisons are the more appropriate comparisons [[]]

The FIV analysis is performed by mapping the steam dryer acoustic nodal pressure (a total of [[]] nodes) on the structural FE model. The stress analysis is directly related to the on-dryer pressure loads, [[]]

]].

NEDC-33824P Figure 4.1-53 presented a summary comparison of BFN [[]]

]].

To reflect the degree of local differences, additional comparison plots are included in the present RAI response.

[[]]

]]

Appendices A-1 to A-4 present additional comparison [[]]

]]

MSL Dead-Legs [[]]:

MSL Measurement:

From the MSL pressure measurements (NEDC-33824P Figure 4.1-51 and NEDC-33824P Appendix D Figures 4-1 to 4-13), [[]].

Calculated [[]] Dryer Pressure Loads:

From the calculated [[]] pressure loads (NEDC-33824P Figure 4.1-53), and present RAI response (Appendices A-1 to A-4), [[]]

[[

]]

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

[[

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[[

[[

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Response Revision 1

Use of the [[]]

[[

]]

Discussion of the BWR/4 versus BFN [[]]

The BFN RSD pressure loads used in the RSD design analyses were reviewed [[

]]

The main cause of the difference [[

]]

With the above being stated, the predicted steam dryer loads are [[

]]

Comparisons of the [[

]]

In summary, the main cause of the differences [[

]]

In order to conservatively address the concerns [[

]]

During the investigation [[

[[
]]

]]

Figure 25-1 [[]]

Updated ASR Based on Effect [[]]
A [[]] bias term was [[]]

]].

Table 25-1 [[]]

[[.....

Power Ascension Test Plan Contingencies for Loss of Instrumentation

There are [[]] instrumentation for the lead unit:

1) [[]]

]]

If the [[]]

]]

The [[]] table below (Table 25-2) has been updated [[]].

Table 25-2 [[]]

[[.....	ooo	oooo ooo o ..

[[.....	ooo	oooo ooo o ..
]]

[[]]

As discussed in the response to EMCB-RAI-39(c), [[

]]

The methods described in NEDC 33824P Appendix E are maintained [[

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

1. Updated [[]].
2. Updated [[]] based on the final SDAR stress analysis results as revised by the RAI responses. [[]]
3. Updated [[]].

Appendix A for GEH Additional Response to EMCB-RAI-25 -

[[]]

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Figure A-1 – [[

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Figure A-2 – [[

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Figure A-3 – [[

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Figure A-4 – [[

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Response Revision 2

Section 1: Additional Response

The following discussion clarifies the applicability of EMCB-RAI-25 Revision 1 response recalculated Flow Induced Vibration (FIV) stress values as it relates to the following;

- (a) NEDC-33824P, "Engineering Report - Browns Ferry Replacement Steam Dryer Stress Analysis," (i.e., the SDAR), Revision 0, documented ASR values and;
- (b) ASME load combinations and stress qualifications containing FIV stress results.

Alternating Stress Ratio (ASR) values presented in Table 25-1 of Browns Ferry Nuclear Plant (BFN) Extended Power Uprate (EPU) License Amendment Request (LAR) Supplement 30, dated September 23, 2016 are the results of a study of the [[]]

on final calculated ASR values. As described in the EMCB-RAI-25 Revision 1 response, the [[]]

]]. The ASR values of this [[]]

]]. However, no deficiency in the load development process was found that would cause an [[]]

]]. Therefore, the load development process used in the generation of NEDC-33824P Table 4.4-1 ASR values remain valid. BFN EPU LAR Supplement 30, Table 39-2 calculated values are consistent with the originally calculated ASR values.

However, as a result of the EMCB-RAI-25 Revision 1 response, the updated ASR values and the associated minimum alternating stress ratio (MASR) value of [[]] reflected in Table 25-1 of the BFN EPU LAR Supplement 30, dated September 23, 2016, are now considered to be the licensing basis ASR and MASR values for the BFN Replacement Steam Dryers. These updated ASR and MASR values replace and supersede ASR and MASR values previously submitted as part of the BFN EPU LAR dated September 21, 2015, and subsequent supplements (Supplement 26, dated July 29, 2016; Supplement 28, dated August 3, 2016; and Supplement 30, dated September 23, 2016).

For ASME load combination and stress qualifications containing FIV results, the FIV stresses used in the calculation of ASME Normal, Upset, Emergency and Faulted condition stresses would [[]]

]]. However, the minimum stress ratio on an ASME code qualification, [[]]

]], is for a [[]]

]]. The minimum stress ratio on an ASME code qualification [[]]

]]. The FIV loads contribute [[]]

]]. Further review of analysis results

shows that, [[]]

]]. Therefore, the minimum stress ratio for the ASME code load combination stress qualifications [[]]

]]. As such,

Table 5.3-1 of NEDC-33824P does not need to be revised.

Section 2: Changes to NEDC-33824P

The following pages provide revised figures and a revised table to NEDC-33824P, “Engineering Report - Browns Ferry Replacement Steam Dryer Stress Analysis,” (i.e., the SDAR), Revision 0 resulting from the GEH Response, Revision 2, to EMCB-RAI-25.

This document contains the information delineated in Items #2 and #3 below (Item #1 was provided in the Revision 1 response to EMCB-RAI-25). Bold, underlined headings in the following pages denote the appendix and the item number addressed. The table and figure titles are the same as the table and figure titles in the SDAR, Revision 0, thereby denoting the correct location for the data in the SDAR.

Note that for Appendix E, Figure E.1-1 is the same as Figure 5.4-3, and Figure E.2-1 is the same as Figure 6.3-1.

From GEH Response Revision 1 to EMCB-RAI-25 Response: Changes to NEDC-33824P Revision 0 – BFN Steam Dryer Analysis Report (SDAR):

1. Updated [[]].
2. Updated limit curves based on the final SDAR stress analysis results as revised by the RAI responses. [[]]
3. Updated [[]].

Changes to NEDC-33824P R0 SDAR, Appendix C, for Item #3

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Figure 3.2-10: [[

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Figure 3.2-11: [[

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Figure E.1-1: [[

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Figure E.1-2: [[

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Figure E.1-3: [[

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Figure E.1-4: [[

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Figure E.1-5: [[

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Figure E.1-6: [[

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Figure E.1-7: [[

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Figure E.1-8: [[

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Figure E.1-9: [[

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Figure E.1-10: [[

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Figure E.1-11: [[

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Figure E.1-12: [[

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Figure E.2-1: [[

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Figure E.2-2: [[

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Figure E.2-3: [[

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Figure E.2-4: [[

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Figure E.2-5: [[

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Figure E.2-6: [[

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Figure E.2-7: [[

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Figure E.2-8: [[

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Figure E.2-9: [[

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Figure E.2-10: [[

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Figure E.2-11: [[

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Figure E.2-12: [[

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ENCLOSURE 3

General Electric Hitachi Affidavit

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 175528-022, “GEH Revised Response and Limit Curves for RAI 25 in Support of the Browns Ferry Steam Dryer Replacement,” dated October 6, 2016. The GEH proprietary information in Enclosure 1, which is entitled “GEH Revised Response and Limit Curves for EMCB-RAI-25 in Support of the Browns Ferry Steam Dryer Replacement,” is identified by a dotted underline inside double square brackets. [[This sentence is an example.^{3}]] Figures and large objects containing proprietary information 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;

GE-Hitachi Nuclear Energy Americas LLC

- 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

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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 6th day of October 2016.



Lisa K. Schichlein
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