**Proprietary Information**
**Withhold from Public Disclosure Under 10 CFR 2.390**
**This letter is decontrolled when separated from Enclosure 2**

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

CNL-16-088

May 20, 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 17, 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 April 14, 2016 (ML16102A339)

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 a NRC Request for Additional Information (RAI) related to ventilation systems. The due date for the response to the NRC RAI provided by the Reference 2 letter is May 23, 2016. The enclosures to this letter provide the responses to the RAIs included in the Reference 2 letter.

Enclosure 2 to this letter provides a supplement to the Power Uprate Safety Analysis Report (PUSAR) (NEDC-33860P, Revision 0). GE-Hitachi Nuclear Energy Americas LLC (GEH) considers portions of the information provided in Enclosure 2 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 4. Enclosure 3 to this letter provides a supplement to PUSAR (NEDO-33860, Revision 0). Enclosure 3 is a non-proprietary version of the supplement provided in Enclosure 2. Therefore, on behalf of GEH, TVA requests that Enclosure 2 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 20th day of May 2016.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosures:

cc: See Page 3

Enclosures:

1. Responses to NRC Requests for Additional Information SBPB-RAI 1, SBPB-RAI 1, and SBPB-RAI 3
2. Supplement to PUSAR (NEDC-33860P, Revision 0) (Proprietary version)
3. Supplement to PUSAR (NEDO-33860, Revision 0) (Non-proprietary version)
4. General Electric Hitachi Affidavit for NEDC-33860P, Revision 0

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 2)

**ENCLOSURE 1**

**Responses to NRC Requests for Additional Information SBPB-RAI 1, SBPB-RAI 2, and SBPB-RAI 3**

**ENCLOSURE 1**

## SBPB-RAI 1

*The licensee in Section 2.7.3 of Power Uprate Safety Analysis Report (PUSAR) (Attachment 6[1] of letter dated September 21, 2015) states: "The conductance of heat through the building structure to the control room is expected to increase only slightly." What is the source of heat that causes an increase of conductance of heat through the control room building structure under extended power uprate (EPU) conditions?*

## TVA Response

The following are the sources of heat that cause an increase in the conductance of heat to the main control room at Extended Power Uprate (EPU) normal operating conditions:

Turbine Building:

1) Installation of the tenth condensate demineralizer causes temperature in the filter/demineralizer vessel area to increase 5.3°F.
2) Installation of the larger condensate pump motors (900 horsepower (HP) to 1250 HP) and larger condensate booster pump motors (1750 HP to 3000 HP), with the associated process piping temperature increase, increases the area temperature by 7.3°F with one cooler in service in each area and 0.9°F with two coolers in service in each area.

Reactor Building:

1) Drywell temperature is expected to increase by 0.12°F due to the increase in feedwater temperature.
2) The increase in feedwater temperature will cause the feedwater lines in the main steam valve vault to increase the room temperature by 0.5°F.

EPU does result in slight temperature increases in areas of the Turbine Building or Reactor Building. As the control room structure is situated between the Reactor Building and Turbine Building structures, the slight increase (at EPU conditions) in process temperatures in the Reactor Building and Turbine Building will be conducted to the control room structure. As summarized in Section 2.7.3 of the PUSAR, “The conductance of heat through the building structure to the control room is expected to increase only slightly.”

[1] *Attachment 7 contains a non-proprietary version of Attachment 6*

## SBPB-RAI 2

*The licensee in Table 2.7-1 of PUSAR states the temperature of the General Floor Area at Elevation (El) 639 will increase to a peak of 128.7 degrees Fahrenheit for the most limiting reactor building room.*

*(a) Is the General Floor Area at El 639 the most limiting reactor building room in the current analysis and by how much is the peak EPU temperature in this room greater than the peak temperature in the current analysis?*

*(b) The temperature increase reflects an increase in the heat load from EPU operation. Explain why the HVAC system is adequate to handle this increased heat load in the reactor building.*

## TVA Response

(a) The statement in Table 2.7-1 of the PUSAR, "The temperature of the General Floor Area at El 639 will increase to a peak of 128.7°F for the most limiting Reactor Building room," is inaccurate. The most limiting reactor building room, post-accident at EPU conditions, is the Torus Room. The Unit 3 Torus Room is most limiting as the temperature increases from 134.0°F to 140.0°F from CLTP to EPU conditions. The error has been entered into the TVA Corrective Action Program for resolution. Enclosure 2 contains the corrected Table 2.7-1 of the proprietary version of the PUSAR. Enclosure 3 contains the corrected Table 2.7-1 of the non-proprietary version of the PUSAR.

(b) From an equipment standpoint, the reactor building area temperatures following a Loss of Coolant Accident (LOCA) are, in most cases, less than the area temperatures resulting from the design basis steam line breaks in the reactor building. The effects of the increase in area temperatures resulting from the steam line breaks have been taken into account with an environmental qualification review of the equipment in the reactor building. The standby gas treatment system (SBGTS) will be the ventilation system in operation for the reactor building post-LOCA. As discussed below, EPU will have a minor effect on both the drywell and reactor building post-LOCA temperatures and a subsequent insignificant effect on the performance of the SBGTS.

A comparison, based on the different LOCA events, of CLTP versus EPU peak drywell temperature is:

| Parameter | CLTP - DBA LOCA | EPU -with EPU Model - DBA-LOCA | CLTP - Steam Line Break LOCA | EPU - with EPU Model - Steam Line Break LOCA |
|---|---|---|---|---|
| Peak Drywell Temperature (°F) | 297 - U2, U3<br>295.2 - U1 | 297.5 (D)<br>295.8 (B)<br>295.2 (R) | 336 - U2, U3<br>335.4 - U1 | 336.9 |

The initial drywell temperature conditions for the EPU Design Basis Accident (DBA) LOCA Design (D), Bounding (B), and Reference (R) results are stated in Note 7 below PUSAR Table 2.6-1. The above table shows that the peak drywell temperature at EPU increases by a maximum of 2.3°F (297.5°F - 295.2°F) for the DBA-LOCA and 1.5°F (336.9°F - 335.4°F) for the steam line break LOCA.

TVA evaluated the effect of the EPU drywell temperature response profiles on the reactor building (secondary containment) temperature response. The results of the evaluation showed a maximum increase of less than 6°F (maximum increase is for the Unit 3 Torus room) for all reactor building rooms and reactor building general area temperatures and specifically a 2°F maximum increase in the refuel floor temperature. The Browns Ferry Nuclear Plant (BFN) SBGTS trains take suction from the refuel floor atmosphere for evacuating and maintaining the BFN secondary containment at negative pressure following a LOCA. The reactor building pressure increase due to this small increase in temperature is insignificant. Therefore, the SBGTS is adequate to handle the increased heat load in the reactor building, post-LOCA, at EPU conditions.

## SBPB-RAI 3

*Section 2.7.5 of the PUSAR does not describe any evaluation of the impact of the EPU on the turbine building ventilation system.*

*(a) Describe all turbine building equipment changes that impact its heat load and provide a comparison of the power rating between the present and proposed equipment for EPU.*

*(b) What is the present and the proposed EPU turbine building ventilation system heat load?*

*(c) Describe the impact and changes in the turbine building ventilation system for EPU.*

## TVA Response

(a) The equipment changes, required by EPU, that impact the Turbine Building heat load are as follows:

1) Larger condensate pump (CP) motors were installed (900 HP to 1250 HP)
2) Larger condensate booster pump (CBP) motors were installed (1750 HP to 3000 HP)
3) The tenth condensate demineralizer was installed

(b) The changes in Turbine Building heat load due to EPU were analyzed. Installation of the larger CP motors and larger CBP motors, with the associated process piping temperature increase, added 688,155 BTU/hr to the CP/CBP areas. This increase in heat load, with operation of one air handling unit (AHU) in each area, resulted in a temperature increase of 7.3°F. Installation of the tenth condensate demineralizer added 33,771 BTU/hr to the condensate filter demineralizer area. This increase in heat load resulted in a temperature increase in the area of 5.3°F. The design of the Turbine Building ventilation system is adequate to handle the increase in heat load.

(c) The only change required by EPU, made to the turbine building ventilation system, consists of installing modifications to facilitate the parallel operation of existing redundant AHUs in the CP and CBP areas. The effect of running two AHUs in parallel in each area versus one AHU is that the temperature increase, from the new CP/CBP motors and associated process piping, is reduced from 7.3°F to 0.9°F.

**Withhold from Public Disclosure Under 10 CFR 2.390**

**ENCLOSURE 2**
**Supplement to PUSAR (NEDC-33860P, Revision 0)**

**(Proprietary version)**

**ENCLOSURE 3**
**Supplement to PUSAR (NEDO-33860, Revision 0)**
**(Non-proprietary version)**

HITACHI

GE Hitachi Nuclear Energy

NEDO-33860
Revision 0
September 2015

*Non-Proprietary Information – Class I (Public)*

# SAFETY ANALYSIS REPORT

# FOR

# BROWNS FERRY NUCLEAR PLANT

# UNITS 1, 2, AND 3

# EXTENDED POWER UPRATE

**Table 2.7-1 EPU Effect on Ventilation Systems**

| System | EPU Effect |
|---|---|
| Turbine Building Ventilation System | Increases in process temperatures results in slight temperature increase. The turbine building is not an EQ zone. The design of the Turbine Building HVAC system is adequate to handle the increase in heat load. |
| Reactor Building Ventilation System | EPU does not result in significant temperature increases in areas of the Reactor Building. The expected increase in the Main Steam Tunnel is < 0.5°F, which is not significant. ~~The temperature of the General Floor Area at El 639 will increase to a peak of 128.7°F for the most limiting Reactor Building room.~~ The design of the HVAC system is adequate for EPU. |
| Drywell Ventilation System | EPU will not result in a significant increase in drywell heat load or area temperature increases (< 0.5°F). The drywell HVAC system is adequate to handle the small increase in heat load. |
| Radwaste Building Ventilation System | Negligible effect due to EPU. |
| Ventilation Systems for Miscellaneous Rooms and Buildings | Core Spray Pump room temperature will increase to a bounding 118.2°F. RHR Pump room temperature will increase to a bounding 131.3°F. The RHR heat exchanger rooms temperature will increase to a bounding 131.0°F. The bounding temperature is the Browns Ferry Unit 1, Unit 2, or Unit 3 highest temperature prediction for the respective room. |
| Control Room HVAC | Negligible effect due to EPU. No process temperature changes in the Control Room/Control Building. |
| Emergency Ventilating Systems | Negligible effect due to EPU. Some electrical operational loads may increase slightly, but will stay below design loads. |

The Torus Room will increase to a peak temperature of 140°F and is the most limiting reactor building room.

**Enclosure 4**

**General Electric Hitachi Affidavit for NEDC-33860P, Revision 0**

# GE-Hitachi Nuclear Energy Americas LLC
# AFFIDAVIT

**I, James F. Harrison,** state as follows:

(1) I am Vice President, Fuel 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 GEH proprietary report, NEDC-33860P, *Safety Analysis Report for Browns Ferry Nuclear Plant Units 1, 2, and 3 Extended Power Uprate*, Revision 0, dated September 2015. GEH proprietary information within text is identified by a dotted underline within double square brackets. [[This sentence is an example.{3}]] Figures and large objects containing GEH proprietary information are identified with double square brackets before and after the object. In all cases, 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 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC 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 qualify 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 F2.d 871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F2.d 1280 (DC Cir. 1983).

(4) Some examples of categories of information which 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 which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

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

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(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, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or 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 agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed results and conclusions regarding supporting evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability of the analysis for a GEH Boiling Water Reactor (BWR). The analysis utilized analytical models and methods, including computer codes, which GEH has developed, obtained NRC approval of, and applied to perform evaluations of Power Uprates for a GEH BWR. The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GEH asset.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes 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.

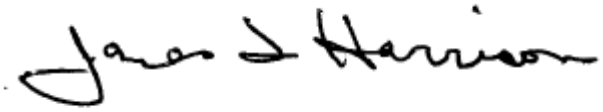
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 17th day of September 2015.



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