Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

August 16, 2006

TVA-BFN-TS-431

10 CFR 50.90

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

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	
	)	

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 1 - TECHNICAL SPECIFICATIONS (TS) CHANGE TS-431 - EXTENDED POWER UPRATE (EPU) - SUPPLEMENTAL RESPONSE TO NRC ROUND 6 REQUEST FOR ADDITIONAL INFORMATION (RAI) SBWB-26 and SBWB-30 AND PARTIAL RESPONSE TO ROUND 8 ON FUEL ANALYSIS METHODS (TAC NO. MC3812)

This letter provides a follow-up response to TVA's July 6, 2006, submittal (ADAMS Accession No. ML061950670), which responded to questions SBWB-26 through SBWB-31 on General Electric Company (GE) fuel analytical methodologies from NRC RAI Round 6, dated June 26, 2006, (ML061730002). In addition, responses are also provided to three questions from RAI Round 8, dated August 10, 2006. TS-431 is the BFN Unit 1 EPU license amendment application, which was originally submitted on June 28, 2004.

In follow-up teleconferences with NRC, the staff requested that data from other EPU plants be added to the RAI question SBWB-26 figures from the Round 3 SBWB-26 response and that the Round 3 response to SBWB-30 be further clarified with regard

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to bypass voiding. Also, TVA later received additional fuel methods questions in the NRC round 8 RAI, dated August 10, 2006. Since responses have been already developed for SBWB-32 through SBWB-34, we are including them in this response. The remainder of the Round 8 will be provided by August 18, 2006.

Enclosure 1 (proprietary) contains revised responses to the July 6, 2006, Round 6 RAIs SBWB-26 and 30, and responses to RAI Round 8 questions SBWB-32, -33, and -34. SWB-32, -33, and 34 are related to TVA's May 15, 2006, submittal in which at NRC's request, a copy of the BFN Unit 1 Cycle 7 Supplemental Reload Licensing Report was transmitted (ML061450390). For NRC facility, a copy of the entire response to SBWB-26 and 30 is provided. Enclosure 2 is the non-proprietary response to the same questions.

Enclosure 1 contains information that GE considers to be proprietary in nature and subsequently, pursuant to 10 CFR 9.17(a)(4), 2.390(a)(4) and 2.390(d)(1), requests that such information be withheld from public disclosure. Enclosure 2 contains a redacted version of Enclosure 1 with the GE proprietary material removed and is suitable for public disclosure. Enclosure 1 also contains an affidavit from GE supporting the request for withholding from public disclosure.

TVA has determined that the additional information provided by this letter does not affect the no significant hazards considerations associated with the proposed TS change. The proposed TS change still qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

There are no new commitments contained in this letter. If you have any questions regarding this letter, please contact me at (256)729-2636.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 16th day of August, 2006.

Sincerely,

William D. Crouch

William D. Crouch
Manager of Licensing
and Industry Affairs

Enclosures:

1. Supplemental Response to NRC Round 6 RAI SBWB-26 and SBWB-30 and Partial Response to Round 8 RAI on GE Fuel Methods (proprietary version and affidavit)
2. Supplemental Response to NRC Round 6 RAI SBWB-26 and SBWB-30 and Partial Response to Round 8 RAI on GE Fuel Methods (non-proprietary version)

cc: See page 4

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General Electric Company

AFFIDAVIT

I, Louis M. Quintana, state as follows:

(1) I am Manager, Licensing, General Electric Company ("GE"), 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 GE's letter, GE-ER1-AEP-06-332, entitled "GE Responses to NRC Request for Additional Information – SWBW-26, 30, 32, 33, and 34", July 28, 2006. The proprietary information in the Enclosure 1, which is entitled "GE Responses to NRC Request for Additional Information – SWBW-26, 30, 32, 33, and 34", is delineated by a double underline inside double square brackets. Figures and large equation 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, GE 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, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (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 General Electric's competitors without license from General Electric 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 General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

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 GE, 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 GE, 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. Access to such documents within GE is limited on a "need to know" basis.

(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, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE 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 GE methods supporting evaluations of safety-significant aspects of the analysis of expanded power/flow operating domains and reload core designs for a GE BWR utilizing analytical models and methods, including computer codes which GE has developed, obtained NRC approval of, and applied to perform evaluations of transients and accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of these system, component, and thermal-hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

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 GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE'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 GE.

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.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE 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 GE 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 GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 28th day of July 2006.

Louis M. Quintana
General Electric Company

ENCLOSURE 2
TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 1

TECHNICAL SPECIFICATIONS (TS) CHANGE TS-431 - EXTENDED POWER UPRATE (EPU) - SUPPLEMENTAL RESPONSE TO NRC ROUND 6 REQUEST FOR ADDITIONAL INFORMATION (RAI) SBWB-26 and SBWB-30 AND PARTIAL RESPONSE TO ROUND 8 ON FUEL ANALYSIS METHODS

(NON-PROPRIETARY VERSION)

This is a non-proprietary version of Enclosure 1 with the proprietary information redacted. Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]].

NRC RAI SBWB-26

Provide the following bundle operating conditions with exposure:

- maximum bundle power,
- maximum bundle power/flow ratio,
- exit void fraction of maximum power bundle,
- maximum channel exit void fraction,
- peak linear heat generation rate, and
- peak end-of-cycle (EOC) nodal exposure.

Provide the maximum bundle operating conditions relative to EPU plants. Include the plant-specific data in the plots containing the high density and EPU plants maximum bundle operating conditions. Since there are no recent Unit 1 pre-EPU data and the units are similar, include the Units 2 and 3 pre-EPU data in the plots.

TVA Response to RAI SBWB-26 - Supplement 1

Plots of bundle operating conditions as a function of cycle exposure for Browns Ferry and Vermont Yankee Nuclear Power Station (VYNPS) are presented in Figures SBWB-26-1 through SBWB-26-5 and in Table SBWB-26-1. The Browns Ferry Units 2 and 3 data shown in the figures and table are for operating cycles rated for 3458 megawatts thermal (MWt), which is 105% of the original licensed thermal (OLTP) power of 3293 MWt. The Browns Ferry Unit 1 data are for Cycles 7 and 8 at EPU conditions (120% of OLTP). The VYNPS data are for EPU conditions at 120%.

Plots of bundle operating conditions as a function of cycle exposure for two plants/cycles at EPU conditions are also presented in Figures SBWB-26-1 through SBWB-26-5 and in Table SBWB-26-1.

[[

]]

Figure SBWB-26-1, Maximum Bundle Power (MW)

[[

]]

Figure SBWB-26-2, Maximum Bundle Power/Flow Ratio

[[

]]

Figure SBWB-26-3, Exit Void Fraction of Maximum Power Bundle

[[

]]

Figure SBWB-26-4, Maximum Channel Exit Void Fraction

[[

]]

Figure SBWB-26-5, Peak Linear Heat Generation Rate (kW/ft)

Table SBWB-26-1
EOC Peak Nodal Exposures

Plant	Cycle	Peak Nodal Exposure (GWD/ST)
A	18	[[
A	19	
B	9	
B	10	
Browns Ferry 1	7	
Browns Ferry 1	8	
Browns Ferry 2	13	
Browns Ferry 3	11	
VYNPS	25 (Design Cycle)	]]

NRC RAI SBWB-30

Based on the EPU Cycle core design, establish whether Unit 1 will experience bypass voiding [[
]] Specify the peak bypass calculated for any 4 bundle bypass zone at EPU conditions. Discuss why the bypass voiding is [[
]] Also calculate the bypass voiding for the second cycle where the large batches of fresh fuel loaded in Unit 1 will be at the most reactive state.

TVA Response to RAI SBWB-30 - Supplement 1

Specific calculations performed for Browns Ferry Unit 1 Cycles 7 and 8 show that the core will not experience bypass voiding [[ ]] The calculation was performed consistent with GE's plant/cycle specific reload licensing process, which includes a step to ensure that 5% hot channel bypass void fraction at LPRM "D" Level is not exceeded in the EPU operating domain.

The Browns Ferry 1 Cycle 7 end of rated (EOR) conditions relative bundle power distribution is shown in Table SWBW-30-1. The EOR occurs at 13,800 MWd/ST cycle exposure when all control rods are withdrawn. At this exposure point, the maximum relative bundle power is 1.45. The EOR exposure was selected because when all control rods are withdrawn, the core power tends to be more flat, and groups of bundles surrounding detector strings could achieve somewhat higher average bundle power.

Detailed thermal hydraulic analyses were performed for Cycles 7 and 8 with the ISCOR steady state thermal hydraulic model. [[
]] The maximum average relative bundle power for the four bundles surrounding a LPRM detector string in Table SWBW-30-1 is 1.3. An ISCOR analysis with a 4 bundle average power of 1.3 shows no bypass voiding at any LPRM level.

To further demonstrate the margin, a very conservative calculation was performed where all four bundles surrounding a LPRM were assumed to have the maximum relative bundle power of 1.45, which corresponds to an actual bundle power of

approximately 7.5 MW. An ISCOR analysis using this very conservative assumption shows no bypass voiding at the axial height of the D level LPRM for both a mid-peaked and bottom-peaked axial power shape. The bypass void fraction at the bundle exit was determined to [[

]] Relative to the Interim Methods LTR, the response to RAI 3.2(a)(iii) contained in MFN 06-211 addressed core average bypass voiding, whereas the calculations contained in this response consider the bypass voiding at an individual hot channel.

Table SBWB-30-1
Relative Bundle Power Distribution at 13,800 MWD/ST in Cycle 7

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.245	0.303	0.342	0.364	0.372	0.386	0.387
58								0.328	0.474	0.583	0.643	0.664	0.685	0.693	0.691
56						0.203	0.342	0.523	0.673	1.010	1.082	1.121	1.152	1.161	1.152
54						0.338	0.545	0.682	1.034	1.109	1.203	0.975	1.258	1.269	1.005
52					0.344	0.538	0.695	1.037	0.872	0.942	1.239	1.287	1.040	1.053	1.346
50			0.201	0.339	0.538	0.686	1.043	1.126	0.929	0.975	1.272	1.303	1.062	1.079	1.380
48			0.340	0.543	0.693	1.042	0.881	0.940	1.229	1.262	1.029	1.050	1.354	1.378	1.108
46		0.327	0.522	0.681	1.036	1.126	0.941	0.985	1.275	1.302	1.055	1.072	1.364	1.388	1.112
44	0.246	0.473	0.672	1.033	0.873	0.932	1.236	1.280	1.049	1.073	1.369	1.386	1.111	1.110	1.380
42	0.301	0.581	1.008	1.108	0.943	0.978	1.270	1.308	1.073	1.098	1.406	1.418	1.125	1.120	1.383
40	0.340	0.639	1.076	1.198	1.238	1.274	1.035	1.058	1.362	1.398	1.146	1.153	1.429	1.397	1.117
38	0.363	0.657	1.109	0.970	1.283	1.306	1.058	1.079	1.383	1.414	1.156	1.163	1.427	1.430	1.128
36	0.366	0.674	1.130	1.239	1.035	1.065	1.371	1.385	1.122	1.135	1.445	1.435	1.141	1.137	1.423
34	0.377	0.679	1.136	1.245	1.045	1.080	1.394	1.412	1.126	1.135	1.418	1.447	1.142	1.143	1.437
32	0.377	0.677	1.128	0.990	1.325	1.371	1.116	1.128	1.401	1.404	1.132	1.140	1.430	1.440	1.152

NRC RAI SBWB-32 (From Round 8 RAI)

In the Supplemental Core Reload Report (SRLR) dated May 15, 2006, different initial minimum critical power ratio (MCPR) values are given for different application conditions. However, for pressurization transients, the operating MCPR for normal operation with all the equipment operating is not given. Provide the operating limit MCPR with all equipment in operation. Address which transient is the limiting transient in determining the operating MCPR. Provide a table similar to the Table for Non-pressurization transients in Section 11 on page 38.

TVA Response to RAI SBWB-32

Section 11, page 39 of the SRLR provides a summary table showing the Operating Limit MCPR (OLMCPR) values for pressurization events for six Application Conditions. Application Condition No.1 shows the OLMCPR for equipment in-service cases and Application Conditions No. 2 through No. 6 are those which include the various equipment-out-of-service (EOOS) cases. Since BFN Technical Specifications require 12 of the 13 Safety/Relief Valves (SRVs) to be operable, the base case pressurization events analysis for each equipment in-service and EOOS case assumes 1 SRV is inoperable.

The page 39 pressurization events summary table is the equivalent of the non-pressurization events table on page 38. The limiting pressurization transient varies depending on operating domain and equipment case, and can be determined by inspection of the Section 11 event tables.

NRC RAI SBWB-33 (From Round 8 RAI)

Pages 23 to 36 of the SRLR gives the uncorrected delta critical power ratio for various events. Address why they are uncorrected. Discuss the purpose for no correction of the associated events.

TVA Response to RAI SBWB-33

The uncorrected ΔCPRs are tabulated in the report to provide the calculated ΔCPRs with no statistical adjustment factors applied. The ΔCPR presented in Section 9 is consistent with the example SRLR template provided in Appendix A of NEDE-24011-P-A-15-US, "General Electric Standard Application for Reactor Fuel (Supplement for United States)", September 2005.

Statistical adjustment factors are applied to the Section 9 uncorrected ΔCPRs to arrive at a "corrected" ΔCPR and the pressurization event OLMCPRs in Section 11 include the statistical adjustment factors.

NRC RAI SBWB-34 (From Round 8 RAI)

In response to SBWB-25, which was transmitted in a letter dated March 7, 2006, TVA stated on page E1-136 that turbine trip with bypass failure will be analyzed for the first Unit 1 EPU core design (Cycle 7). The NRC staff has reviewed the Supplemental Core Reload Report (SRLR) and notes that it does not appear to include the turbine trip with bypass failure analysis. Address whether the analysis was reperformed as indicated and discuss why the analysis is not contained in the Cycle 7 Unit 1 SRLR.

TVA Response to RAI SBWB-34

Turbine trip with no bypass valve operation and load reject without bypass valve operation transients were analyzed for Unit 1 Cycle 7. The two transients are quite similar with only minor differences resulting from valve closure characteristics (stop valve versus control valve) and in scram signal delays. The load reject without bypass valve operation transient is slightly more limiting than the turbine trip and hence is included in the SRLR.