

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

Brian O'Grady
Vice President, Browns Ferry Nuclear Plant

July 6, 2006

TVA-BFN-TS-431

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop OWFN, P1-35
Washington, D. C. 20555-0001

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket Nos. 50-259

**BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 1 - TECHNICAL
SPECIFICATIONS (TS) CHANGE TS-431 - EXTENDED POWER UPRATE
(EPU) - RESPONSE TO NRC ROUND 6 REQUEST FOR ADDITIONAL
INFORMATION ON GE METHODS (TAC NO. MC3812)**

This letter provides TVA's partial response to the NRC staff's June 26, 2006, request for additional information (RAI) (ADAMS Accession No. ML061730002) regarding the BFN Unit 1 EPU license amendment application. This response addresses NRC questions regarding General Electric Company (GE) fuel analytical methodologies. TVA expects to respond to the remaining Round 6 questions by July 14, 2006.

Enclosure 1 contains responses to RAIs SBWB-26 through 31. Note that 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, which is suitable for public disclosure. Enclosure 1 also contains an affidavit from GE supporting the request for withholding from public disclosure.

D030

U.S. Nuclear Regulatory Commission
Page 2
July 6, 2006

By letter dated March 7, 2006 (ML060720248), TVA submitted GE licensing topical report NEDC-33173P, *Applicability of GE Methods to Expanded Operating Domains*, in response to NRC's Round 3 RAI for BFN Unit 1, dated December 22, 2005 (ML053560120). NEDC-33173P was prepared to address NRC questions regarding the applicability of GE's analytical methods to expanded operating domains, including the EPU of BFN Unit 1. As stated in the March 7, 2006, submittal, TVA is applying the methodology of NEDC-33173P for the BFN Unit 1 EPU.

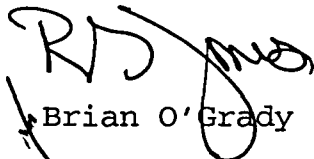
In support of the NRC staff's review of NEDC-33173P, GE has submitted additional information to the NRC in References 1, 2, and 3, which are hereby incorporated by reference in TVA's EPU application for BFN Unit 1. While acknowledging their applicability, TVA does not intend to duplicate those submittals on the BFN Unit 1 docket.

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 6th day of July, 2006.

Sincerely,


Brian O'Grady

U.S. Nuclear Regulatory Commission
Page 3
July 6, 2006

References:

1. Letter from GE Energy to NRC, *Responses to Methods RAIs - Interim Methods LTR*, MFN 06-195, June 23, 2006
2. Letter from GE Energy to NRC, *Responses to Methods RAIs 1 and 5 - Interim Methods LTR*, MFN 06-207, June 29, 2006
3. Letter from GE Energy to NRC, *Remaining Responses to Methods RAIs - Interim Methods LTR*, MFN 06-209, June 30, 2006

Enclosures:

1. Response to NRC Round 6 Request for Additional Information on GE Methods (proprietary version)
2. Response to NRC Round 6 Request for Additional Information on GE Methods (non-proprietary version)

U.S. Nuclear Regulatory Commission
Page 4
July 6, 2006

Enclosure:

cc: (Enclosures):
State Health Officer
Alabama Dept. of Public Health
RSA Tower - Administration
Suite 1552
P.O. Box 303017
Montgomery, AL 36130-3017

U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-3415

NRC Unit 1 Restart Senior Resident Inspector
Browns Ferry Nuclear Plant
10833 Shaw Road
Athens, Alabama 35611-6970

Margaret Chernoff, Project Manager
U.S. Nuclear Regulatory Commission
(MS 08G9)
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

Ms. Eva A. Brown, Project Manager
U.S. Nuclear Regulatory Commission
(MS 08G9)
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

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 to GE letter GE-ER1-AEP-06-315, L.W. King to J.D. Wolcott (TVA), *Transmittal of BFN Responses to NRC Request for Additional Information*, dated June 29, 2006. The proprietary information in Enclosure 1 of this letter, entitled *Responses to RAIs Related to Browns Ferry Nuclear Plant*, 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 and analyses supporting evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability for the expanded power/flow operating domains including Extended Power Uprates, Constant Pressure Power Uprates, and the MELLLA+ domain 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 transient 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 27th day of June 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) - RESPONSE TO NRC ROUND 6 REQUEST FOR ADDITIONAL
INFORMATION ON GE METHODS (TAC NO. MC3812)

(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 [[]].

NON-PROPRIETARY VERSION

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

Plots of bundle operating conditions as a function of cycle exposure for Browns Ferry and Vermont Yankee 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 is for operating cycles rated for 3458 megawatts thermal (Mwt), which is 105% of the original rated power of 3293 Mwt. The Browns Ferry Unit 1 data is for Cycle 7 operation at extended power uprate (EPU) conditions (120% of original rated power). The Vermont Yankee Nuclear Power Station data is for EPU conditions at 120%.

NON-PROPRIETARY VERSION

[[

]]

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

NON-PROPRIETARY VERSION

[[

]]

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

NON-PROPRIETARY VERSION

[[

]]

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

[[

]]

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

NON-PROPRIETARY VERSION

[[

]]

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

NON-PROPRIETARY VERSION

**Table SBWB-26-1
EOC Peak Nodal Exposures**

Plant	Cycle	Peak Nodal Exposure (GWD/ST)
Browns Ferry 1	7	[[
Browns Ferry 2	13	
Browns Ferry 3	11	
VYNPS (120%)	25 (Design Cycle)]]

NON-PROPRIETARY VERSION

NRC SBWB-27

Provide quarter core map (assuming core symmetry) showing the bundle maximum linear heat generation rate and the minimum critical power ratio for beginning-of-cycle, middle-of-cycle and EOC. Similarly, show the associated bundle powers and exposures.

TVA Response to RAI SBWB-27

The requested information is provided in Tables SBWB-27-1 through SBWB-27-24. Middle-of-cycle (MOC) is at 7000 MWD/ST cycle exposure and the EOC is at 13800 MWD/ST when the end of full power capability at rated conditions occurs.

The bundle maximum linear heat generation rate (LHGR) distributions are shown in Tables SBWB-27-1, SBWB-27-9, and SBWB-27-17. The bundle margins to LHGR limit are shown in Tables SBWB-27-2, SBWB-27-10, and SBWB-27-18. The margin to LHGR limits is defined as:

$MFLPD = \text{Maximum Bundle Nodal LHGR} / \text{LHGR Limit}$

The bundle critical power ratio (CPR) distributions are shown in Tables SBWB-27-3, SBWB-27-11, and SBWB-27-19. The bundle margins to operating limit MCPR (OLMCPR) are shown in Tables SBWB-27-4, SBWB-27-12, and SBWB-27-20. The margin to OLMCPR is defined as:

$MFLCPR = \text{OLMCPR} / \text{CPR}$

The bundle margins to average planar linear heat generation rate (APLHGR) limit are shown in Tables SBWB-27-5, SBWB-27-13, and SBWB-27-21. The margin to APLHGR limits is defined as:

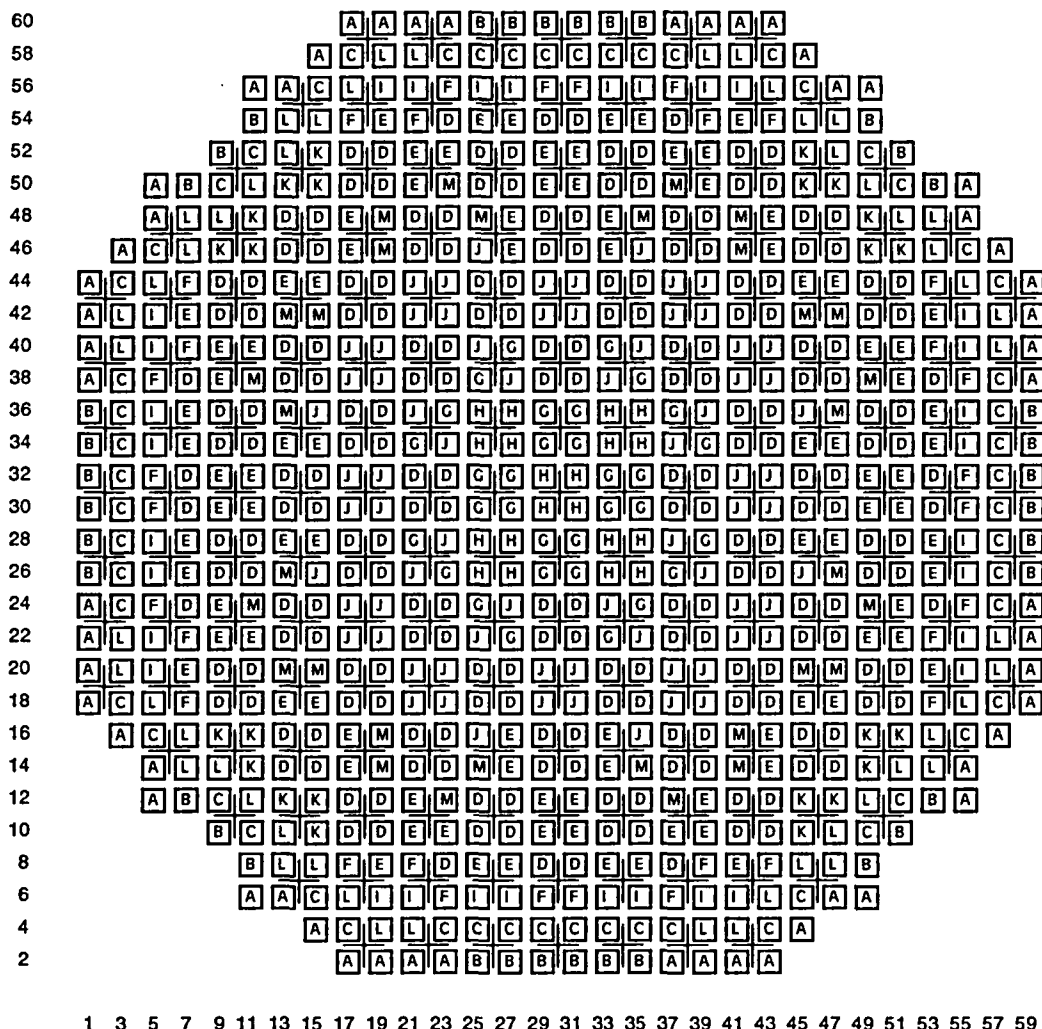
$MAPRAT = \text{Maximum Bundle Nodal APLHGR} / \text{APLHGR Limit}$

Bundle relative power distributions are shown in Tables SBWB-27-6, SBWB-27-14, and SBWB-27-22. Bundle absolute power distributions are shown in Tables SBWB-27-7, SBWB-27-15, and SBWB-27-23.

Bundle exposure distributions are shown in Tables SBWB-27-8, SBWB-27-16, and SBWB-27-24.

The information is based on the Browns Ferry Unit 1 Cycle 7 Core Loading Pattern shown in Figure SBWB-27-1, which was previously submitted to NRC on May 15, 2006, as part of the Unit 1 Reload Licensing Report (ADAMS Accession No. ML061450390).

NON-PROPRIETARY VERSION



Fuel Type			
A=GE13-P9DTB391-13GZ-100T-146-T6-3964	(Cycle 13)	H=GE14-P10DNAB147-NOG-100T-150-T6-2893	(Cycle 7)
B=GE14-P10DNAB200-3GZ-100T-150-T6-2609	(Cycle 13)	I=GE14-P10DNAB419-16GZ-100T-150-T6-2894	(Cycle 7)
C=GE13-P9DTB156-NOG-100T-146-T6-2887	(Cycle 7)	J=GE14-P10DNAB368-15GZ-100T-150-T6-2895	(Cycle 7)
D=GE14-P10DNAB157-NOG-100T-150-T6-2889	(Cycle 7)	K=GE14-P10DNAB402-19GZ-100T-150-T6-2896	(Cycle 7)
E=GE14-P10DNAB377-16GZ-100T-150-T6-2890	(Cycle 7)	L=GE13-P9DTB163-NOG-100T-146-T6-2888	(Cycle 7)
F=GE14-P10DNAB402-16GZ-100T-150-T6-2891	(Cycle 7)	M=GE14-P10DNAB377-17GZ-100T-150-T6-2897	(Cycle 7)
G=GE14-P10DNAB350-16GZ-100T-150-T6-2892	(Cycle 7)		

Figure SBWB-27-1 Browns Ferry 1 Cycle 7 Core Loading Pattern

NON-PROPRIETARY VERSION

**Table SBWB-27-1
Browns Ferry 1 Cycle 7 Maximum Linear Heat Generation Rate (MLHGR) at Beginning of Cycle (kW/ft)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									4.683	5.444	5.609	5.638	4.471	4.553	4.409
58								6.343	10.038	8.824	9.362	9.463	8.980	8.639	7.858
56						3.747	6.450	10.677	9.968	11.549	10.932	10.881	10.219	9.633	10.776
54						5.679	10.418	9.674	11.006	10.498	11.217	8.638	10.355	9.651	8.632
52					5.596	10.236	9.748	11.119	9.026	9.156	10.629	10.524	8.918	8.640	9.773
50			3.743	5.618	10.244	8.983	9.568	10.603	9.021	9.211	11.435	11.446	9.045	8.743	9.502
48			6.710	10.438	9.765	9.575	7.796	8.037	10.090	11.436	10.669	10.655	11.364	9.743	8.543
46		6.317	10.702	9.701	11.127	10.605	8.038	8.141	10.191	11.493	10.676	10.639	11.345	9.994	8.519
44	4.751	10.044	9.986	11.014	9.028	9.022	10.091	10.191	9.129	9.221	11.500	11.401	9.005	8.897	9.913
42	5.311	8.827	11.557	10.500	9.157	9.212	11.436	11.493	9.221	9.148	10.286	10.056	8.890	8.829	10.638
40	5.591	9.373	10.937	11.222	10.632	11.436	10.669	10.677	11.501	10.286	8.246	8.060	9.776	10.809	9.179
38	5.900	9.475	10.888	8.641	10.528	11.447	10.655	10.639	11.402	10.057	8.061	7.925	9.893	10.319	9.092
36	4.492	8.995	10.225	10.359	8.920	9.046	11.365	11.345	9.006	8.890	9.776	9.893	8.568	8.651	10.457
34	4.555	8.650	9.640	9.652	8.643	8.744	9.745	9.994	8.898	8.829	10.810	10.319	8.651	8.469	9.440
32	4.413	7.869	10.778	8.634	9.774	9.503	8.544	8.519	9.914	10.638	9.179	9.092	10.457	9.440	7.612

NON-PROPRIETARY VERSION

**Table SBWB-27-2
Browns Ferry 1 Cycle 7 Bundle Margins to LHGR Limit (MFLPD) at Beginning of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.461	0.527	0.548	0.553	0.379	0.373	0.355
58								0.596	0.697	0.613	0.650	0.657	0.624	0.600	0.546
56						0.352	0.590	0.741	0.692	0.862	0.816	0.812	0.763	0.719	0.804
54						0.463	0.724	0.672	0.821	0.783	0.837	0.645	0.773	0.720	0.644
52					0.446	0.711	0.677	0.830	0.674	0.683	0.793	0.785	0.665	0.645	0.729
50			0.353	0.464	0.711	0.624	0.714	0.791	0.673	0.687	0.853	0.854	0.675	0.652	0.709
48			0.602	0.725	0.678	0.715	0.582	0.600	0.753	0.853	0.796	0.795	0.848	0.727	0.638
46		0.594	0.743	0.674	0.830	0.791	0.600	0.608	0.761	0.858	0.797	0.794	0.847	0.746	0.636
44	0.467	0.698	0.693	0.822	0.674	0.673	0.753	0.761	0.681	0.688	0.858	0.851	0.672	0.664	0.740
42	0.521	0.613	0.862	0.784	0.683	0.687	0.853	0.858	0.688	0.683	0.768	0.750	0.663	0.659	0.794
40	0.548	0.651	0.816	0.837	0.793	0.853	0.796	0.797	0.858	0.768	0.615	0.602	0.730	0.807	0.685
38	0.566	0.658	0.813	0.645	0.786	0.854	0.795	0.794	0.851	0.751	0.602	0.591	0.738	0.770	0.678
36	0.379	0.625	0.763	0.773	0.666	0.675	0.848	0.847	0.672	0.663	0.730	0.738	0.639	0.646	0.780
34	0.374	0.601	0.719	0.720	0.645	0.653	0.727	0.746	0.664	0.659	0.807	0.770	0.646	0.632	0.704
32	0.356	0.546	0.804	0.644	0.729	0.709	0.638	0.636	0.740	0.794	0.685	0.679	0.780	0.704	0.568

Minimum margin of 0.86 at location 5-42.

NON-PROPRIETARY VERSION

**Table SBWB-27-3
Browns Ferry 1 Cycle 7 Critical Power Ratio (CPR) at Beginning of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									3.751	3.366	3.121	3.026	3.323	3.303	3.410
58								2.656	2.527	2.303	2.193	2.160	2.186	2.271	2.379
56						4.301	2.666	2.262	1.958	1.567	1.564	1.688	1.622	1.722	2.042
54						2.933	2.245	1.956	1.575	1.963	1.621	1.991	1.897	2.017	1.922
52					2.801	2.311	2.005	1.660	1.820	1.767	1.905	1.815	1.764	1.826	2.014
50			4.325	2.913	2.308	2.112	1.854	1.766	1.828	1.757	1.795	1.780	1.738	1.801	2.001
48			2.660	2.240	2.003	1.854	2.165	2.056	1.985	1.826	1.698	1.688	1.786	1.922	1.834
46		2.653	2.259	1.955	1.659	1.766	2.056	1.982	1.955	1.810	1.689	1.677	1.576	1.884	1.828
44	3.721	2.524	1.956	1.574	1.819	1.827	1.985	1.955	1.765	1.726	1.570	1.565	1.707	1.722	1.639
42	3.384	2.303	1.566	1.962	1.767	1.757	1.825	1.809	1.726	1.745	1.704	1.711	1.753	1.709	1.545
40	3.118	2.191	1.563	1.620	1.905	1.795	1.698	1.689	1.570	1.704	2.148	2.180	1.777	1.753	1.711
38	2.983	2.155	1.687	1.990	1.814	1.780	1.688	1.677	1.565	1.711	2.180	2.237	1.982	1.678	1.775
36	3.309	2.183	1.620	1.896	1.764	1.738	1.786	1.576	1.707	1.753	1.777	1.982	1.970	1.962	1.907
34	3.301	2.269	1.721	2.016	1.825	1.800	1.922	1.884	1.722	1.709	1.752	1.678	1.962	2.041	2.152
32	3.406	2.377	2.042	1.922	2.013	2.000	1.834	1.828	1.639	1.545	1.711	1.775	1.907	2.152	2.423

NON-PROPRIETARY VERSION

**Table SBWB-27-4
Browns Ferry 1 Cycle 7 Bundle Margins to OLMCPR (MFLCPR) at Beginning of Cycle (OLMCPR=1.40)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.368	0.410	0.442	0.456	0.421	0.424	0.411
58								0.520	0.546	0.599	0.629	0.639	0.631	0.608	0.580
56						0.321	0.518	0.610	0.705	0.894	0.895	0.829	0.863	0.813	0.685
54						0.477	0.615	0.706	0.889	0.713	0.864	0.703	0.738	0.694	0.728
52					0.500	0.597	0.688	0.843	0.769	0.792	0.735	0.771	0.794	0.767	0.695
50			0.319	0.481	0.598	0.653	0.755	0.793	0.766	0.797	0.780	0.786	0.805	0.777	0.700
48			0.519	0.616	0.689	0.755	0.647	0.681	0.705	0.767	0.824	0.829	0.784	0.728	0.763
46		0.520	0.611	0.706	0.844	0.793	0.681	0.706	0.716	0.774	0.829	0.835	0.888	0.743	0.766
44	0.371	0.547	0.705	0.889	0.769	0.766	0.705	0.716	0.793	0.811	0.892	0.895	0.820	0.813	0.854
42	0.408	0.599	0.894	0.713	0.792	0.797	0.767	0.774	0.811	0.802	0.822	0.818	0.799	0.819	0.906
40	0.443	0.630	0.896	0.864	0.735	0.780	0.824	0.829	0.892	0.822	0.652	0.642	0.788	0.799	0.818
38	0.463	0.640	0.830	0.704	0.772	0.786	0.830	0.835	0.895	0.818	0.642	0.626	0.706	0.834	0.789
36	0.423	0.632	0.864	0.738	0.794	0.806	0.784	0.889	0.820	0.799	0.788	0.706	0.711	0.713	0.734
34	0.424	0.608	0.813	0.694	0.767	0.778	0.729	0.743	0.813	0.819	0.799	0.834	0.713	0.686	0.651
32	0.411	0.581	0.686	0.729	0.695	0.700	0.763	0.766	0.854	0.906	0.818	0.789	0.734	0.651	0.578

Minimum margin of 0.91 at location 19-32.

NON-PROPRIETARY VERSION

**Table SBWB-27-5
Browns Ferry 1 Cycle 7 Bundle Margins to APLHGR Limit (MAPRAT) at Beginning of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.315	0.351	0.374	0.381	0.261	0.250	0.251
58								0.435	0.471	0.521	0.543	0.536	0.522	0.491	0.448
56						0.270	0.427	0.520	0.597	0.584	0.585	0.592	0.555	0.504	0.564
54						0.297	0.526	0.595	0.625	0.559	0.615	0.536	0.554	0.526	0.558
52					0.309	0.504	0.583	0.583	0.574	0.588	0.571	0.585	0.569	0.537	0.537
50			0.270	0.300	0.504	0.556	0.524	0.545	0.567	0.591	0.612	0.612	0.579	0.544	0.523
48			0.430	0.529	0.584	0.524	0.470	0.493	0.531	0.603	0.678	0.677	0.599	0.529	0.565
46		0.434	0.522	0.596	0.583	0.545	0.493	0.513	0.535	0.607	0.680	0.677	0.606	0.530	0.565
44	0.317	0.472	0.598	0.626	0.574	0.567	0.532	0.535	0.577	0.593	0.621	0.615	0.580	0.563	0.535
42	0.349	0.521	0.584	0.559	0.588	0.591	0.603	0.607	0.593	0.582	0.553	0.545	0.562	0.569	0.577
40	0.375	0.543	0.586	0.615	0.571	0.612	0.679	0.680	0.621	0.553	0.381	0.372	0.520	0.541	0.582
38	0.386	0.537	0.592	0.536	0.585	0.612	0.677	0.677	0.615	0.545	0.372	0.365	0.491	0.550	0.571
36	0.261	0.523	0.555	0.554	0.569	0.579	0.599	0.606	0.580	0.562	0.520	0.491	0.523	0.526	0.510
34	0.250	0.491	0.505	0.526	0.537	0.544	0.529	0.530	0.563	0.569	0.541	0.550	0.526	0.508	0.459
32	0.251	0.449	0.564	0.558	0.537	0.523	0.565	0.565	0.535	0.577	0.582	0.571	0.510	0.459	0.371

Minimum margin of 0.68 at location 15-40.

NON-PROPRIETARY VERSION

**Table SBWB-27-6
Browns Ferry 1 Cycle 7 Relative Bundle Power at Beginning of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.420	0.469	0.505	0.518	0.511	0.511	0.494
58								0.591	0.772	0.857	0.897	0.892	0.880	0.846	0.802
56						0.365	0.591	0.859	0.998	1.121	1.121	1.146	1.090	1.027	0.854
54						0.583	0.883	1.001	1.224	1.107	1.186	1.068	1.136	1.066	0.839
52					0.606	0.843	0.979	1.130	1.161	1.187	1.129	1.176	1.183	1.147	1.062
50			0.364	0.587	0.844	0.934	1.028	1.066	1.150	1.184	1.170	1.171	1.190	1.157	1.071
48			0.593	0.885	0.980	1.028	0.794	0.822	1.079	1.142	1.091	1.097	1.163	1.108	0.867
46		0.592	0.860	1.002	1.130	1.067	0.822	0.837	1.088	1.147	1.096	1.103	1.194	1.131	0.889
44	0.423	0.773	0.999	1.225	1.161	1.150	1.079	1.088	1.171	1.192	1.195	1.202	1.215	1.213	1.181
42	0.467	0.857	1.122	1.107	1.187	1.184	1.142	1.147	1.192	1.186	1.130	1.131	1.197	1.230	1.255
40	0.505	0.898	1.122	1.187	1.130	1.170	1.091	1.096	1.195	1.130	0.804	0.797	1.109	1.161	1.236
38	0.525	0.893	1.147	1.069	1.177	1.171	1.097	1.103	1.202	1.131	0.797	0.785	1.042	1.173	1.199
36	0.513	0.881	1.091	1.136	1.183	1.190	1.163	1.194	1.215	1.197	1.109	1.042	1.108	1.112	1.081
34	0.512	0.846	1.027	1.067	1.147	1.157	1.108	1.131	1.213	1.230	1.161	1.173	1.112	1.074	0.969
32	0.494	0.802	0.854	0.839	1.063	1.071	0.867	0.889	1.181	1.255	1.236	1.199	1.081	0.969	0.714

NON-PROPRIETARY VERSION

**Table SBWB-27-7
Browns Ferry 1 Cycle 7 Bundle Power at Beginning of Cycle (MW)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									2.174	2.427	2.612	2.677	2.644	2.644	2.555
58								3.057	3.993	4.431	4.638	4.612	4.550	4.374	4.147
56						1.891	3.057	4.442	5.163	5.800	5.800	5.927	5.640	5.311	4.417
54						3.016	4.569	5.180	6.333	5.725	6.136	5.527	5.876	5.516	4.339
52					3.137	4.361	5.063	5.844	6.004	6.140	5.841	6.085	6.118	5.931	5.495
50			1.883	3.036	4.367	4.831	5.316	5.516	5.948	6.123	6.051	6.057	6.157	5.985	5.538
48			3.066	4.579	5.067	5.317	4.109	4.253	5.579	5.909	5.644	5.673	6.016	5.729	4.485
46		3.063	4.449	5.184	5.847	5.518	4.253	4.330	5.630	5.935	5.669	5.707	6.174	5.852	4.598
44	2.188	3.998	5.167	6.336	6.006	5.949	5.580	5.630	6.058	6.166	6.182	6.219	6.284	6.276	6.107
42	2.416	4.432	5.804	5.727	6.142	6.124	5.910	5.936	6.167	6.133	5.844	5.852	6.191	6.361	6.491
40	2.615	4.643	5.804	6.139	5.843	6.053	5.644	5.669	6.183	5.844	4.160	4.123	5.734	6.007	6.395
38	2.715	4.620	5.932	5.530	6.087	6.058	5.673	5.707	6.219	5.852	4.123	4.063	5.389	6.068	6.201
36	2.655	4.556	5.644	5.879	6.120	6.158	6.017	6.174	6.284	6.191	5.734	5.389	5.729	5.753	5.593
34	2.646	4.378	5.314	5.518	5.933	5.986	5.730	5.853	6.276	6.362	6.007	6.068	5.753	5.553	5.011
32	2.557	4.149	4.419	4.341	5.497	5.539	4.485	4.599	6.107	6.492	6.395	6.202	5.593	5.011	3.692

NON-PROPRIETARY VERSION

**Table SBWB-27-8
Browns Ferry 1 Cycle 7 Bundle Exposures at Beginning of Cycle (MWd/ST)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									38953	38581	38468	38774	19199	17919	17438
58								38671	0	0	0	0	0	0	0
56						38844	37983	0	0	0	0	0	0	0	0
54						18838	0	0	0	0	0	0	0	0	0
52					19136	0	0	0	0	0	0	0	0	0	0
50			39200	18722	0	0	0	0	0	0	0	0	0	0	0
48			38078	0	0	0	0	0	0	0	0	0	0	0	0
46		38536	0	0	0	0	0	0	0	0	0	0	0	0	0
44	38868	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	38793	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	38462	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	38205	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	19114	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	18014	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	17437	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NON-PROPRIETARY VERSION

**Table SBWB-27-9
Browns Ferry 1 Cycle 7 Maximum Linear Heat Generation Rate (MLHGR) at Middle of Cycle (kW/ft)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									3.227	3.698	4.093	4.374	3.932	4.208	4.081
58								4.321	6.528	6.238	6.364	6.704	7.470	7.630	7.470
56						2.849	4.603	7.358	7.199	9.049	9.112	8.473	9.737	10.000	9.167
54						4.019	7.572	7.506	9.707	9.612	9.451	7.106	9.588	9.827	7.630
52					4.217	7.030	7.750	9.719	7.360	7.751	9.974	9.124	7.539	7.677	9.208
50			2.947	4.276	7.506	6.777	9.164	10.451	7.911	7.863	10.168	9.270	7.714	7.778	9.321
48			4.677	7.393	7.549	9.676	7.468	8.234	10.324	10.377	7.763	7.533	9.778	10.128	7.920
46		4.210	6.631	6.659	9.352	9.909	8.043	8.172	10.532	10.258	7.780	7.538	9.909	10.134	7.914
44	3.204	6.695	7.310	9.203	7.167	7.733	9.937	10.464	7.878	7.901	9.810	9.179	7.708	7.756	9.433
42	3.733	7.171	9.954	10.249	8.099	8.047	10.637	10.082	7.794	7.434	9.303	8.875	7.422	7.511	8.985
40	4.112	7.914	10.927	11.086	10.973	10.991	8.274	7.975	9.321	9.211	7.300	7.295	9.153	9.478	7.319
38	4.419	8.043	10.465	8.408	11.491	11.094	8.298	7.985	9.311	9.169	7.274	7.260	9.129	9.141	7.203
36	3.612	8.142	11.054	11.172	8.342	8.339	10.678	10.217	7.804	7.291	9.002	8.531	6.981	7.030	8.573
34	3.675	8.015	10.657	10.304	8.016	8.038	10.280	10.668	7.867	7.863	9.737	8.582	6.768	6.739	8.253
32	3.742	7.737	9.544	7.389	9.614	9.779	8.395	8.554	10.845	10.182	7.542	6.990	8.571	8.698	6.581

NON-PROPRIETARY VERSION

**Table SBWB-27-10
Browns Ferry 1 Bundle Margins to LHGR Limit (MFLPD) Cycle at Middle of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.319	0.369	0.405	0.436	0.338	0.352	0.346
58								0.420	0.453	0.433	0.442	0.466	0.519	0.530	0.519
56						0.268	0.436	0.511	0.500	0.675	0.681	0.632	0.727	0.746	0.684
54						0.338	0.526	0.521	0.724	0.717	0.705	0.530	0.716	0.733	0.569
52					0.350	0.488	0.538	0.725	0.549	0.578	0.744	0.682	0.563	0.573	0.687
50			0.278	0.354	0.521	0.471	0.684	0.780	0.590	0.587	0.760	0.692	0.576	0.580	0.696
48			0.429	0.513	0.524	0.722	0.557	0.614	0.770	0.774	0.579	0.562	0.730	0.756	0.591
46		0.398	0.461	0.462	0.698	0.739	0.600	0.610	0.786	0.766	0.581	0.563	0.739	0.756	0.591
44	0.312	0.465	0.508	0.687	0.535	0.577	0.742	0.781	0.588	0.590	0.732	0.685	0.575	0.579	0.704
42	0.380	0.498	0.746	0.765	0.604	0.601	0.796	0.753	0.582	0.555	0.694	0.662	0.554	0.561	0.671
40	0.416	0.550	0.823	0.833	0.822	0.824	0.617	0.595	0.696	0.687	0.545	0.544	0.683	0.707	0.546
38	0.444	0.559	0.781	0.627	0.863	0.832	0.619	0.596	0.695	0.684	0.543	0.542	0.681	0.682	0.538
36	0.316	0.565	0.836	0.839	0.623	0.622	0.797	0.762	0.582	0.544	0.672	0.637	0.521	0.525	0.640
34	0.317	0.557	0.805	0.770	0.598	0.600	0.767	0.796	0.587	0.587	0.727	0.640	0.505	0.503	0.616
32	0.315	0.537	0.712	0.551	0.717	0.730	0.626	0.638	0.809	0.760	0.563	0.522	0.640	0.649	0.491

Minimum margin of 0.86 at location 9-38.

NON-PROPRIETARY VERSION

**Table SBWB-27-11
Browns Ferry 1 Cycle 7 Critical Power Ratio (MCPR) at Middle of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									4.831	4.212	3.928	3.885	4.357	4.282	4.246
58								3.457	3.258	2.880	2.744	2.763	2.832	2.831	2.779
56						5.330	3.316	2.871	2.406	1.925	1.899	1.980	2.246	2.191	2.034
54						3.666	2.742	2.309	1.775	1.933	1.708	2.297	1.952	1.915	2.361
52					3.734	2.824	2.256	1.744	2.103	2.020	1.752	1.749	2.164	2.197	1.870
50			5.976	4.054	3.017	2.453	1.783	1.619	1.975	1.928	1.634	1.699	2.122	2.156	1.814
48			3.669	3.065	2.407	2.022	2.152	1.958	1.608	1.586	1.914	2.024	1.819	1.807	2.114
46		3.615	3.050	2.537	2.076	1.914	2.039	1.896	1.574	1.570	1.904	2.014	1.804	1.797	2.098
44	4.793	3.298	2.467	1.860	2.246	2.099	1.661	1.596	1.887	1.892	1.596	1.658	2.103	2.132	1.735
42	4.132	2.837	1.900	1.919	2.044	1.959	1.609	1.613	1.980	1.996	1.646	1.691	2.150	2.178	1.776
40	3.707	2.617	1.795	1.622	1.684	1.590	1.895	1.978	1.842	1.843	2.059	2.111	1.934	1.904	2.260
38	3.485	2.536	1.760	2.081	1.611	1.579	1.888	1.973	1.841	1.852	2.085	2.143	1.921	2.004	2.341
36	3.788	2.505	1.748	1.724	1.962	1.914	1.596	1.592	1.980	2.025	1.709	1.867	2.377	2.460	2.068
34	3.695	2.520	1.780	1.793	2.084	2.019	1.618	1.574	1.877	1.915	1.742	1.783	2.408	2.497	2.096
32	3.710	2.545	1.836	2.258	2.023	1.923	1.938	1.827	1.525	1.562	1.969	2.167	2.034	2.074	2.536

NON-PROPRIETARY VERSION

**Table SBWB-27-12
Browns Ferry 1 Cycle 7 Bundle Margins to OLMCPR (MFLCPR) at Middle of Cycle (OLMCPR=1.40)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.286	0.328	0.351	0.355	0.321	0.327	0.330
58								0.399	0.424	0.479	0.503	0.499	0.487	0.487	0.497
56						0.259	0.416	0.481	0.574	0.727	0.737	0.707	0.623	0.639	0.688
54						0.382	0.503	0.598	0.789	0.724	0.820	0.609	0.717	0.731	0.593
52					0.375	0.489	0.612	0.803	0.666	0.693	0.799	0.800	0.647	0.637	0.749
50			0.231	0.345	0.457	0.563	0.785	0.865	0.709	0.726	0.857	0.824	0.660	0.649	0.772
48			0.376	0.450	0.573	0.692	0.651	0.715	0.870	0.883	0.732	0.692	0.770	0.775	0.662
46		0.382	0.452	0.544	0.675	0.731	0.687	0.738	0.889	0.892	0.735	0.695	0.776	0.779	0.667
44	0.288	0.418	0.559	0.753	0.623	0.667	0.843	0.877	0.742	0.740	0.877	0.844	0.666	0.657	0.807
42	0.334	0.486	0.737	0.730	0.685	0.715	0.870	0.868	0.707	0.701	0.850	0.828	0.651	0.643	0.788
40	0.372	0.527	0.780	0.863	0.831	0.880	0.739	0.708	0.760	0.760	0.680	0.663	0.724	0.735	0.620
38	0.396	0.544	0.795	0.673	0.869	0.887	0.741	0.710	0.760	0.756	0.672	0.653	0.729	0.698	0.598
36	0.370	0.551	0.801	0.812	0.714	0.731	0.877	0.879	0.707	0.691	0.819	0.750	0.589	0.569	0.677
34	0.379	0.548	0.786	0.781	0.672	0.693	0.865	0.890	0.746	0.731	0.804	0.785	0.581	0.561	0.668
32	0.377	0.542	0.763	0.620	0.692	0.728	0.722	0.766	0.918	0.897	0.711	0.646	0.688	0.675	0.552

Minimum margin of 0.92 at location 17-32.

NON-PROPRIETARY VERSION

**Table SBWB-27-13
Browns Ferry 1 Cycle 7 Bundle Margins to APLHGR Limit (MAPRAT) at Middle of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.233	0.261	0.291	0.316	0.241	0.250	0.248
58								0.314	0.318	0.365	0.374	0.398	0.432	0.447	0.442
56						0.213	0.317	0.366	0.453	0.520	0.517	0.512	0.578	0.595	0.559
54						0.239	0.386	0.473	0.574	0.585	0.596	0.467	0.612	0.629	0.513
52					0.256	0.358	0.476	0.569	0.501	0.522	0.633	0.595	0.519	0.532	0.586
50			0.216	0.244	0.381	0.432	0.532	0.608	0.530	0.542	0.657	0.604	0.525	0.536	0.592
48			0.323	0.382	0.480	0.581	0.491	0.532	0.677	0.681	0.528	0.514	0.640	0.655	0.545
46		0.306	0.334	0.418	0.571	0.609	0.507	0.550	0.687	0.678	0.523	0.519	0.645	0.658	0.546
44	0.223	0.324	0.454	0.553	0.468	0.492	0.657	0.682	0.542	0.531	0.624	0.578	0.526	0.532	0.597
42	0.255	0.406	0.579	0.639	0.537	0.548	0.693	0.670	0.503	0.495	0.592	0.563	0.509	0.516	0.572
40	0.286	0.454	0.638	0.716	0.729	0.733	0.561	0.515	0.573	0.591	0.500	0.496	0.599	0.602	0.506
38	0.304	0.467	0.663	0.581	0.754	0.737	0.562	0.515	0.575	0.589	0.494	0.490	0.589	0.607	0.492
36	0.217	0.473	0.660	0.720	0.571	0.566	0.688	0.656	0.501	0.487	0.564	0.521	0.467	0.467	0.546
34	0.219	0.467	0.642	0.680	0.520	0.523	0.668	0.676	0.543	0.522	0.581	0.532	0.450	0.454	0.537
32	0.215	0.458	0.618	0.498	0.481	0.511	0.537	0.571	0.689	0.660	0.504	0.447	0.567	0.578	0.442

Minimum margin of 0.75 at location 9-38.

NON-PROPRIETARY VERSION

**Table SBWB-27-14
Browns Ferry 1 Cycle 7 Relative Bundle Power at Middle of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.323	0.372	0.398	0.397	0.378	0.380	0.385
58								0.453	0.612	0.701	0.731	0.706	0.663	0.650	0.669
56						0.291	0.474	0.697	0.840	1.085	1.097	1.064	0.859	0.841	0.988
54						0.467	0.736	0.874	1.195	1.185	1.240	0.991	0.977	0.955	0.931
52					0.450	0.698	0.889	1.195	1.082	1.126	1.293	1.286	1.035	1.009	1.179
50			0.254	0.412	0.632	0.805	1.161	1.276	1.147	1.175	1.371	1.320	1.057	1.032	1.216
48			0.423	0.632	0.669	0.936	1.051	1.154	1.390	1.409	1.182	1.117	1.044	1.023	1.052
46		0.434	0.653	0.785	0.924	1.016	1.109	1.191	1.416	1.420	1.187	1.121	1.047	1.033	1.062
44	0.328	0.611	0.825	1.151	1.018	1.084	1.353	1.401	1.199	1.195	1.379	1.326	1.068	1.050	1.268
42	0.386	0.724	1.113	1.202	1.121	1.163	1.396	1.390	1.147	1.135	1.336	1.299	1.048	1.031	1.243
40	0.432	0.787	1.179	1.316	1.351	1.415	1.200	1.151	1.066	1.049	1.099	1.072	0.962	0.933	0.993
38	0.458	0.805	1.224	1.112	1.403	1.424	1.204	1.154	1.065	1.043	1.086	1.056	0.930	0.910	0.958
36	0.460	0.815	1.212	1.326	1.168	1.192	1.404	1.389	1.148	1.121	1.287	1.206	0.970	0.934	1.080
34	0.471	0.811	1.194	1.280	1.105	1.134	1.383	1.415	1.207	1.183	1.294	1.235	0.962	0.922	1.062
32	0.469	0.803	1.179	1.030	1.009	1.049	1.173	1.237	1.446	1.415	1.153	1.052	0.888	0.846	0.909

NON-PROPRIETARY VERSION

**Table SBWB-27-15
Browns Ferry 1 Cycle 7 Bundle Power at Middle of Cycle (MW)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									1.671	1.925	2.058	2.052	1.956	1.968	1.990
58								2.342	3.167	3.626	3.783	3.653	3.431	3.364	3.461
56						1.504	2.450	3.604	4.345	5.612	5.676	5.504	4.444	4.353	5.109
54						2.413	3.805	4.519	6.181	6.129	6.415	5.128	5.056	4.938	4.815
52					2.329	3.613	4.597	6.180	5.598	5.822	6.690	6.651	5.351	5.220	6.101
50			1.314	2.131	3.270	4.166	6.006	6.602	5.935	6.076	7.091	6.827	5.470	5.340	6.288
48			2.186	3.271	3.459	4.841	5.435	5.968	7.190	7.287	6.113	5.776	5.401	5.294	5.439
46		2.246	3.375	4.059	4.782	5.257	5.737	6.159	7.325	7.345	6.138	5.798	5.416	5.341	5.493
44	1.698	3.162	4.268	5.951	5.264	5.605	7.000	7.246	6.201	6.180	7.131	6.860	5.527	5.432	6.557
42	1.996	3.744	5.759	6.218	5.798	6.017	7.222	7.188	5.933	5.874	6.909	6.719	5.419	5.334	6.428
40	2.233	4.072	6.097	6.807	6.989	7.317	6.207	5.956	5.514	5.429	5.683	5.543	4.974	4.825	5.139
38	2.369	4.163	6.332	5.753	7.259	7.369	6.230	5.970	5.510	5.396	5.617	5.462	4.811	4.709	4.953
36	2.379	4.215	6.272	6.860	6.044	6.165	7.265	7.187	5.938	5.801	6.656	6.236	5.017	4.831	5.589
34	2.435	4.193	6.174	6.622	5.716	5.866	7.156	7.319	6.242	6.120	6.693	6.390	4.977	4.770	5.496
32	2.426	4.151	6.101	5.326	5.222	5.424	6.070	6.397	7.479	7.318	5.963	5.444	4.591	4.374	4.701

NON-PROPRIETARY VERSION

**Table SBWB-27-16
Browns Ferry 1 Cycle 7 Bundle Exposures at Middle of Cycle (MWd/ST)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									41561	41576	41741	42169	22428	21259	20805
58								42254	4765	5441	5788	5825	5826	5827	5870
56						41013	41540	5223	6293	7487	7680	7856	7408	7359	7676
54						22125	5241	6196	8006	7765	8368	7219	7936	7802	7066
52					22563	5063	5700	7029	7332	7749	8355	8654	7857	7646	7527
50			41426	22119	5169	5929	6713	7208	7581	7969	8860	8845	7978	7727	7531
48			41751	5431	6040	7019	6407	6793	8394	8809	8209	8146	8344	8047	7028
46		42228	5372	6399	7443	7577	6870	7137	8625	8870	8145	8073	8396	8183	7240
44	41569	4893	6457	8227	7526	7743	8500	8667	8143	8110	8258	8186	7949	8007	8786
42	41871	5598	7707	7983	7925	8109	8917	8938	8150	7973	7929	7843	7773	7943	8853
40	41866	5997	7962	8646	8579	9023	8293	8213	8446	8091	6902	6792	7698	7758	7781
38	41819	6116	8274	7538	8942	9014	8198	8101	8346	7989	6784	6647	7254	7601	7379
36	22570	6225	8194	8696	8173	8133	8217	8205	7916	7734	7506	7094	6977	6901	6872
34	21601	6260	8186	8611	8023	7930	7928	7974	7933	7861	7548	7408	6886	6692	6465
32	21052	6273	8266	7561	8139	7980	7105	7208	8716	8763	7689	7323	6993	6603	5802

NON-PROPRIETARY VERSION

**Table SBWB-27-17
Browns Ferry 1 Cycle 7 Maximum Linear Heat Generation Rate (MLHGR) at End of Cycle (kW/ft)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									2.681	3.243	3.437	3.573	3.087	3.134	3.173
58								3.637	5.247	5.307	5.777	5.771	5.932	5.919	5.897
56						2.290	3.815	5.693	5.823	7.142	7.573	7.550	8.497	8.706	8.009
54						3.309	5.803	5.804	7.566	7.590	7.739	6.306	8.291	8.661	6.396
52					3.298	5.829	6.184	7.576	6.259	6.324	7.974	8.312	7.289	7.250	9.280
50			2.288	3.297	5.841	5.830	7.665	8.028	6.336	6.425	8.381	8.591	7.364	7.304	9.389
48			3.859	5.853	6.222	7.636	6.442	6.521	8.051	8.414	7.140	7.114	8.696	9.060	7.790
46		3.697	5.788	5.882	7.599	8.033	6.521	6.629	8.619	8.794	7.121	7.122	9.040	9.064	7.843
44	2.846	5.395	5.980	7.686	6.371	6.415	8.094	8.629	7.666	7.657	9.011	9.302	7.877	7.865	9.119
42	3.252	5.517	7.366	7.803	6.483	6.544	8.542	8.830	7.671	7.627	9.498	9.692	7.823	7.868	9.280
40	3.568	6.039	7.769	8.009	8.210	8.590	7.280	7.248	8.998	9.344	8.223	8.192	9.974	9.785	7.527
38	3.829	6.065	7.666	6.588	8.634	8.885	7.261	7.245	9.227	9.686	8.194	8.158	10.453	10.306	7.453
36	3.273	6.241	8.085	8.524	7.602	7.629	9.034	9.228	7.988	7.921	10.350	10.551	7.909	7.902	10.748
34	3.335	6.242	8.125	8.594	7.584	7.581	9.261	9.283	7.968	7.954	10.071	10.513	7.897	7.949	11.257
32	3.348	6.229	7.759	6.746	8.826	9.210	8.012	8.011	9.344	9.561	7.575	7.506	10.804	11.240	8.323

NON-PROPRIETARY VERSION

**Table SBWB-27-18
Browns Ferry 1 Cycle 7 Bundle Margins to LHGR Limit (MFLPD) at End of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.268	0.329	0.355	0.372	0.276	0.276	0.274
58								0.358	0.364	0.369	0.404	0.405	0.424	0.423	0.421
56						0.219	0.366	0.395	0.409	0.573	0.635	0.624	0.698	0.712	0.653
54						0.289	0.404	0.406	0.599	0.611	0.651	0.491	0.684	0.708	0.493
52					0.282	0.405	0.429	0.598	0.472	0.491	0.669	0.698	0.552	0.546	0.729
50			0.220	0.290	0.407	0.407	0.605	0.639	0.492	0.507	0.705	0.713	0.559	0.551	0.744
48			0.367	0.408	0.432	0.605	0.481	0.496	0.681	0.710	0.554	0.550	0.733	0.746	0.581
46		0.365	0.403	0.412	0.604	0.642	0.498	0.508	0.720	0.729	0.550	0.548	0.727	0.754	0.586
44	0.281	0.375	0.421	0.611	0.481	0.499	0.684	0.722	0.581	0.579	0.716	0.732	0.595	0.595	0.746
42	0.337	0.383	0.591	0.627	0.504	0.518	0.719	0.732	0.581	0.575	0.759	0.780	0.589	0.594	0.762
40	0.368	0.423	0.629	0.670	0.689	0.723	0.563	0.559	0.724	0.758	0.614	0.611	0.796	0.796	0.577
38	0.390	0.427	0.619	0.514	0.723	0.736	0.560	0.557	0.740	0.782	0.612	0.609	0.831	0.817	0.566
36	0.294	0.442	0.657	0.702	0.575	0.575	0.751	0.737	0.602	0.595	0.797	0.831	0.590	0.590	0.831
34	0.296	0.442	0.659	0.705	0.571	0.569	0.766	0.770	0.600	0.598	0.807	0.823	0.589	0.593	0.858
32	0.295	0.441	0.627	0.520	0.736	0.762	0.598	0.598	0.752	0.779	0.578	0.569	0.842	0.863	0.621

Minimum margin of 0.86 at location 27-32.

NON-PROPRIETARY VERSION

**Table SBWB-27-19
Browns Ferry 1 Cycle 7 Critical Power Ratio (CPR) at End of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									6.328	5.171	4.606	4.339	4.640	4.486	4.487
58								4.722	4.207	3.511	3.213	3.097	3.013	2.987	2.997
56						7.530	4.533	3.819	3.038	2.178	2.038	1.988	1.911	1.896	1.939
54						5.002	3.695	2.987	2.133	2.084	1.831	2.401	1.824	1.808	2.333
52					4.911	3.706	2.927	2.122	2.647	2.453	1.843	1.767	2.230	2.205	1.684
50			7.586	4.983	3.711	2.968	2.110	1.940	2.475	2.359	1.780	1.735	2.173	2.143	1.632
48			4.546	3.696	2.934	2.110	2.611	2.444	1.839	1.786	2.230	2.190	1.662	1.633	2.080
46		4.704	3.801	2.976	2.116	1.936	2.439	2.327	1.766	1.727	2.177	2.144	1.659	1.617	2.069
44	6.229	4.167	3.012	2.116	2.629	2.460	1.825	1.757	2.183	2.135	1.657	1.638	2.071	2.074	1.631
42	5.147	3.474	2.157	2.065	2.428	2.337	1.768	1.714	2.133	2.089	1.612	1.599	2.044	2.054	1.628
40	4.570	3.176	2.020	1.813	1.824	1.761	2.207	2.162	1.656	1.618	2.000	1.988	1.586	1.611	2.065
38	4.272	3.064	1.974	2.373	1.750	1.713	2.160	2.122	1.632	1.600	1.983	1.970	1.580	1.586	2.044
36	4.619	2.989	1.916	1.823	2.205	2.142	1.627	1.632	2.044	2.023	1.562	1.572	2.034	2.042	1.588
34	4.485	2.969	1.906	1.813	2.186	2.116	1.599	1.578	2.038	2.023	1.591	1.561	2.034	2.034	1.570
32	4.490	2.978	1.937	2.320	1.690	1.628	2.047	2.030	1.604	1.604	2.035	2.021	1.579	1.568	2.020

NON-PROPRIETARY VERSION

**Table SBWB-27-20
Browns Ferry 1 Cycle 7 Bundle Margins to OLMCPR (MFLCPR at End of Cycle (OLMCPR=1.43))**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.218	0.267	0.300	0.318	0.308	0.319	0.319
58								0.292	0.328	0.393	0.429	0.446	0.458	0.462	0.460
56						0.183	0.304	0.361	0.454	0.657	0.702	0.719	0.748	0.754	0.738
54						0.286	0.373	0.462	0.670	0.686	0.781	0.596	0.784	0.791	0.613
52					0.291	0.372	0.471	0.674	0.540	0.583	0.776	0.810	0.641	0.649	0.849
50			0.182	0.287	0.372	0.465	0.678	0.737	0.578	0.606	0.803	0.824	0.658	0.667	0.876
48			0.304	0.373	0.470	0.678	0.548	0.585	0.778	0.801	0.641	0.653	0.860	0.876	0.687
46		0.293	0.363	0.464	0.676	0.739	0.586	0.615	0.810	0.828	0.657	0.667	0.862	0.884	0.691
44	0.222	0.331	0.458	0.676	0.544	0.581	0.784	0.814	0.655	0.670	0.863	0.873	0.691	0.690	0.877
42	0.268	0.397	0.663	0.693	0.589	0.612	0.809	0.834	0.670	0.685	0.887	0.894	0.700	0.696	0.878
40	0.302	0.435	0.708	0.789	0.784	0.812	0.648	0.661	0.864	0.884	0.715	0.719	0.902	0.888	0.693
38	0.323	0.450	0.725	0.603	0.817	0.835	0.662	0.674	0.876	0.894	0.721	0.726	0.905	0.902	0.700
36	0.310	0.462	0.746	0.784	0.648	0.668	0.879	0.876	0.700	0.707	0.915	0.910	0.703	0.700	0.901
34	0.319	0.465	0.750	0.789	0.654	0.676	0.895	0.906	0.702	0.707	0.899	0.916	0.703	0.703	0.911
32	0.318	0.463	0.738	0.616	0.846	0.878	0.699	0.705	0.891	0.892	0.703	0.707	0.906	0.912	0.708

Minimum margin of 0.92 at location 23-34.

NON-PROPRIETARY VERSION

**Table SBWB-27-21
Browns Ferry 1 Cycle 7 Bundle Margins to APLHGR Limit (MAPRAT) at End of Cycle**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.191	0.222	0.245	0.259	0.198	0.200	0.198
58								0.256	0.259	0.305	0.328	0.336	0.345	0.348	0.348
56						0.166	0.261	0.285	0.351	0.455	0.493	0.515	0.549	0.562	0.547
54						0.196	0.298	0.360	0.476	0.497	0.551	0.428	0.581	0.594	0.441
52					0.199	0.295	0.368	0.482	0.412	0.434	0.553	0.577	0.466	0.469	0.635
50			0.165	0.195	0.296	0.364	0.485	0.521	0.434	0.450	0.583	0.594	0.481	0.485	0.645
48			0.262	0.300	0.371	0.486	0.415	0.440	0.570	0.586	0.475	0.481	0.612	0.624	0.500
46		0.261	0.290	0.364	0.485	0.523	0.441	0.460	0.593	0.605	0.486	0.492	0.619	0.629	0.505
44	0.199	0.266	0.360	0.485	0.416	0.439	0.574	0.594	0.489	0.497	0.624	0.629	0.508	0.507	0.628
42	0.232	0.316	0.470	0.511	0.444	0.459	0.594	0.609	0.499	0.506	0.644	0.663	0.513	0.511	0.636
40	0.257	0.341	0.495	0.548	0.571	0.598	0.485	0.493	0.625	0.638	0.520	0.521	0.685	0.662	0.506
38	0.272	0.350	0.511	0.447	0.598	0.613	0.494	0.501	0.633	0.651	0.523	0.533	0.699	0.700	0.509
36	0.210	0.358	0.519	0.572	0.486	0.499	0.633	0.636	0.517	0.519	0.699	0.707	0.531	0.532	0.709
34	0.214	0.362	0.522	0.576	0.490	0.504	0.643	0.649	0.518	0.519	0.684	0.717	0.538	0.545	0.727
32	0.212	0.361	0.521	0.460	0.613	0.634	0.517	0.519	0.640	0.650	0.512	0.523	0.720	0.735	0.565

Minimum margin of 0.74 at location 27-32.

NON-PROPRIETARY VERSION

**Table SBWB-27-22
Browns Ferry 1 Cycle 7 Relative Bundle Power at End of Cycle**

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

NON-PROPRIETARY VERSION

**Table SBWB-27-23
Browns Ferry 1 Cycle 7 Bundle Power at End of Cycle (MW)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									1.266	1.567	1.771	1.882	1.926	1.997	2.000
58								1.698	2.452	3.016	3.325	3.435	3.544	3.584	3.574
56						1.049	1.767	2.705	3.482	5.225	5.596	5.800	5.959	6.007	5.957
54						1.748	2.818	3.527	5.347	5.736	6.220	5.042	6.506	6.562	5.196
52					1.778	2.785	3.596	5.363	4.509	4.872	6.411	6.659	5.379	5.448	6.962
50			1.040	1.751	2.781	3.549	5.394	5.822	4.808	5.041	6.578	6.741	5.495	5.581	7.136
48			1.758	2.811	3.585	5.389	4.557	4.861	6.359	6.530	5.325	5.434	7.003	7.127	5.732
46		1.694	2.699	3.522	5.359	5.823	4.867	5.094	6.594	6.734	5.455	5.547	7.055	7.182	5.754
44	1.271	2.444	3.477	5.345	4.514	4.820	6.392	6.620	5.425	5.552	7.084	7.167	5.749	5.743	7.138
42	1.557	3.004	5.212	5.730	4.879	5.059	6.571	6.765	5.553	5.681	7.274	7.335	5.822	5.795	7.152
40	1.760	3.305	5.566	6.198	6.405	6.593	5.352	5.472	7.047	7.233	5.927	5.965	7.391	7.226	5.776
38	1.879	3.400	5.739	5.019	6.636	6.756	5.471	5.581	7.154	7.316	5.977	6.017	7.379	7.397	5.836
36	1.895	3.486	5.845	6.407	5.356	5.511	7.092	7.167	5.805	5.872	7.474	7.425	5.901	5.883	7.363
34	1.951	3.514	5.874	6.439	5.407	5.584	7.213	7.306	5.825	5.873	7.333	7.485	5.905	5.911	7.435
32	1.951	3.501	5.836	5.122	6.856	7.091	5.775	5.832	7.250	7.263	5.855	5.897	7.397	7.449	5.960

NON-PROPRIETARY VERSION

**Table SBWB-27-24
Browns Ferry 1 Cycle 7 Bundle Exposures at End of Cycle (MWd/ST)**

I/J	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									43697	44122	44560	45106	25227	24129	23669
58								45172	8733	10148	10868	10973	11018	11004	11018
56						42881	44587	9661	11796	15059	15611	15949	15375	15247	15565
54						25015	9924	11851	16024	16086	17207	14198	16545	16245	13756
52					25542	9694	11520	15127	14131	14929	17432	17792	14543	14154	15583
50			43251	24977	9750	11612	14828	15902	14761	15363	18228	18065	14763	14340	15680
48			44742	10029	11707	14997	13270	14036	17683	18211	15677	15533	17371	16928	13974
46		45113	9755	11967	15352	16073	14027	14502	17868	18107	15453	15332	17326	17147	14333
44	43704	8834	11919	16173	14232	14787	17433	17615	14920	14811	16618	16521	14659	14818	17844
42	44402	10290	15265	16276	15051	15396	17969	17884	14869	14572	16102	15998	14388	14707	17884
40	44689	11083	15916	17497	17687	18365	15668	15499	17276	16736	13572	13427	16216	16338	14934
38	44804	11296	16436	14573	18146	18219	15465	15294	17109	16582	13397	13217	15549	16090	14309
36	25408	11480	16340	17508	14925	14855	16677	16574	14515	14246	15493	14905	13224	13143	14657
34	24515	11524	16303	17339	14700	14571	16267	16311	14527	14409	15521	15360	13090	12863	14139
32	23965	11515	16368	14497	16913	16720	13993	14100	17529	17545	14621	14130	15110	14648	12345

NON-PROPRIETARY VERSION

NRC RAI SBWB-28

Figure 2-4 of licensing topical report, NEDC-33173P, *Applicability of GE Methods to Expanded Operating Domain*, shows the cold critical eigenvalues of reference plants. Figure 2-5 of NEDC-33173P shows the measured and predicted eigenvalues for Reference Plants. Provide the pre-EPU Units 2 and 3 cold critical eigenvalues measured and predicted differences for previous cycles based on the GE methods. Provide evaluation of any available local critical and startup shutdown calculations.

TVA Response to RAI SBWB-28

Table SBWB-28-1 provides the requested information for Browns Ferry Nuclear (BFN) Units 2 and 3 for the most recent operating cycles that used GE cores and methodology. BFN Units 2 and 3 transitioned to Areva fuel/Areva methodology in 2005 and 2004, respectively.

These results are based on the earlier TGBLA04/PANAC10 methods rather than GNF's current TGBLA06/PANAC11 set of nuclear methods being used for Unit 1. Nonetheless, the results correlate well with the results presented in NEDC-33173P. Local critical data is not available since BFN units perform shutdown margin demonstrations (SDM) using an insequence (distributed) critical approach.

The standard SDM design margin used by GE is 1.0% $\Delta k/k$. The differences shown in the table below remain well within this design margin criterion. [[

]]

NON-PROPRIETARY VERSION

Table SBWB-28-1
BFN Units 2 and 3 Recent Cold Critical Comparisons

Plant/Cycle	Cycle Exposure (MWd/ST)	Projected Eigenvalue	Actual Critical Eigenvalue	Difference (Δk)
BFN-2 C12	[[
BFN-2 C13				
BFN-3 C10				
BFN-3 C11]]

NON-PROPRIETARY VERSION

NRC RAI SBWB-29

Provide a discussion addressing whether the traversing-in-core probes (TIPs) are gamma or thermal TIPs.

TVA Response to RAI SBWB-29

The BFN Unit 1 TIPs previously used fission chamber probes. These are being replaced with gamma TIPS of the same model and type being used on Units 2 and 3. As would be expected, TIP incore tube locations remain the same on all three units.

Many of the Unit 1 TIP system subcomponents, including the TIP drive units, indexers, and tubing runs, are being replaced or refurbished. The existing TIP control drawers in the control room are being upgraded to the General Electric NUMAC design. The existing Unit 1 control drawers, which are installed in all three units, require operator action to position the TIPs and perform TIP scans. The NUMAC design controls will allow most TIP functions to be performed automatically, greatly reducing the need for operator actions.

NON-PROPRIETARY VERSION

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

Specific calculations performed for Browns Ferry Unit 1 Cycles 7 and 8 show that the core will not experience bypass voiding [[
]]

The maximum relative bundle power in cycles 7 and 8 is 1.45. This maximum occurs at 13,800 MWd/ST cycle exposure in Cycle 7. This is the cycle exposure when the end of full power capability occurs and all control rods are fully withdrawn. The relative bundle power distribution for this statepoint is provided below in Table SBWB-30-1.

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 [[

]]

NON-PROPRIETARY VERSION

**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

NON-PROPRIETARY VERSION

NRC RAI SBWB-31

Based on the first/second EPU Cycle core design, determine the bypass voiding at the different local power range monitor elevations after a recirculation pump trip. Perform the calculations on limiting conditions (initial condition, axial power distribution and in-channel voids) and provide the results.

TVA Response to RAI SBWB-31

TRACG was used to determine the most limiting condition following a two-recirculation pump trip. The limiting condition is at natural circulation following a two-recirculation pump trip from the rated power, minimum flow maximum extended load line limit analysis (MELLLA) statepoint. The first EPU cycle Reference Loading Pattern from Reference 31-1 for 120% uprated power was used.

PANACEA is used to calculate a limiting Axial Power Shape to input into ISCOR. Since beginning-of-cycle (BOC), MOC, and EOC were analyzed, a variety of Axial Power Shapes are considered. ISCOR is then used to compute core average and hot channel bypass void fractions for the limiting condition following a two-recirculation pump trip from the rated power, minimum flow MELLLA statepoint. ISCOR results for the first EPU cycle are shown in Table 31-1 at the Top of Active Fuel (TAF) and local power range monitors (LPRMs) A, B, C, and D for BOC, MOC, and EOC. ISCOR in-channel voids are also provided in Table 31-1 for reference.

[[

]]

ISCOR results for the second EPU cycle are shown in Table 31-2 at the TAF and LPRMs A, B, C, and D for BOC, MOC, and EOC. ISCOR in-channel voids are also provided in Table 31-2 for reference.

[[

]]

Therefore, for both first EPU cycle and second EPU cycle hydraulic data, the highest voiding for LPRM locations is [[

]]

NON-PROPRIETARY VERSION

Table SBWB-31-1

First EPU Cycle (Cycle 7)	Location	ISCOR Core Average Bypass Voids	ISCOR Hot Channel Bypass Voids	ISCOR Core Average In-Channel Voids (TAF)	ISCOR Hot Channel In-Channel Voids (TAF)
[[
]]

NON-PROPRIETARY VERSION

Table SBWB-31-2

Second EPU Cycle (Cycle 8)	Location	ISCOR Core Average Bypass Voids	ISCOR Hot Channel Bypass Voids	ISCOR Core Average In-Channel Voids (TAF)	ISCOR Hot Channel In-Channel Voids (TAF)
[[
]]

Reference:

31-1 *Supplemental Reload Licensing Report for Browns Ferry 1 Reload 6 Cycle 7, 0000-0043-8325-SRLR, May 2006.*