ATTACHMENT 11

Browns Ferry Nuclear Plant (BFN)
Unit 1

Technical Specifications (TS) Change 467

Revision of Technical Specifications to allow utilization of AREVA NP fuel and associated analysis methodologies

Fuel Cycle Design Report

Attached is the non proprietary version of the fuel cycle design report for 120% OLTP conditions.

L32 090907 803

An AREVA and Siemens company

ANP-2850(NP)
Revision 0

Browns Ferry Unit 1 Cycle 9 Fuel Cycle Design

AREVA

August 2009

AREVA NP Inc.

ANP-2850(NP)
Revision 0

Browns Ferry Unit 1 Cycle 9 Fuel Cycle Design

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AREVA NP Inc.

Nature of Changes

Item	Page	Description and Justification
1.	All	This is the initial release.

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Nomenclature

BOC	beginning of cycle
BOL	beginning of life
BWR	boiling water reactor
CSDM	cold shutdown margin
EOC	end of cycle
EOFP	end of full power capability
FFTR	final feedwater temperature reduction
GWd/MTU	gigawatt days per metric ton of initial uranium
HEXR	hot excess reactivity
LHGR	linear heat generation rate
MCPR	minimum critical power ratio
MICROBURN-B2	AREVA NP advanced BWR core simulator methodology with PPR capability
MWd/MTU	megawatt days per metric ton of initial uranium
NRC	Nuclear Regulatory Commission, U.S.
PPR	Pin Power Reconstruction. The PPR methodology accounts for variation in local rod power distributions due to neighboring assemblies and control state. The local rod power distributions are reconstructed based on the actual flux solution for each statepoint.
R Value	the larger of zero or the shutdown margin at BOC minus the minimum calculated shutdown margin in the cycle
SLC	standby liquid control
SPCB	AREVA NP (formerly Siemens Power Corporation) critical power correlation

1.0 Introduction

AREVA NP Inc.* has performed fuel cycle design and fuel management calculations for the Cycle 9 operation of the Browns Ferry Unit 1 BWR. These analyses have been performed with the approved AREVA neutronics methodology (References 1 and 2). The CASMO-4 lattice depletion code was used to generate nuclear data including cross sections and local power peaking factors. The MICROBURN-B2 three dimensional core simulator code, combined with the application of the SPCB critical power correlation, was used to model the core. The MICROBURN-B2 pin power reconstruction (PPR) model was used to determine the thermal margins presented in this report.

Design results for the Cycle 9 reactor core loading including projected control rod patterns and evaluations of thermal and reactivity margins are presented. The Cycle 9 results are based on Cycle 8 core operational history as summarized in Table 2.1

* AREVA NP Inc. is an AREVA and Siemens company.

2.0 Summary

The Cycle 9 fresh batch size (332 assemblies) and batch average enrichment [ ] were determined to meet the energy requirements provided by Tennessee Valley Authority (Reference 4). For a complete description of the fresh reload assemblies, see Reference 3. The loading of the Cycle 9 fuel, as described in this report, results in a projected Cycle 9 full power energy capability of 2,408±41 GWd (17,678±300 MWd/MTU). Beyond the full power capability, the cycle has been designed to achieve 184 GWd additional energy via FFTR and power coastdown operation.

In order to obtain optimum operating flexibility, the projected control rod patterns for Cycle 9 were developed to be consistent with a conservative margin to thermal limits. The cycle design calculations also demonstrate adequate hot excess reactivity and cold shutdown margin throughout the cycle. Key results from the design analysis are summarized in Table 2.1. Table 2.2 summarizes the assembly identification range by nuclear fuel type batch for the Cycle 9 design. Figures 2.1 and 2.2 provide a summary of the cycle design step-through projection.

The Cycle 9 design has been verified to satisfy the C-Lattice Channel Bow Restrictions as defined in GNF SIL-320, which are conservative for a D-lattice plant.

There are no rod average exposures ≥ 54 GWd/MTU at end-of-cycle. Therefore, the kw/ft restriction of 6.3 kw/FT for rod exposures between 54—62 GWd/MTU imposed by Regulation Guide 1.183 is satisfied.

Table 2.1 Browns Ferry Unit 1 Cycle 9 Energy and Key Results Summary

Cycle Energy, GWd (Cycle Exposure, MWd/MTU)	
Cycle 8	
• Core follow through March 31, 2009	312 (2,289)
• Best estimate depletion to Nominal EOC 8	2,308 (16,928)
• Short window EOC 8	2,170 (15,913)
• Long window EOC 8	2,363 (17,333)
Cycle 9	
• EOFP Energy	2,408±41 (17,678±300)
• FFTR and power coastdown Energy	184 (1,348)
• EOC Energy	2,591±41 (19,025±300)

Key Results	
BOC CSDM, %Δk/k (based on short EOC 8)	1.62
Minimum CSDM, %Δk/k (based on short EOC 8)	1.18
Cycle Exposure of Minimum CSDM, MWd/MTU (short basis)	18,084
Cycle R Value, %Δk/k (short basis)	0.44
BOC CSDM, %Δk/k (based on nominal EOC 8)	1.44
Minimum CSDM, %Δk/k (based on nominal EOC 8)	1.33
Cycle Exposure of Minimum CSDM, MWd/MTU (nominal basis)	17,000
Cycle R Value, %Δk/k (nominal basis)	0.11
BOC CSDM, %Δk/k (based on long EOC 8)	1.40
Minimum CSDM, %Δk/k (based on long EOC 8)	1.38
Cycle Exposure of Minimum CSDM, MWd/MTU (long basis)	17,000
Cycle R Value, %Δk/k (long basis)	0.01
Minimum SLC SDM, %Δk/k (based on short EOC 8)	2.98
Cycle Exposure of Minimum SLC SDM, MWd/MTU (short basis)	5,000
BOC HEXR, %Δk/k (based on short EOC 8)	1.41
Maximum HEXR, %Δk/k (based on short EOC 8)	2.47

Key Results	
Cycle Exposure of Maximum HEXR, MWd/MTU (short basis)	12,000
BOC HEXR, %Δk/k (based on nominal EOC 8)	1.36
Maximum HEXR, %Δk/k (based on nominal EOC 8)	2.09
Cycle Exposure of Maximum HEXR, MWd/MTU (nominal basis)	11,000
BOC HEXR, %Δk/k (based on long EOC 8)	1.33
Maximum HEXR, %Δk/k (based on long EOC 8)	1.93
Cycle Exposure of Maximum HEXR, MWd/MTU (long basis)	11,000
Minimum MAPLHGR Margin, %	22.6
Exposure of Minimum MAPLHGR Margin, MWd/MTU	14,800
Minimum LHGR Margin, %	11.3
Exposure of Minimum LHGR Margin, MWd/MTU	14,800
Minimum CPR Margin, %	7.2
Exposure of Minimum CPR Margin, MWd/MTU	16,740

Table 2.2 Browns Ferry Unit 1 Cycle 9 Fuel Cycle Design Assembly ID Range by Nuclear Fuel Type

Nuclear Fuel Type	Number of Assemblies	Assembly ID Range
4	24	JLX229-JLX412
5	12	JLX447-JLX515
6	17	JLX530-JLX560
9	32	JLX613-JLX644
10	12	JLX659-JLX702
11	8	JLX717-JLX740
14	48	JYE101-JYE148
15	96	JYE149-JYE244
16	64	JYE245-JYE308
17	48	JYE309-JYE356
18	71	JYE357-JYE428
19	192	FAA001-FAA192
20	40	FAA193-FAA232
21	100	FAA233-FAA332

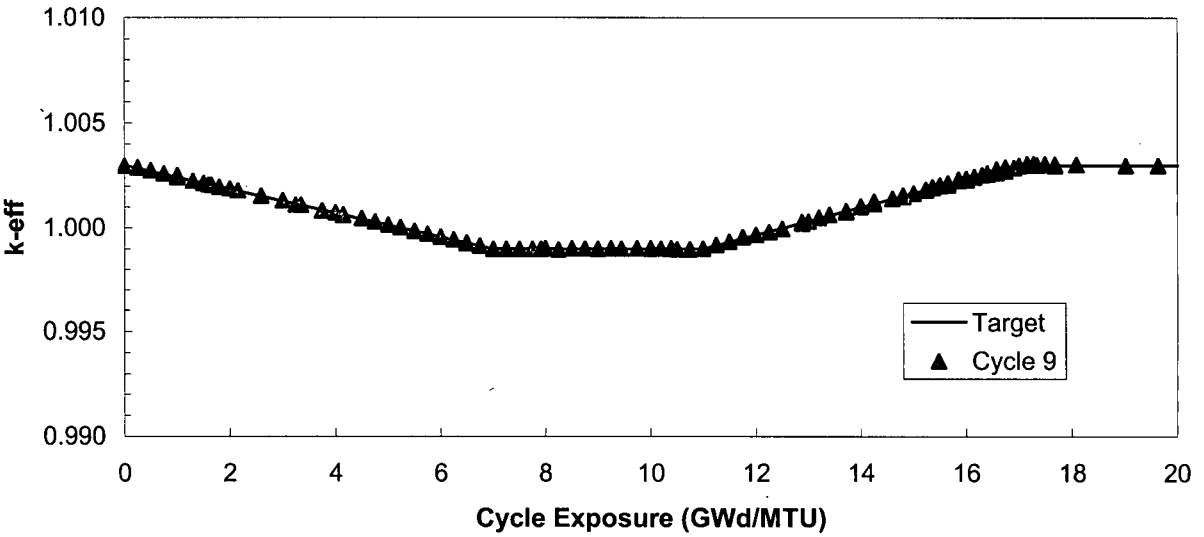

Figure 2.1 Browns Ferry Unit 1 Cycle 9 Design Step-through k-eff versus Cycle Exposure

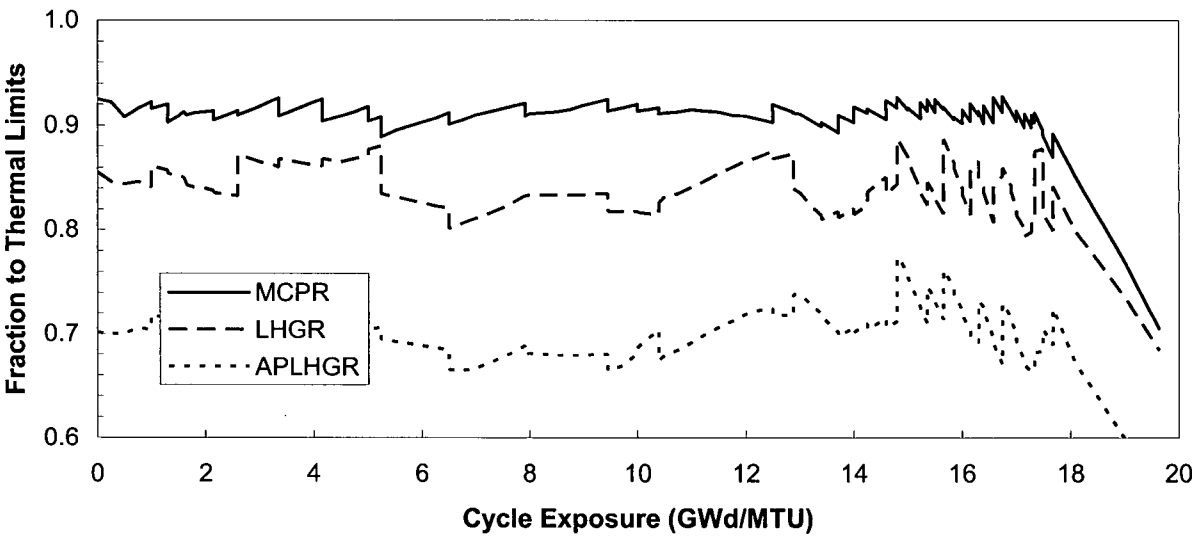

Figure 2.2 Browns Ferry Unit 1 Cycle 9 Design Margin to Thermal Limits versus Cycle Exposure

3.0 Cycle 9 Fuel Cycle Design

3.1 *General Description*

The assembly design for the Cycle 9 BFE1-9 fresh reload fuel for Browns Ferry Unit 1 is described in detail in Reference 3. Elevation views of the fresh reload fuel design axial enrichment and gadolinia distributions are shown in Appendix B, Figures B.1 through B.3. The loading pattern maintains full core symmetry within a scatter load fuel management scheme. This loading in conjunction with the control rod patterns presented in Appendix A shows acceptable power peaking and associated margins to limits for projected Cycle 9 operation. The analyses supporting this fuel cycle design were based on the core parameters shown in Table 3.1. Figures 3.1 through 3.5, along with Table 3.1 define the reference loading pattern used in the fuel cycle design. The specific core location of the fresh assemblies in Cycle 9 is provided in Appendix C. Key results for the cycle are summarized in Table 2.1.

3.2 *Control Rod Patterns and Thermal Limits*

Projected control rod patterns for Cycle 9 and resultant key operating parameters including thermal margins are shown in Appendix A. The thermal margins presented in this report were determined using the MICROBURN-B2 3D core simulator PPR model to provide adequate margin to thermal limits from Reference 4. A detailed summary of the core parameters resulting from the step-through projection analysis is provided in Tables A.1 and A.2. Limiting results from the step-through are summarized in Table 2.1 and in Figure 2.2. The hot operating target k-eff versus cycle exposure which was determined to be appropriate for Cycle 9 is shown in Table 3.2. The k-eff and margin to limits results from the design cycle depletion are presented graphically in Figures 2.1 and 2.2. The k-eff values presented in Figure 2.1 and in Appendix A are not bias corrected. Selected exposure and radial power distributions from the design step-through are presented in Appendix D. Projected control rod patterns near EOC8 are shown in Appendix E.

3.3 *Hot Excess Reactivity and Cold Shutdown Margin*

The cycle design calculations demonstrate adequate hot excess reactivity, SLC shutdown margin, and cold shutdown margin throughout the cycle. Key shutdown margin and R-Value results are presented in Table 2.1. The shutdown margin for Cycle 9 is in conformance with the Technical Specification limit of R + 0.38 %Δk/k at BOC. The cold target k-eff versus exposure determined to be appropriate for calculation of cold shutdown margin in Cycle 9 is shown in

Table 3.3. The core hot excess reactivity was calculated at full power with all rods out, 102.5 Mlb/hr core flow, with equilibrium xenon. Tables 3.4 through 3.6 summarize the Cycle 9 reactivity margins versus cycle exposure, including the SLC shutdown margin for the cycle.

Table 3.1 Cycle 9 Core Composition and Design Parameters

Fuel Description	Cycle Loaded	Nuclear Fuel Type	Number of Assemblies
GE-14 GE14-P10DNAB157-NOG	7	4	24
GE-14 GE14-P10DNAB377-16GZ	7	5	12
GE-14 GE14-P10DNAB402-16GZ	7	6	17
GE-14 GE14-P10DNAB419-16GZ	7	9	32
GE-14 GE14-P10DNAB368-15GZ	7	10	12
GE-14 GE14-P10DNAB402-19GZ	7	11	8
GE-14 GE14-P10DNAB406-16GZ	8	14	48
GE-14 GE14-P10DNAB400-17GZ	8	15	96
GE-14 GE14-P10DNAB406-15GZ	8	16	64
GE-14 GE14-P10DNAB417-16GZ	8	17	48
GE-14 GE14-P10DNAB418-16GZ	8	18	71
ATRIUM™-10* [ ]	9	19	192
ATRIUM-10 [ ]	9	20	40
ATRIUM-10 [ ]	9	21	100

Number of Fuel Assemblies in Core	764
Total Number of Fresh Assemblies	332
Total Core Mass, MTU	136.19
Rated Thermal Power Level, MW_t	3,952
Rated Core Flow, Mlb/hr	102.5
Reference Pressure, psia	1,050†
Reference Inlet Subcooling, Btu/lbm	26.94‡

* ATRIUM is a trademark of AREVA NP.

† Value is representative of MICROBURN-B2 input for dome pressure at rated conditions and varies depending on core state point.

‡ Value is typically determined by MICROBURN-B2 using a heat balance method based on nominal feedwater temperature and other parameters identified in the cycle specific plant parameters document.

Table 3.2 Browns Ferry Unit 1 Cycle 9 Hot Operating Target k-eff Versus Cycle Exposure

Cycle Exposure (MWd/MTU)	Hot Operating k-eff*
0.0	1.0030
7,000.0	0.9990
11,000.0	0.9990
17,000.0	1.0030
20,000.0	1.0030

Table 3.3 Browns Ferry Unit 1 Cycle 9 Cold Critical Target k-eff Versus Cycle Exposure

Cycle Exposure (MWd/MTU)	Cold Critical k-eff*
0.0	0.9930
2,000.0	0.9910
25,000.0	0.9910

* Values are linearly interpolated between cycle exposure points.

Table 3.4 Browns Ferry Unit 1 Cycle 9 Reactivity Margin Summary

Cycle Exposure (MWd/MTU)	Cold Shutdown Margin* (% Δk/k)	SLC Cold Shutdown Margin† (% Δk/k)	Hot Excess Reactivity‡ (% Δk/k)
0	1.62	3.19	1.41
500	1.94	3.52	1.32
1,000	1.70	3.29	1.45
2,000	1.52	3.08	1.69
3,000	1.51	3.02	1.85
4,000	1.55	2.99	1.96
5,000	1.61	2.98	2.06
6,000	1.68	3.01	2.14
7,000	1.73	3.05	2.23
8,000	1.78	3.10	2.27
9,000	1.82	3.16	2.32
10,000	1.82	3.18	2.39
11,000	1.79	3.18	2.47
12,000	1.68	3.15	2.47
13,000	1.55	3.13	2.41
14,000	1.40	3.16	2.26
15,000	1.27	3.32	1.97
16,000	1.20	3.58	1.57
17,000	1.21	4.03	1.02
17,678	1.18	4.37	0.62
18,084	1.18	4.56	--
19,025	1.20	4.96	--

* Based on short window EOC 8.

† Based on short window EOC 8, calculated at 366.0 °F ARO conditions (720 ppm boron at 68°F).

‡ Based on short EOC 8.

Table 3.5 Browns Ferry Unit 1 Cycle 9 Reactivity Margin Summary

Cycle Exposure (MWd/MTU)	Cold Shutdown Margin* (% Δk/k)	SLC Cold Shutdown Margin† (% Δk/k)	Hot Excess Reactivity‡ (% Δk/k)
0	1.44	3.19	1.36
500	1.80	3.52	1.24
1,000	1.61	3.29	1.36
2,000	1.54	3.08	1.54
3,000	1.61	3.02	1.65
4,000	1.72	2.99	1.72
5,000	1.81	2.98	1.77
6,000	1.91	3.01	1.82
7,000	1.99	3.05	1.88
8,000	2.05	3.10	1.90
9,000	2.10	3.16	1.94
10,000	2.08	3.18	2.01
11,000	2.00	3.18	2.09
12,000	1.85	3.15	2.08
13,000	1.69	3.13	2.01
14,000	1.53	3.16	1.81
15,000	1.43	3.32	1.44
16,000	1.39	3.58	0.95
17,000	1.33	4.03	0.31
17,678	1.33	4.37	-0.14
18,084	1.34	4.56	--
19,025	1.40	4.96	--

* Based on nominal window EOC 8.

† Based on short window EOC 8, calculated at 366.0 °F ARO conditions (720 ppm boron at 68°F).

‡ Based on nominal EOC 8.

Table 3.6 Browns Ferry Unit 1 Cycle 9 Reactivity Margin Summary

Cycle Exposure (MWd/MTU)	Cold Shutdown Margin* (% Δk/k)	SLC Cold Shutdown Margin† (% Δk/k)	Hot Excess Reactivity‡ (% Δk/k)
0	1.40	3.19	1.33
500	1.79	3.52	1.20
1,000	1.59	3.29	1.30
2,000	1.56	3.08	1.47
3,000	1.67	3.02	1.55
4,000	1.80	2.99	1.61
5,000	1.90	2.98	1.64
6,000	2.02	3.01	1.68
7,000	2.10	3.05	1.73
8,000	2.16	3.10	1.76
9,000	2.20	3.16	1.79
10,000	2.16	3.18	1.86
11,000	2.06	3.18	1.93
12,000	1.89	3.15	1.93
13,000	1.71	3.13	1.84
14,000	1.57	3.16	1.62
15,000	1.49	3.32	1.21
16,000	1.41	3.58	0.68
17,000	1.38	4.03	0.00
17,678	1.40	4.37	-0.47
18,084	1.41	4.56	--
19,025	1.51	4.96	--

* Based on long window EOC 8.

† Based on short window EOC 8, calculated at 366.0 °F ARO conditions (720 ppm boron at 68°F).

‡ Based on long EOC 8.

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									JLX621	JLX623	JLX533	JLX643	JYE381	JLX675	JLX725
58								JLX625	JYE169	JYE365	JYE245	JYE325	JYE317	JYE333	JYE309
56						JLX627	JLX478	JYE213	FAA209	FAA233	FAA253	FAA322	FAA177	FAA314	JYE261
54						JLX530	JYE145	JYE341	FAA277	JYE421	FAA117	JYE273	FAA289	JYE133	FAA261
52					JYE369	JYE189	FAA273	FAA265	JYE373	FAA305	FAA197	FAA185	JYE293	FAA221	JYE285
50			JLX616	JLX541	JYE185	JYE113	FAA001	JYE389	FAA241	JYE409	FAA169	JYE117	FAA201	JYE413	FAA225
48			JLX477	JYE141	FAA281	FAA065	FAA329	FAA013	JYE349	FAA129	JYE277	FAA045	JYE125	FAA141	JYE101
46		JLX615	JYE197	JYE345	FAA269	JYE393	FAA093	JYE221	FAA125	JYE301	FAA109	JYE253	FAA157	JYE157	FAA097
44	JLX613	JYE177	FAA213	FAA293	JYE377	FAA245	JYE353	FAA121	JYE397	FAA149	JYE241	FAA029	JYE229	FAA041	JYE153
42	JLX614	JYE361	FAA237	JYE425	FAA307	JYE405	FAA137	JYE305	FAA133	JYE401	FAA085	JYE149	FAA021	JLX350	FAA069
40	JLX543	JYE249	FAA249	FAA165	FAA193	FAA173	JYE281	FAA161	JYE201	FAA053	JYE357	FAA077	JYE165	FAA005	JLX291
38	JLX666	JYE329	FAA321	JYE269	FAA189	JYE121	FAA113	JYE257	FAA025	JYE217	FAA073	JYE109	FAA105	JYE181	FAA081
36	JLX448	JYE321	FAA181	FAA285	JYE297	FAA205	JYE129	FAA153	JYE233	FAA057	JYE237	FAA101	JLX280	FAA297	JYE209
34	JLX659	JYE337	FAA313	JYE137	FAA217	JYE417	FAA145	JYE173	FAA049	JLX275	FAA009	JYE225	FAA301	JLX365	FAA061
32	JLX717	JYE313	JYE265	FAA257	JYE289	FAA229	JYE105	FAA089	JYE161	FAA017	JLX362	FAA037	JYE205	FAA033	JYE193
30	JLX718	JYE316	JYE268	FAA264	JYE292	FAA228	JYE108	FAA100	JYE164	FAA072	JLX276	FAA084	JYE212	FAA064	JYE192
28	JLX663	JYE340	FAA320	JYE140	FAA224	JYE420	FAA144	JYE176	FAA044	JLX361	FAA008	JYE188	FAA300	JLX321	FAA036
26	JYE388	JYE324	FAA180	FAA292	JYE300	FAA204	JYE132	FAA160	JYE236	FAA024	JYE156	FAA108	JLX299	FAA304	JYE208
24	JLX544	JYE332	FAA328	JYE272	FAA188	JYE124	FAA048	JYE260	FAA032	JYE220	FAA080	JYE116	FAA104	JYE224	FAA040
22	JLX536	JYE252	FAA256	FAA120	FAA200	FAA172	JYE284	FAA016	JYE240	FAA088	JYE364	FAA076	JYE244	FAA012	JLX279
20	JLX619	JYE360	FAA236	JYE428	FAA308	JYE408	FAA132	JYE308	FAA152	JYE400	FAA056	JYE216	FAA060	JLX366	FAA020
18	JLX620	JYE180	FAA212	FAA280	JYE380	FAA244	JYE356	FAA128	JYE404	FAA136	JYE200	FAA028	JYE232	FAA052	JYE160
16		JLX618	JYE152	JYE348	FAA268	JYE396	FAA112	JYE228	FAA124	JYE304	FAA164	JYE256	FAA156	JYE204	FAA092
14			JLX447	JYE144	FAA276	FAA004	FAA332	FAA096	JYE352	FAA140	JYE280	FAA116	JYE128	FAA148	JYE104
12			JLX617	JLX542	JYE196	JYE112	FAA068	JYE392	FAA248	JYE412	FAA176	JYE120	FAA208	JYE416	FAA232
10					JYE372	JYE184	FAA284	FAA272	JYE376	FAA309	FAA196	FAA192	JYE296	FAA220	JYE288
8						JLX469	JYE148	JYE344	FAA296	JYE424	FAA168	JYE276	FAA288	JYE136	FAA260
6						JLX628	JLX479	JYE168	FAA216	FAA240	FAA252	FAA327	FAA184	FAA319	JYE264
4								JLX626	JYE172	JYE368	JYE248	JYE328	JYE320	JYE336	JYE312
2									JLX622	JLX624	JLX531	JLX673	JYE384	JLX670	JLX728

Figure 3.1 Browns Ferry Unit 1 Cycle 9 Reference Loading Pattern

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	JLX729	JLX691	JYE382	JLX688	JLX558	JLX633	JLX635								
58	JYE310	JYE334	JYE318	JYE326	JYE246	JYE366	JYE170	JLX631							
56	JYE274	FAA315	FAA182	FAA323	FAA250	FAA238	FAA214	JYE202	JLX482	JLX629					
54	FAA258	JYE134	FAA286	JYE270	FAA166	JYE422	FAA294	JYE342	JYE146	JLX491					
52	JYE286	FAA218	JYE294	FAA190	FAA194	FAA306	JYE374	FAA270	FAA282	JYE182	JYE370				
50	FAA230	JYE414	FAA206	JYE118	FAA174	JYE410	FAA246	JYE390	FAA066	JYE110	JYE194	JLX547	JLX640		
48	JYE102	FAA146	JYE126	FAA114	JYE282	FAA138	JYE350	FAA094	FAA330	FAA002	FAA274	JYE142	JLX481		
46	FAA090	JYE166	FAA154	JYE254	FAA162	JYE302	FAA122	JYE226	FAA110	JYE394	FAA266	JYE346	JYE150	JLX639	
44	JYE158	FAA050	JYE230	FAA026	JYE198	FAA134	JYE402	FAA126	JYE354	FAA242	JYE378	FAA278	FAA210	JYE178	JLX637
42	FAA018	JLX355	FAA058	JYE214	FAA054	JYE398	FAA150	JYE306	FAA130	JYE406	FAA312	JYE426	FAA234	JYE358	JLX638
40	JLX286	FAA010	JYE242	FAA074	JYE362	FAA086	JYE238	FAA014	JYE278	FAA170	FAA198	FAA118	FAA254	JYE250	JLX553
38	FAA038	JYE222	FAA102	JYE114	FAA078	JYE218	FAA030	JYE258	FAA046	JYE122	FAA186	JYE262	FAA324	JYE330	JLX545
36	JYE210	FAA302	JLX330	FAA106	JYE154	FAA022	JYE234	FAA158	JYE130	FAA202	JYE298	FAA290	FAA178	JYE322	JYE386
34	FAA034	JLX229	FAA298	JYE186	FAA006	JLX412	FAA042	JYE174	FAA142	JYE418	FAA222	JYE138	FAA316	JYE338	JLX692
32	JYE190	FAA062	JYE206	FAA082	JLX403	FAA070	JYE162	FAA098	JYE106	FAA226	JYE290	FAA262	JYE266	JYE314	JLX739
30	JYE195	FAA035	JYE207	FAA039	JLX290	FAA019	JYE163	FAA091	JYE107	FAA231	JYE291	FAA259	JYE263	JYE315	JLX740
28	FAA063	JLX287	FAA303	JYE227	FAA011	JLX343	FAA051	JYE175	FAA147	JYE419	FAA219	JYE139	FAA317	JYE339	JLX702
26	JYE211	FAA299	JLX311	FAA103	JYE239	FAA059	JYE235	FAA155	JYE131	FAA207	JYE299	FAA287	FAA183	JYE323	JYE387
24	FAA083	JYE183	FAA107	JYE111	FAA075	JYE219	FAA027	JYE259	FAA115	JYE123	FAA191	JYE271	FAA325	JYE331	JLX701
22	JLX354	FAA007	JYE151	FAA079	JYE359	FAA055	JYE203	FAA163	JYE283	FAA175	FAA195	FAA167	FAA251	JYE251	JLX548
20	FAA071	JLX351	FAA023	JYE215	FAA087	JYE403	FAA135	JYE307	FAA139	JYE407	FAA311	JYE427	FAA239	JYE363	JLX492
18	JYE155	FAA043	JYE231	FAA031	JYE243	FAA151	JYE399	FAA123	JYE355	FAA247	JYE379	FAA295	FAA215	JYE179	JLX644
16	FAA099	JYE159	FAA159	JYE255	FAA015	JYE303	FAA127	JYE223	FAA095	JYE395	FAA271	JYE347	JYE199	JLX642	
14	JYE103	FAA143	JYE127	FAA047	JYE279	FAA131	JYE351	FAA111	FAA331	FAA067	FAA283	JYE143	JLX515		
12	FAA227	JYE415	FAA203	JYE119	FAA171	JYE411	FAA243	JYE391	FAA003	JYE115	JYE187	JLX560	JLX641		
10	JYE287	FAA223	JYE295	FAA187	FAA199	FAA310	JYE375	FAA267	FAA275	JYE191	JYE371				
8	FAA263	JYE135	FAA291	JYE275	FAA119	JYE423	FAA279	JYE343	JYE147	JLX559					
6	JYE267	FAA318	FAA179	FAA326	FAA255	FAA235	FAA211	JYE167	JLX483	JLX630					
4	JYE311	JYE335	JYE319	JYE327	JYE247	JYE367	JYE171	JLX632							
2	JLX732	JLX689	JYE383	JLX546	JLX556	JLX634	JLX636								

Figure 3.1 Browns Ferry Unit 1 Cycle 9 Reference Loading Pattern *(Continued)*

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									9	9	6	9	18	10	11
									27.8	28.9	30.5	29.6	19.1	28.9	26.9
58	Nuclear Fuel Type							9	15	18	16	17	17	17	17
	BOC Exposure (GWd/MTU)							26.9	20.3	18.9	18.7	18.1	17.8	16.4	17.1
56						9	5	15	20	21	21	21	19	21	16
						28.0	26.4	19.9	0.0	0.0	0.0	0.0	0.0	0.0	19.7
54						6	14	17	21	18	19	16	21	14	21
						30.2	17.8	18.0	0.0	17.9	0.0	19.7	0.0	18.0	0.0
52					18	15	21	21	18	21	20	19	16	20	16
					19.4	20.7	0.0	0.0	18.9	0.0	0.0	0.0	20.3	0.0	20.0
50			9	6	15	14	19	18	21	18	19	14	20	18	20
			28.3	30.8	20.0	20.1	0.0	20.1	0.0	20.3	0.0	20.9	0.0	19.8	0.0
48			5	14	21	19	21	19	17	19	16	19	14	19	14
			26.3	17.8	0.0	0.0	0.0	0.0	19.0	0.0	19.2	0.0	18.2	0.0	18.7
46		9	15	17	21	18	19	15	19	16	19	16	19	15	19
		26.9	19.7	18.1	0.0	20.8	0.0	18.6	0.0	18.3	0.0	18.4	0.0	19.7	0.0
44	9	15	20	21	18	21	17	19	18	19	15	19	15	19	15
	28.2	20.1	0.0	0.0	20.4	0.0	19.1	0.0	19.7	0.0	18.9	0.0	18.9	0.0	20.4
42	9	18	21	18	21	18	19	16	19	18	19	15	19	4	19
	29.5	18.8	0.0	17.4	0.0	20.2	0.0	18.7	0.0	19.7	0.0	19.8	0.0	11.7	0.0
40	6	16	21	19	20	19	16	19	15	19	18	19	15	19	4
	29.9	19.0	0.0	0.0	0.0	0.0	19.4	0.0	19.6	0.0	18.6	0.0	19.6	0.0	11.7
38	10	17	21	16	19	14	19	16	19	15	19	14	19	15	19
	28.4	19.6	0.0	19.6	0.0	20.8	0.0	18.5	0.0	19.7	0.0	19.7	0.0	19.4	0.0
36	5	17	19	21	16	20	14	19	15	19	15	19	4	21	15
	15.9	18.4	0.0	0.0	20.8	0.0	18.8	0.0	19.0	0.0	18.8	0.0	11.9	0.0	19.1
34	10	17	21	14	20	18	19	15	19	4	19	15	21	4	19
	29.1	16.5	0.0	18.2	0.0	20.1	0.0	19.9	0.0	11.9	0.0	18.8	0.0	11.7	0.0
32	11	17	16	21	16	20	14	19	15	19	4	19	15	19	15
	27.3	17.3	20.3	0.0	19.9	0.0	18.9	0.0	20.0	0.0	11.7	0.0	18.8	0.0	20.8

Fuel Type	Description	Cycle Loaded	No. Per Quarter core
4	GE14-P10DNAB157-NOG	7	6
5	GE14-P10DNAB377-16GZ	7	3
6	GE14-P10DNAB402-16GZ	7	4
9	GE14-P10DNAB419-16GZ	7	9
10	GE14-P10DNAB368-15GZ	7	3
11	GE14-P10DNAB402-19GZ	7	2
14	GE14-P10DNAB406-16GZ	8	12
15	GE14-P10DNAB400-17GZ	8	24
16	GE14-P10DNAB406-15GZ	8	16
17	GE14-P10DNAB417-16GZ	8	12
18	GE14-P10DNAB418-16GZ	8	17
19	[ ]	9	48
20	[ ]	9	10
21	[ ]	9	25

Figure 3.2 Browns Ferry Unit 1 Cycle 9 Upper Left Quarter Core Layout by Fuel Type

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	11	10	18	10	6	9	9								
	26.9	28.2	19.1	28.3	30.2	28.9	27.9								
58	17	17	17	17	16	18	15	9			Nuclear Fuel Type				
	17.1	16.4	17.8	18.1	18.8	18.9	20.3	26.8			BOC Exposure (GWd/MTU)				
56	16	21	19	21	21	21	20	15	5	9					
	19.7	0.0	0.0	0.0	0.0	0.0	0.0	19.6	26.4	27.9					
54	21	14	21	16	19	18	21	17	14	5					
	0.0	18.0	0.0	19.6	0.0	17.9	0.0	18.0	17.9	31.0					
52	16	20	16	19	20	21	18	21	21	15	18				
	20.1	0.0	20.4	0.0	0.0	0.0	18.9	0.0	0.0	19.4	19.4				
50	20	18	20	14	19	18	21	18	19	14	15	6	9		
	0.0	19.8	0.0	20.9	0.0	20.3	0.0	20.1	0.0	19.7	20.8	30.8	28.4		
48	14	19	14	19	16	19	17	19	21	19	21	14	5		
	18.7	0.0	18.2	0.0	19.4	0.0	19.0	0.0	0.0	0.0	0.0	17.8	26.4		
46	19	15	19	16	19	16	19	15	19	18	21	17	15	9	
	0.0	19.6	0.0	18.4	0.0	18.3	0.0	18.8	0.0	20.8	0.0	18.2	19.8	26.9	
44	15	19	15	19	15	19	18	19	17	21	18	21	20	15	9
	19.8	0.0	18.9	0.0	19.7	0.0	19.7	0.0	19.1	0.0	20.4	0.0	0.0	20.2	28.1
42	19	4	19	15	19	18	19	16	19	18	21	18	21	18	9
	0.0	11.6	0.0	20.0	0.0	19.7	0.0	18.7	0.0	20.2	0.0	17.6	0.0	18.6	29.6
40	4	19	15	19	18	19	15	19	16	19	20	19	21	16	6
	11.7	0.0	18.9	0.0	18.8	0.0	18.8	0.0	19.2	0.0	0.0	0.0	0.0	19.0	30.5
38	19	15	19	14	19	15	19	16	19	14	19	16	21	17	6
	0.0	18.6	0.0	20.1	0.0	19.7	0.0	18.6	0.0	20.8	0.0	19.7	0.0	19.6	30.0
36	15	21	4	19	15	19	15	19	14	20	16	21	19	17	18
	19.2	0.0	11.9	0.0	20.4	0.0	19.0	0.0	18.9	0.0	20.9	0.0	0.0	18.4	20.6
34	19	4	21	15	19	4	19	15	19	18	20	14	21	17	10
	0.0	11.6	0.0	20.1	0.0	11.6	0.0	20.0	0.0	20.2	0.0	18.3	0.0	16.5	28.5
32	15	19	15	19	4	19	15	19	14	20	16	21	16	17	11
	20.8	0.0	18.8	0.0	11.6	0.0	20.0	0.0	18.9	0.0	19.9	0.0	20.2	17.3	27.2

Fuel Type	Description	Cycle Loaded	No. Per Quarter core
4	GE14-P10DNAB157-NOG	7	6
5	GE14-P10DNAB377-16GZ	7	3
6	GE14-P10DNAB402-16GZ	7	4
9	GE14-P10DNAB419-16GZ	7	8
10	GE14-P10DNAB368-15GZ	7	3
11	GE14-P10DNAB402-19GZ	7	2
14	GE14-P10DNAB406-16GZ	8	12
15	GE14-P10DNAB400-17GZ	8	24
16	GE14-P10DNAB406-15GZ	8	16
17	GE14-P10DNAB417-16GZ	8	12
18	GE14-P10DNAB418-16GZ	8	18
19	[ ]	9	48
20	[ ]	9	10
21	[ ]	9	25

Figure 3.3 Browns Ferry Unit 1 Cycle 9 Upper Right Quarter Core Layout by Fuel Type

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
30	11	17	16	21	16	20	14	19	15	19	4	19	15	19	15
	27.2	17.3	20.3	0.0	20.0	0.0	19.0	0.0	20.0	0.0	11.8	0.0	19.2	0.0	20.7
28	10	17	21	14	20	18	19	15	19	4	19	15	21	4	19
	28.5	16.5	0.0	18.2	0.0	20.1	0.0	19.9	0.0	11.9	0.0	20.0	0.0	11.8	0.0
26	18	17	19	21	16	20	14	19	15	19	15	19	4	21	15
	20.6	18.4	0.0	0.0	20.8	0.0	18.8	0.0	19.0	0.0	20.4	0.0	11.9	0.0	18.9
24	6	17	21	16	19	14	19	16	19	15	19	14	19	15	19
	30.0	19.6	0.0	19.5	0.0	20.8	0.0	18.6	0.0	19.7	0.0	20.1	0.0	18.6	0.0
22	6	16	21	19	20	19	16	19	15	19	18	19	15	19	4
	30.5	19.1	0.0	0.0	0.0	0.0	19.5	0.0	18.8	0.0	18.9	0.0	18.9	0.0	11.8
20	9	18	21	18	21	18	19	16	19	18	19	15	19	4	19
	29.5	18.6	0.0	17.4	0.0	20.0	0.0	18.7	0.0	19.7	0.0	19.9	0.0	11.8	0.0
18	9	15	20	21	18	21	17	19	18	19	15	19	15	19	15
	28.2	20.2	0.0	0.0	20.4	0.0	19.0	0.0	19.8	0.0	19.7	0.0	18.9	0.0	19.7
16		9	15	17	21	18	19	15	19	16	19	16	19	15	19
		26.9	19.7	18.2	0.0	20.8	0.0	18.8	0.0	18.2	0.0	18.4	0.0	19.6	0.0
14			5	14	21	19	21	19	17	19	16	19	14	19	14
			27.7	17.7	0.0	0.0	0.0	0.0	18.9	0.0	19.1	0.0	18.2	0.0	18.7
12			9	6	15	14	19	18	21	18	19	14	20	18	20
			28.3	30.8	20.8	19.7	0.0	20.2	0.0	20.2	0.0	21.0	0.0	19.8	0.0
10					18	15	21	21	18	21	20	19	16	20	16
					19.5	19.4	0.0	0.0	18.9	0.0	0.0	0.0	20.3	0.0	20.0
8						5	14	17	21	18	19	16	21	14	21
						31.0	17.7	17.9	0.0	17.7	0.0	19.7	0.0	18.0	0.0
6						9	5	15	20	21	21	21	19	21	16
						28.1	26.3	19.7	0.0	0.0	0.0	0.0	0.0	0.0	19.8
4	Nuclear Fuel Type							9	15	18	16	17	17	17	17
	BOC Exposure (GWd/MTU)							26.9	20.4	18.9	18.7	18.1	17.8	16.3	17.1
2									9	9	6	10	18	10	11
									27.8	29.0	30.2	28.4	19.2	28.2	26.9

Fuel Type	Description	Cycle Loaded	No. Per Quarter core
4	GE14-P10DNAB157-NOG	7	6
5	GE14-P10DNAB377-16GZ	7	3
6	GE14-P10DNAB402-16GZ	7	4
9	GE14-P10DNAB419-16GZ	7	8
10	GE14-P10DNAB368-15GZ	7	3
11	GE14-P10DNAB402-19GZ	7	2
14	GE14-P10DNAB406-16GZ	8	12
15	GE14-P10DNAB400-17GZ	8	24
16	GE14-P10DNAB406-15GZ	8	16
17	GE14-P10DNAB417-16GZ	8	12
18	GE14-P10DNAB418-16GZ	8	18
19	[ ]	9	48
20	[ ]	9	10
21	[ ]	9	25

Figure 3.4 Browns Ferry Unit 1 Cycle 9 Lower Left Quarter Core Layout by Fuel Type

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
30	15	19	15	19	4	19	15	19	14	20	16	21	16	17	11
	20.8	0.0	18.9	0.0	11.6	0.0	20.0	0.0	18.9	0.0	19.9	0.0	19.8	17.3	27.2
28	19	4	21	15	19	4	19	15	19	18	20	14	21	17	10
	0.0	11.6	0.0	18.8	0.0	11.9	0.0	20.0	0.0	20.1	0.0	18.3	0.0	16.5	29.0
26	15	21	4	19	15	19	15	19	14	20	16	21	19	17	18
	19.2	0.0	11.8	0.0	18.8	0.0	19.0	0.0	18.9	0.0	20.9	0.0	0.0	18.4	20.6
24	19	15	19	14	19	15	19	16	19	14	19	16	21	17	10
	0.0	19.4	0.0	19.7	0.0	19.7	0.0	18.5	0.0	20.8	0.0	19.6	0.0	19.6	28.5
22	4	19	15	19	18	19	15	19	16	19	20	19	21	16	6
	11.6	0.0	19.8	0.0	18.6	0.0	19.6	0.0	19.4	0.0	0.0	0.0	0.0	19.0	30.8
20	19	4	19	15	19	18	19	16	19	18	21	18	21	18	5
	0.0	11.6	0.0	20.0	0.0	19.7	0.0	18.7	0.0	20.2	0.0	17.6	0.0	18.8	31.1
18	15	19	15	19	15	19	18	19	17	21	18	21	20	15	9
	20.4	0.0	18.9	0.0	18.9	0.0	19.7	0.0	19.1	0.0	20.4	0.0	0.0	20.1	28.1
16	19	15	19	16	19	16	19	15	19	18	21	17	15	9	
	0.0	19.8	0.0	18.4	0.0	18.3	0.0	18.6	0.0	20.9	0.0	18.1	19.7	26.9	
14	14	19	14	19	16	19	17	19	21	19	21	14	5		
	18.7	0.0	18.3	0.0	19.2	0.0	19.0	0.0	0.0	0.0	0.0	17.8	27.7		
12	20	18	20	14	19	18	21	18	19	14	15	6	9		
	0.0	19.8	0.0	21.0	0.0	20.3	0.0	20.2	0.0	20.1	20.0	31.1	28.4		
10	16	20	16	19	20	21	18	21	21	15	18				
	20.1	0.0	20.4	0.0	0.0	0.0	19.0	0.0	0.0	20.7	19.4				
8	21	14	21	16	19	18	21	17	14	6					
	0.0	18.0	0.0	19.7	0.0	17.7	0.0	18.0	17.9	30.2					
6	16	21	19	21	21	21	20	15	5	9					
	20.3	0.0	0.0	0.0	0.0	0.0	0.0	19.7	26.4	28.1					
4	17	17	17	17	16	18	15	9							
	17.1	16.4	17.8	18.1	18.8	18.9	20.4	26.9							
2	11	10	18	6	6	9	9								
	26.9	28.3	19.2	30.1	30.5	28.9	27.9								

Nuclear Fuel Type
BOC Exposure (GWd/MTU)

Fuel Type	Description	Cycle Loaded	No. Per Quarter core
4	GE14-P10DNAB157-NOG	7	6
5	GE14-P10DNAB377-16GZ	7	3
6	GE14-P10DNAB402-16GZ	7	5
9	GE14-P10DNAB419-16GZ	7	7
10	GE14-P10DNAB368-15GZ	7	3
11	GE14-P10DNAB402-19GZ	7	2
14	GE14-P10DNAB406-16GZ	8	12
15	GE14-P10DNAB400-17GZ	8	24
16	GE14-P10DNAB406-15GZ	8	16
17	GE14-P10DNAB417-16GZ	8	12
18	GE14-P10DNAB418-16GZ	8	18
19	[ ]	9	48
20	[ ]	9	10
21	[ ]	9	25

Figure 3.5 Browns Ferry Unit 1 Cycle 9 Lower Right Quarter Core Layout by Fuel Type

4.0 References

1. EMF-2158(P)(A) Revision 0, *Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2*, Siemens Power Corporation, October, 1999.

2. EMF-2209(P)(A) Revision 2, *SPCB Critical Power Correlation*, Framatome ANP, September 2003.

3. ANP-2837(P) Revision 0, *Nuclear Fuel Design Report Browns Ferry Unit 1 Fabrication Batch BFE1-9 ATRIUM-10 Fuel*, July 2009.

4. 38-9102622-002, TVA document, Browns Ferry Unit 2 Cycle 9 Reload Requirement Specification (120% OLTP), BFE-2722 Revision 2, March 2009.

Appendix A Browns Ferry Unit 1 Cycle 9 Step-through Depletion Summary, Control Rod Patterns and Core Average Axial Power and Exposure Distributions

Table A.1 Browns Ferry Unit 1 Cycle 9 Design Depletion Summary

Cycle Exposure (GWd/MT)	Calculated K-eff	Control Rod Density	Total Core Power MWt	Total Core Flow (Mlb/hr)	Ref. Pressure (psia)	Inlet Sub-Cooling (Btu/lb)	Void Fraction	Core Minimum CPR	Core Maximum LHGR (kW/ft)	Core Maximum APLHGR (kW/ft)
0.000	1.00296	7.03	3952.0	102.38	1050.04	26.97	0.458	1.557	11.46	8.77
0.250	1.00288	7.03	3952.0	103.29	1050.04	26.72	0.455	1.563	11.33	8.74
0.500	1.00275	7.03	3952.0	106.64	1050.04	25.81	0.447	1.586	11.30	8.75
0.750	1.00259	7.03	3952.0	105.12	1050.04	26.21	0.448	1.572	11.34	8.81
1.000	1.00252	7.03	3952.0	102.54	1050.04	26.93	0.453	1.562	11.27	8.80
1.000	1.00241	7.39	3952.0	106.34	1050.04	25.88	0.444	1.572	11.52	8.99
1.300	1.00224	7.39	3952.0	103.28	1050.04	26.72	0.449	1.565	11.38	8.93
1.300	1.00225	7.48	3952.0	106.37	1050.04	25.88	0.446	1.594	11.11	8.84
1.500	1.00214	7.48	3952.0	104.61	1050.04	26.35	0.448	1.584	11.02	8.80
1.600	1.00206	7.48	3952.0	103.68	1050.04	26.60	0.450	1.578	10.98	8.78
1.650	1.00205	7.57	3952.0	106.05	1050.04	25.96	0.447	1.582	11.21	8.86
1.800	1.00195	7.57	3952.0	104.74	1050.04	26.31	0.449	1.579	11.14	8.84
2.000	1.00188	7.57	3952.0	103.61	1050.04	26.62	0.451	1.578	11.07	8.82
2.150	1.00179	7.57	3952.0	102.55	1050.04	26.92	0.452	1.576	11.01	8.79
2.150	1.00179	7.66	3952.0	105.60	1050.04	26.08	0.449	1.592	10.81	8.59
2.591	1.00151	7.66	3952.0	103.12	1050.04	26.76	0.452	1.575	10.67	8.52
2.592	1.00153	7.48	3952.0	106.59	1050.04	25.82	0.456	1.583	11.15	8.54
3.000	1.00131	7.48	3952.0	104.61	1050.04	26.35	0.458	1.568	11.00	8.48
3.250	1.00110	7.48	3952.0	103.42	1050.04	26.68	0.460	1.559	10.92	8.45
3.350	1.00109	7.48	3952.0	103.14	1050.04	26.76	0.460	1.556	10.88	8.44
3.350	1.00110	7.61	3952.0	106.56	1050.04	25.83	0.457	1.584	10.99	8.52
3.750	1.00082	7.61	3952.0	104.93	1050.04	26.26	0.459	1.571	10.90	8.48
4.000	1.00074	7.61	3952.0	103.79	1050.04	26.57	0.459	1.562	10.87	8.48
4.150	1.00063	7.61	3952.0	103.35	1050.04	26.70	0.460	1.556	10.85	8.49
4.150	1.00060	7.84	3952.0	106.52	1050.04	25.84	0.458	1.593	10.95	8.56
4.500	1.00046	7.84	3952.0	105.16	1050.04	26.20	0.459	1.584	10.91	8.59
4.750	1.00029	7.84	3952.0	104.44	1050.04	26.39	0.460	1.577	10.90	8.62
5.000	1.00014	7.84	3952.0	103.75	1050.04	26.59	0.461	1.569	10.89	8.65
5.000	1.00014	7.93	3952.0	106.08	1050.04	25.95	0.459	1.594	10.97	8.71
5.237	1.00003	7.93	3952.0	105.34	1050.04	26.15	0.460	1.585	10.96	8.74
5.237	1.00001	8.20	3952.0	106.60	1050.04	25.82	0.446	1.620	9.82	8.14
5.500	0.99984	8.20	3952.0	105.79	1050.04	26.03	0.447	1.610	9.83	8.08
5.750	0.99971	8.20	3952.0	105.28	1050.04	26.17	0.448	1.603	9.85	8.02
6.000	0.99958	8.20	3952.0	104.68	1050.04	26.33	0.449	1.595	9.86	8.03
6.250	0.99944	8.20	3952.0	104.03	1050.04	26.51	0.450	1.587	9.87	8.08
6.500	0.99930	8.20	3952.0	103.37	1050.04	26.69	0.451	1.579	9.89	8.13
6.500	0.99925	8.38	3952.0	106.76	1050.04	25.77	0.447	1.597	9.98	8.20
6.750	0.99914	8.38	3952.0	106.21	1050.04	25.92	0.448	1.590	9.99	8.26
7.000	0.99900	8.38	3952.0	105.39	1050.04	26.14	0.449	1.582	10.02	8.32
7.250	0.99900	8.38	3952.0	105.12	1050.04	26.21	0.450	1.577	10.05	8.38
7.500	0.99900	8.38	3952.0	104.81	1050.04	26.30	0.451	1.572	10.09	8.46
7.750	0.99900	8.38	3952.0	104.46	1050.04	26.39	0.451	1.567	10.13	8.54
7.910	0.99900	8.38	3952.0	104.19	1050.04	26.46	0.452	1.564	10.17	8.60
7.911	0.99900	9.28	3952.0	106.22	1050.04	25.92	0.431	1.583	9.54	7.88
8.000	0.99902	9.28	3952.0	105.83	1050.04	26.02	0.432	1.580	9.55	7.89
8.250	0.99896	9.28	3952.0	105.43	1050.04	26.13	0.433	1.579	9.45	7.88
8.500	0.99903	9.28	3952.0	105.22	1050.04	26.18	0.433	1.577	9.39	7.88
8.750	0.99901	9.28	3952.0	104.65	1050.04	26.34	0.434	1.573	9.33	7.88
9.000	0.99900	9.28	3952.0	103.87	1050.04	26.55	0.436	1.566	9.27	7.87
9.250	0.99902	9.28	3952.0	103.37	1050.04	26.69	0.437	1.561	9.21	7.95
9.450	0.99901	9.28	3952.0	102.80	1050.04	26.85	0.439	1.556	9.21	8.05
9.450	0.99901	9.37	3952.0	104.63	1050.04	26.34	0.436	1.575	9.25	8.08
9.750	0.99902	9.37	3952.0	103.72	1050.04	26.59	0.438	1.570	9.39	8.22
10.000	0.99901	9.37	3952.0	102.97	1050.04	26.80	0.440	1.566	9.50	8.35
10.000	0.99902	9.46	3952.0	105.32	1050.04	26.16	0.438	1.576	9.57	8.40
10.200	0.99901	9.46	3952.0	104.70	1050.04	26.33	0.440	1.573	9.66	8.51
10.393	0.99900	9.46	3952.0	104.09	1050.04	26.49	0.442	1.571	9.73	8.61
10.393	0.99902	10.36	3952.0	106.39	1050.04	25.87	0.441	1.581	9.68	8.42
10.500	0.99897	10.36	3952.0	105.97	1050.04	25.98	0.442	1.580	9.73	8.48
10.750	0.99897	10.36	3952.0	105.45	1050.04	26.12	0.444	1.577	9.77	8.51
11.000	0.99901	10.36	3952.0	104.78	1050.04	26.30	0.445	1.573	9.83	8.57
11.250	0.99919	10.36	3952.0	104.90	1050.04	26.27	0.446	1.575	9.90	8.63

11.500	0.99934	10.36	3952.0	105.02	1050.04	26.24	0.446	1.577	9.96	8.69
11.750	0.99955	10.36	3952.0	105.54	1050.04	26.10	0.446	1.582	10.01	8.73
12.000	0.99967	10.36	3952.0	105.70	1050.04	26.05	0.447	1.585	10.06	8.77
12.250	0.99980	10.36	3952.0	106.09	1050.04	25.95	0.446	1.590	10.08	8.79
12.500	0.99996	10.36	3952.0	106.74	1050.04	25.78	0.446	1.595	10.07	8.80
12.500	0.99996	10.18	3952.0	104.07	1050.04	26.50	0.449	1.565	9.99	8.73
12.875	1.00022	10.18	3952.0	105.40	1050.04	26.13	0.447	1.577	9.98	8.82
12.875	1.00029	9.23	3952.0	102.38	1050.04	26.97	0.457	1.578	9.87	8.84
13.000	1.00031	9.23	3952.0	102.79	1050.04	26.86	0.456	1.581	9.84	8.81
13.200	1.00049	9.23	3952.0	104.26	1050.04	26.45	0.454	1.590	9.65	8.68
13.400	1.00062	9.23	3952.0	105.47	1050.04	26.11	0.451	1.602	9.47	8.55
13.400	1.00062	9.10	3952.0	103.80	1050.04	26.57	0.453	1.595	9.43	8.51
13.720	1.00081	9.10	3952.0	105.96	1050.04	25.99	0.448	1.612	9.32	8.45
13.720	1.00076	9.01	3952.0	103.82	1050.04	26.57	0.450	1.583	9.25	8.38
14.000	1.00104	9.01	3952.0	106.28	1050.04	25.90	0.444	1.594	9.35	8.47
14.000	1.00101	8.92	3952.0	104.17	1050.04	26.47	0.446	1.568	9.28	8.41
14.250	1.00115	8.92	3952.0	106.51	1050.04	25.84	0.440	1.580	9.36	8.48
14.250	1.00127	8.69	3952.0	102.33	1050.04	26.99	0.444	1.572	9.28	8.41
14.600	1.00139	8.69	3952.0	105.95	1050.04	25.99	0.435	1.590	9.38	8.50
14.600	1.00141	8.51	3952.0	103.79	1050.04	26.57	0.436	1.558	9.26	8.39
14.800	1.00155	8.51	3952.0	106.33	1050.04	25.89	0.430	1.570	9.31	8.44
14.800	1.00150	6.62	3952.0	102.87	1050.04	26.83	0.463	1.553	10.07	9.07
15.000	1.00165	6.62	3952.0	106.02	1050.04	25.97	0.455	1.574	9.84	8.86
15.000	1.00167	6.49	3952.0	102.91	1050.04	26.82	0.458	1.571	9.77	8.80
15.230	1.00183	6.49	3952.0	106.40	1050.04	25.87	0.449	1.588	9.39	8.45
15.230	1.00180	6.40	3952.0	104.58	1050.04	26.36	0.451	1.563	9.36	8.42
15.357	1.00192	6.40	3952.0	106.81	1050.04	25.76	0.445	1.575	9.17	8.25
15.357	1.00196	5.86	3952.0	103.17	1050.04	26.75	0.461	1.557	9.63	8.72
15.500	1.00200	5.86	3952.0	106.09	1050.04	25.95	0.455	1.577	9.46	8.56
15.500	1.00205	5.77	3952.0	103.75	1050.04	26.59	0.457	1.556	9.41	8.52
15.650	1.00205	5.77	3952.0	106.64	1050.04	25.81	0.450	1.572	9.18	8.30
15.650	1.00216	5.05	3952.0	102.09	1050.04	27.06	0.464	1.568	10.06	9.09
15.850	1.00225	5.05	3952.0	105.59	1050.04	26.08	0.454	1.590	9.78	8.85
15.850	1.00232	4.95	3952.0	103.94	1050.04	26.53	0.456	1.585	9.73	8.80
16.000	1.00236	4.95	3952.0	106.67	1050.04	25.80	0.449	1.597	9.49	8.60
16.000	1.00229	4.77	3952.0	103.25	1050.04	26.73	0.452	1.574	9.41	8.53
16.150	1.00243	4.77	3952.0	106.35	1050.04	25.88	0.444	1.592	9.18	8.33
16.150	1.00246	4.59	3952.0	103.05	1050.04	26.78	0.448	1.563	9.11	8.27
16.300	1.00253	4.59	3952.0	106.40	1050.04	25.87	0.440	1.582	8.89	8.07
16.300	1.00254	3.51	3952.0	103.48	1050.04	26.66	0.462	1.576	9.61	8.66
16.400	1.00263	3.51	3952.0	106.57	1050.04	25.82	0.456	1.596	9.52	8.57
16.400	1.00256	3.33	3952.0	102.36	1050.04	26.98	0.460	1.566	9.45	8.51
16.575	1.00264	3.33	3952.0	106.49	1050.04	25.84	0.450	1.594	9.11	8.19
16.575	1.00281	3.15	3952.0	103.32	1050.04	26.70	0.454	1.575	9.03	8.12
16.740	1.00272	3.15	3952.0	106.72	1050.04	25.78	0.445	1.599	8.75	7.87
16.740	1.00290	2.16	3952.0	102.24	1050.04	27.01	0.467	1.573	9.65	8.75
16.900	1.00287	2.16	3952.0	106.49	1050.04	25.84	0.458	1.598	9.43	8.56
16.900	1.00289	1.89	3952.0	104.34	1050.04	26.42	0.460	1.598	9.37	8.51
17.000	1.00297	1.89	3952.0	106.33	1050.04	25.89	0.454	1.615	9.18	8.34
17.000	1.00296	1.62	3952.0	102.46	1050.04	26.95	0.457	1.597	9.09	8.26
17.150	1.00305	1.62	3952.0	106.50	1050.04	25.84	0.448	1.625	8.82	8.02
17.150	1.00300	1.44	3952.0	103.25	1050.04	26.73	0.451	1.602	8.78	7.98
17.280	1.00303	1.44	3952.0	106.84	1050.04	25.75	0.443	1.625	8.57	7.79
17.280	1.00305	1.26	3952.0	103.83	1050.04	26.57	0.447	1.604	8.52	7.75
17.340	1.00300	1.26	3952.0	105.38	1050.04	26.14	0.444	1.616	8.44	7.68
17.340	1.00301	1.08	3952.0	102.61	1050.04	26.91	0.448	1.600	8.70	7.74
17.490	1.00304	1.08	3952.0	106.91	1050.04	25.73	0.438	1.632	8.70	7.74
17.490	1.00305	0.00	3952.0	102.51	1050.04	26.93	0.457	1.640	9.42	8.42
17.678	1.00304	0.00	3952.0	108.16	1050.04	25.41	0.445	1.678	9.20	8.23
17.678	1.00296	0.00	3952.0	96.94	1044.68	35.56	0.443	1.637	9.68	8.65
18.084	1.00302	0.00	3952.0	108.29	1044.68	31.59	0.415	1.714	8.95	7.96
19.025	1.00297	0.00	3354.8	107.63	1033.11	26.42	0.366	1.963	7.39	6.64
19.635	1.00297	0.00	2983.1	107.63	1025.92	23.11	0.334	2.175	6.72	6.04

Table A.2 Browns Ferry Unit 1 Cycle 9 Design Depletion Thermal Margin Summary

Cycle Exposure (GWd/MT)	Calculated K-eff	Control Rod Density	Core Limiting CPR	Fraction of Limiting CPR	Core Limiting LHGR (kW/ft)	Fraction of Limiting LHGR	Core Limiting APLHGR (kW/ft)	Fraction of Limiting APLHGR
0.000	1.00296	7.027	1.557	0.925	11.46	0.855	8.77	0.701
0.250	1.00288	7.027	1.563	0.922	11.33	0.846	8.74	0.700
0.500	1.00275	7.027	1.586	0.908	11.30	0.844	8.75	0.700
0.750	1.00259	7.027	1.572	0.916	11.34	0.846	8.81	0.705
1.000	1.00252	7.027	1.562	0.922	11.27	0.841	8.80	0.704
1.000	1.00241	7.387	1.572	0.916	9.37	0.861	8.99	0.719
1.300	1.00224	7.387	1.565	0.920	9.27	0.857	8.93	0.714
1.300	1.00225	7.477	1.594	0.903	9.24	0.854	8.84	0.706
1.500	1.00214	7.477	1.584	0.909	9.17	0.852	8.80	0.705
1.600	1.00206	7.477	1.578	0.913	9.14	0.850	8.78	0.705
1.650	1.00205	7.568	1.582	0.910	9.05	0.843	8.86	0.709
1.800	1.00195	7.568	1.579	0.912	9.00	0.841	8.84	0.707
2.000	1.00188	7.568	1.578	0.913	8.95	0.840	8.82	0.705
2.150	1.00179	7.568	1.576	0.914	8.90	0.838	8.79	0.704
2.150	1.00179	7.658	1.592	0.905	8.83	0.836	8.59	0.696
2.591	1.00151	7.658	1.575	0.914	8.72	0.833	8.51	0.695
2.592	1.00153	7.477	1.583	0.910	8.87	0.872	8.16	0.690
3.000	1.00131	7.477	1.568	0.918	8.72	0.865	8.04	0.684
3.250	1.00110	7.477	1.559	0.924	8.64	0.862	7.97	0.681
3.350	1.00109	7.477	1.556	0.926	8.61	0.860	7.95	0.680
3.350	1.00110	7.613	1.584	0.909	8.69	0.868	8.02	0.687
3.750	1.00082	7.613	1.571	0.917	8.58	0.864	7.95	0.686
4.000	1.00074	7.613	1.562	0.922	8.51	0.862	7.92	0.687
4.150	1.00063	7.613	1.556	0.925	8.47	0.861	7.90	0.687
4.150	1.00060	7.838	1.593	0.904	8.54	0.868	7.97	0.693
4.500	1.00046	7.838	1.584	0.909	8.76	0.865	7.94	0.695
4.750	1.00029	7.838	1.577	0.913	8.74	0.868	7.93	0.696
5.000	1.00014	7.838	1.569	0.918	8.72	0.871	7.92	0.699
5.000	1.00014	7.928	1.594	0.904	8.78	0.877	7.98	0.704
5.237	1.00003	7.928	1.585	0.908	8.77	0.880	7.97	0.706
5.237	1.00001	8.198	1.620	0.889	8.36	0.835	8.14	0.694
5.500	0.99984	8.198	1.610	0.895	8.29	0.832	8.08	0.692
5.750	0.99971	8.198	1.603	0.899	8.21	0.829	8.02	0.690
6.000	0.99958	8.198	1.595	0.903	8.14	0.826	7.96	0.688
6.250	0.99944	8.198	1.587	0.907	8.08	0.823	7.91	0.686
6.500	0.99930	8.198	1.579	0.912	8.01	0.821	7.85	0.684
6.500	0.99925	8.378	1.597	0.901	7.44	0.801	7.59	0.665
6.750	0.99914	8.378	1.590	0.905	7.44	0.806	7.55	0.664
7.000	0.99900	8.378	1.582	0.910	7.45	0.811	8.32	0.666
7.250	0.99900	8.378	1.577	0.913	7.46	0.816	8.38	0.671
7.500	0.99900	8.378	1.572	0.916	7.48	0.821	8.46	0.677
7.750	0.99900	8.378	1.567	0.919	7.50	0.828	8.54	0.683
7.910	0.99900	8.378	1.564	0.921	7.52	0.833	8.60	0.688
7.911	0.99900	9.279	1.583	0.909	8.33	0.833	7.68	0.680
8.000	0.99902	9.279	1.580	0.911	8.33	0.834	7.68	0.681
8.250	0.99896	9.279	1.579	0.912	8.28	0.834	7.63	0.680
8.500	0.99903	9.279	1.577	0.913	8.24	0.834	7.60	0.679
8.750	0.99901	9.279	1.573	0.915	8.21	0.834	7.58	0.679
9.000	0.99900	9.279	1.566	0.919	8.16	0.834	7.54	0.679
9.250	0.99902	9.279	1.561	0.922	8.13	0.835	7.52	0.680
9.450	0.99901	9.279	1.556	0.925	8.11	0.835	7.49	0.680
9.450	0.99901	9.369	1.575	0.914	7.95	0.818	7.32	0.664
9.750	0.99902	9.369	1.570	0.917	7.90	0.818	8.22	0.669
10.000	0.99901	9.369	1.566	0.920	7.86	0.818	8.34	0.681
10.000	0.99902	9.459	1.576	0.914	7.85	0.817	8.40	0.686
10.200	0.99901	9.459	1.573	0.915	7.82	0.816	8.49	0.695
10.393	0.99900	9.459	1.571	0.917	7.78	0.815	8.57	0.704
10.393	0.99902	10.360	1.581	0.911	7.65	0.826	8.42	0.674
10.500	0.99897	10.360	1.580	0.912	7.68	0.832	8.48	0.679
10.750	0.99897	10.360	1.577	0.913	7.67	0.835	8.51	0.684

11.000	0.99901	10.360	1.573	0.915	7.69	0.841	8.57	0.691
11.250	0.99919	10.360	1.575	0.914	7.71	0.847	8.63	0.699
11.500	0.99934	10.360	1.577	0.913	7.73	0.854	8.69	0.706
11.750	0.99955	10.360	1.582	0.910	7.74	0.860	8.73	0.712
12.000	0.99967	10.360	1.585	0.909	7.75	0.866	8.77	0.719
12.250	0.99980	10.360	1.590	0.906	7.75	0.870	8.79	0.723
12.500	0.99996	10.360	1.595	0.903	7.79	0.875	8.78	0.725
12.500	0.99996	10.180	1.565	0.920	7.73	0.868	8.70	0.719
12.875	1.00022	10.180	1.577	0.913	7.71	0.873	8.64	0.718
12.875	1.00029	9.234	1.578	0.912	6.94	0.840	8.84	0.739
13.000	1.00031	9.234	1.581	0.911	6.90	0.836	8.81	0.738
13.200	1.00049	9.234	1.590	0.905	6.77	0.824	8.68	0.729
13.400	1.00062	9.234	1.602	0.899	8.37	0.814	8.55	0.720
13.400	1.00062	9.099	1.595	0.903	8.33	0.810	8.50	0.717
13.720	1.00081	9.099	1.612	0.893	8.37	0.818	8.28	0.701
13.720	1.00076	9.009	1.583	0.910	8.31	0.812	8.23	0.697
14.000	1.00104	9.009	1.594	0.903	8.35	0.821	8.47	0.706
14.000	1.00101	8.919	1.568	0.918	8.29	0.815	8.41	0.701
14.250	1.00115	8.919	1.580	0.912	8.33	0.824	8.48	0.710
14.250	1.00127	8.694	1.572	0.916	7.70	0.837	8.41	0.704
14.600	1.00139	8.694	1.590	0.906	7.78	0.851	8.50	0.715
14.600	1.00141	8.514	1.558	0.924	7.62	0.835	8.39	0.706
14.800	1.00155	8.514	1.570	0.917	7.68	0.844	8.44	0.712
14.800	1.00150	6.622	1.553	0.927	7.57	0.887	9.07	0.774
15.000	1.00165	6.622	1.574	0.915	7.39	0.870	8.86	0.759
15.000	1.00167	6.486	1.571	0.917	7.35	0.865	8.80	0.754
15.230	1.00183	6.486	1.588	0.907	6.94	0.839	8.45	0.726
15.230	1.00180	6.396	1.563	0.922	6.91	0.836	8.42	0.724
15.357	1.00192	6.396	1.575	0.914	6.79	0.824	8.24	0.710
15.357	1.00196	5.856	1.557	0.925	7.02	0.846	8.71	0.746
15.500	1.00200	5.856	1.577	0.913	6.91	0.834	8.56	0.734
15.500	1.00205	5.766	1.556	0.925	6.88	0.830	8.52	0.731
15.650	1.00205	5.766	1.572	0.916	6.73	0.816	8.30	0.714
15.650	1.00216	5.045	1.568	0.918	7.56	0.887	8.93	0.762
15.850	1.00225	5.045	1.590	0.906	7.32	0.864	8.69	0.744
15.850	1.00232	4.955	1.585	0.908	7.28	0.859	8.64	0.739
16.000	1.00236	4.955	1.597	0.902	7.32	0.840	8.43	0.723
16.000	1.00229	4.775	1.574	0.915	7.26	0.834	8.37	0.718
16.150	1.00243	4.775	1.592	0.904	7.08	0.815	8.16	0.702
16.150	1.00246	4.595	1.563	0.921	7.73	0.857	8.11	0.697
16.300	1.00253	4.595	1.582	0.910	7.78	0.866	7.15	0.691
16.300	1.00254	3.514	1.576	0.914	7.30	0.850	8.66	0.732
16.400	1.00263	3.514	1.596	0.902	7.21	0.841	8.57	0.726
16.400	1.00256	3.333	1.566	0.919	7.17	0.836	8.51	0.721
16.575	1.00264	3.333	1.594	0.903	6.89	0.807	8.19	0.696
16.575	1.00281	3.153	1.575	0.927	7.49	0.841	8.12	0.690
16.740	1.00272	3.153	1.599	0.913	7.56	0.852	7.87	0.670
16.740	1.00290	2.162	1.573	0.928	7.44	0.860	8.75	0.730
16.900	1.00287	2.162	1.598	0.914	7.26	0.842	8.56	0.716
16.900	1.00289	1.892	1.598	0.914	7.21	0.837	8.51	0.712
17.000	1.00297	1.892	1.615	0.904	7.06	0.821	8.34	0.699
17.000	1.00296	1.622	1.597	0.914	7.00	0.814	8.26	0.692
17.150	1.00305	1.622	1.625	0.898	6.97	0.801	8.02	0.673
17.150	1.00300	1.441	1.602	0.911	6.91	0.794	7.98	0.670
17.280	1.00303	1.441	1.625	0.898	6.93	0.798	6.86	0.663
17.280	1.00305	1.261	1.604	0.910	7.24	0.812	6.89	0.666
17.340	1.00300	1.261	1.616	0.903	7.25	0.814	6.91	0.669
17.340	1.00301	1.081	1.600	0.912	7.82	0.875	7.14	0.682
17.490	1.00304	1.081	1.632	0.895	7.82	0.878	7.14	0.683
17.490	1.00305	0.000	1.640	0.890	7.39	0.816	8.42	0.704
17.678	1.00304	0.000	1.678	0.870	7.20	0.799	8.22	0.689
17.678	1.00296	0.000	1.637	0.892	7.59	0.842	8.65	0.725
18.084	1.00302	0.000	1.714	0.852	7.00	0.799	7.96	0.672
19.025	1.00297	0.000	1.963	0.767	6.36	0.734	6.01	0.597
19.635	1.00297	0.000	2.175	0.705	5.85	0.684	5.44	0.551

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    11634.6
Exposure: MWd/MTU (GWd)             0.0 (   0.00 )
Delta E: MWd/MTU, (GWd)             0.0 (   0.00 )                    Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.135   1.972     4  0.872 0.940  27 28
Inlet Subcooling: Btu/lbm         -26.97                       24  0.441   6.006     5  0.562 0.647   1 36
Flow: Mlb/hr                     102.38 ( 99.89 %)            23  0.640   8.434     6  0.540 0.563  53 50
                                                              22  0.821  10.372     9  0.472 0.573  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.968  11.775    10  0.578 0.601  33 60
 1              -- -- -- -- -- -- --              59  :JR     20  1.077  12.698    11  0.633 0.636  31  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.141  13.184    14  1.057 1.188  27 54
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  1.152  13.275    15  1.040 1.217  31 32
 7     -- -- -- -- 12 -- 28 -- 12 -- -- -- --     47          17  1.150  13.181    16  1.055 1.262  51 32
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.122  12.103    17  0.978 1.192  17 48
11 -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- -- 39          15  1.104  12.055    18  1.008 1.262  33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.130  12.062    19  1.092 1.214  33 48
15 -- -- -- 28 -- 20 -- -- -- 20 -- 28 -- -- -- 31          13  1.131  12.401    20  1.156 1.276  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.146  12.814    21  1.075 1.226  31 54
19 -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- -- 23          11  1.165  13.201
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.177  13.508
23    -- -- -- -- 12 -- 28 -- 12 -- -- -- --    15           9  1.189  13.570
25       -- -- -- -- -- -- -- -- -- -- -- --     11           8  1.226  13.966
27          -- -- -- -- -- -- -- -- -- --        7           7  1.272  14.514
29             -- -- -- -- -- -- -- --           3           6  1.308  15.034
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.311* 15.204*
                                                            4  1.244  14.463
Control Rod Density: %              7.03                    3  1.050  12.130
                                                            2  0.714   8.220
k-effective:                     1.00296                Bottom  1  0.184   2.285
Void Fraction:                     0.458
Core Delta-P: psia                24.461          % AXIAL TILT  -8.814  -7.525
Core Plate Delta-P: psia          19.918       AVG BOT 8ft/12ft  1.0542  1.0319
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr            86.49   Active Channel Flow: Mlb/hr        86.49
Total Bypass Flow (%):             15.5   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence              0.00010
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.276	20	29	50	1.557	0.925	21	33	26	8.77	0.701	0.0	19	31	38	17	11.46	0.855	0.0	21	31	8	5
1.276	20	49	32	1.557	0.925	21	35	34	8.76	0.701	0.0	19	37	32	17	11.43	0.853	0.0	21	7	32	5
1.268	20	27	52	1.559	0.924	20	31	50	8.50	0.680	0.0	21	29	8	5	9.12	0.851	23.3	16	9	32	5
1.267	20	51	34	1.560	0.923	19	43	34	8.47	0.678	0.0	21	53	32	5	9.01	0.850	24.3	16	31	10	5
1.262	18	33	50	1.561	0.923	20	49	32	8.47	0.677	0.0	20	27	52	5	11.37	0.848	0.0	19	29	38	17
1.262	16	51	32	1.562	0.922	19	33	44	8.44	0.675	0.0	20	51	34	5	11.36	0.848	0.0	19	37	30	17
1.260	18	49	28	1.577	0.913	19	33	30	8.27	0.671	25.4	16	51	32	5	11.34	0.847	0.0	21	25	8	5
1.258	16	29	52	1.577	0.913	20	27	52	8.20	0.669	26.1	16	29	52	5	11.29	0.842	0.0	21	33	56	5
1.228	20	25	50	1.578	0.912	19	31	34	8.31	0.666	24.1	14	37	38	20	11.27	0.841	0.0	21	7	26	5
1.227	20	49	36	1.579	0.912	19	33	48	8.33	0.660	22.8	15	31	36	18	11.21	0.837	0.0	21	55	34	5

```
  * LHGR calculated with pin-power reconstruction
  * CPR calculated with pin-power reconstruction & CPR limit type 3
  * Thermal limit file:
```

Figure A.1 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 0.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    11884.6
Exposure: MWd/MTU (GWd)           250.0 (  34.05 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.137   2.012     4  0.872 0.942  27 28
Inlet Subcooling: Btu/lbm         -26.72                       24  0.446   6.124     5  0.563 0.650   1 36
Flow: Mlb/hr                     103.29 (100.77 %)            23  0.647   8.606     6  0.542 0.565  53 50
                                                              22  0.828  10.593     9  0.474 0.575  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.975  12.036    10  0.581 0.603  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.084  12.988    11  0.636 0.639  31  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.147  13.492    14  1.059 1.191  27 54
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  1.158  13.586    15  1.042 1.220  31 32
 7     -- -- -- -- 12 -- 28 -- 12 -- -- -- --     47          17  1.156  13.491    16  1.058 1.264  51 32
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.130  12.394    17  0.982 1.193  17 48
11 -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --  39          15  1.113  12.341    18  1.010 1.265  33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35          14  1.139  12.329    19  1.089 1.211  33 48
15 -- -- -- 28 -- 20 -- -- -- 20 -- 28 -- -- --  31          13  1.140  12.668    20  1.152 1.273  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27          12  1.155  13.085    21  1.073 1.225  31 54
19 -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --  23          11  1.173  13.475
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19          10  1.184  13.786
23    -- -- -- -- 12 -- 28 -- 12 -- -- -- --     15           9  1.194  13.851
25       -- -- -- -- -- -- -- -- -- -- -- --     11           8  1.226  14.256
27          -- -- -- -- -- -- -- -- -- --        7           7  1.264  14.815
29             -- -- -- -- -- -- -- --           3           6  1.292* 15.343
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.288  15.514*
                                                             4  1.217  14.757
Control Rod Density: %             7.03                      3  1.027  12.378
                                                             2  0.700   8.389
k-effective:                    1.00288                Bottom  1  0.181   2.329
Void Fraction:                    0.455
Core Delta-P: psia               24.759              % AXIAL TILT  -8.138  -7.426
Core Plate Delta-P: psia         20.217          AVG BOT 8ft/12ft  1.0511  1.0315
Coolant Temp: Deg-F              548.2
In Channel Flow: Mlb/hr          87.29   Active Channel Flow: Mlb/hr        87.29
Total Bypass Flow (%):            15.5   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.273	20	29	50	1.563	0.922	21	33	26	8.74	0.700	0.5	19	31	38	17	11.33	0.846	0.6	19	29	38	17
1.272	20	49	32	1.563	0.921	21	35	34	8.74	0.699	0.5	19	37	32	17	11.32	0.845	0.6	19	37	30	17
1.265	20	27	52	1.569	0.918	19	43	34	8.34	0.671	24.5	14	37	38	20	8.99	0.843	23.8	16	9	32	5
1.265	18	33	50	1.569	0.918	20	31	50	8.34	0.667	0.5	21	29	8	5	8.88	0.842	24.8	16	31	10	5
1.264	16	51	32	1.571	0.917	19	33	44	8.31	0.665	0.5	21	53	32	5	11.20	0.836	0.6	21	31	8	5
1.263	20	51	34	1.572	0.916	20	49	32	8.41	0.665	22.6	15	31	36	17	11.17	0.833	0.6	21	7	32	5
1.261	18	49	28	1.587	0.907	20	27	52	8.41	0.665	22.6	15	25	30	17	11.07	0.826	0.6	21	25	8	5
1.261	16	29	52	1.587	0.907	19	33	30	8.16	0.664	25.8	16	51	32	5	8.73	0.824	24.5	16	25	10	5
1.225	21	31	54	1.589	0.906	19	31	28	8.29	0.663	0.5	20	27	52	5	11.04	0.824	0.6	21	33	56	5
1.224	20	25	50	1.589	0.906	19	33	48	8.09	0.663	26.5	16	29	52	5	10.99	0.820	0.6	21	7	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.2 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 250.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)           500.0 (  68.09 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -25.81
Flow: Mlb/hr                      106.64 (104.04 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- 12 -- 28 -- 12 -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- 28 -- 20 -- -- -- 20 -- 28 -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- 12 -- 28 -- 12 -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.03

k-effective:                     1.00275
Void Fraction:                     0.447
Core Delta-P: psia                25.957
Core Plate Delta-P: psia          21.414
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr           90.24
Total Bypass Flow (%):             15.4
Total Water Rod Flow (%):          -0.0
Source Convergence             0.00009
```

Core Average Exposure: MWd/MTU 12134.6

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.139	2.053	4	0.870	0.939	27	28
24	0.453	6.244	5	0.562	0.650	1	36
23	0.657	8.780	6	0.541	0.565	53	50
22	0.839	10.817	9	0.473	0.575	23	60
21	0.985	12.299	10	0.580	0.603	33	60
20	1.093	13.281	11	0.635	0.639	29	2
19	1.156	13.801	14	1.062	1.195	27	54
18	1.167	13.898	15	1.041	1.216	31	32
17	1.165	13.803	16	1.060	1.267	51	32
16	1.139	12.686	17	0.984	1.196	17	48
15	1.123	12.629	18	1.013	1.268	33	50
14	1.150	12.597	19	1.087	1.211	33	48
13	1.152	12.937	20	1.152	1.273	29	50
12	1.168	13.357	21	1.072	1.226	31	54
11	1.185	13.752					
10	1.194	14.065					
9	1.199	14.133					
8	1.224	14.546					
7	1.253	15.114					
6	1.271*	15.648					
5	1.257	15.818*					
4	1.181	15.045					
3	0.995	12.621					
2	0.679	8.555					
Bottom 1	0.176	2.372					
% AXIAL TILT	-7.195	-7.318					
AVG BOT 8ft/12ft	1.0466	1.0311					

Active Channel Flow: Mlb/hr 90.24
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.273	20	29	50	1.586	0.908	21	33	26	8.75	0.700	1.0	19	31	38	17	11.30	0.844	1.3	19	29	38	17
1.271	20	49	32	1.587	0.907	21	35	34	8.74	0.700	1.0	19	37	30	17	11.29	0.843	1.3	19	37	30	17
1.268	18	33	50	1.592	0.904	20	31	50	8.37	0.676	25.0	14	37	38	20	8.83	0.833	24.3	16	9	32	5
1.267	16	51	32	1.594	0.904	19	43	34	8.44	0.670	23.1	15	31	36	17	8.73	0.831	25.3	16	31	10	5
1.265	16	29	52	1.594	0.903	19	33	44	8.44	0.669	23.0	15	25	30	17	10.99	0.820	1.3	21	31	8	5
1.265	20	27	52	1.596	0.902	20	49	32	8.28	0.665	24.4	15	31	32	17	9.20	0.817	18.1	18	39	40	20
1.264	18	49	28	1.610	0.895	20	27	52	8.21	0.657	0.9	21	29	8	5	10.95	0.817	1.3	21	7	32	5
1.262	20	51	34	1.610	0.894	19	33	48	8.15	0.656	24.6	15	37	34	18	8.57	0.813	25.0	16	25	10	5
1.226	21	31	54	1.614	0.892	19	47	34	8.02	0.656	26.3	16	51	32	5	10.84	0.809	1.3	21	25	8	5
1.224	21	53	32	1.614	0.892	20	51	34	8.32	0.656	22.3	14	31	48	17	10.82	0.807	1.2	21	33	56	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.3 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 500.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          750.0 ( 102.14 )
Delta E: MWd/MTU, (GWd)          250.0 (  34.05 )
Power: MWt                      3952.0 (100.00 %)
Core Pressure: psia             1050.0
Inlet Subcooling: Btu/lbm        -26.21
Flow: Mlb/hr                     105.12 (102.56 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --                59  :JR
 3           -- -- -- -- -- -- -- -- -- --          55
 5        -- -- -- -- -- -- -- -- -- -- -- --       51
 7     -- -- -- -- 12 -- 28 -- 12 -- -- -- --       47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    43
11  -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --    39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    35
15  -- -- -- 28 -- 20 -- -- -- 20 -- 28 -- -- --    31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    27
19  -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --    23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    19
23     -- -- -- -- 12 -- 28 -- 12 -- -- -- --       15
25        -- -- -- -- -- -- -- -- -- -- --          11
27           -- -- -- -- -- -- -- -- --             7
29              -- -- -- -- -- -- --                3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %             7.03

k-effective:                    1.00259
Void Fraction:                    0.448
Core Delta-P: psia               25.384
Core Plate Delta-P: psia         20.841
Coolant Temp: Deg-F              548.2
In Channel Flow: Mlb/hr           88.93
Total Bypass Flow (%):             15.4
Total Water Rod Flow (%):          -0.0
Source Convergence             0.00009
```

Core Average Exposure: MWd/MTU 12384.6

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.140	2.094	4	0.869	0.938	27	28
24	0.455	6.366	5	0.560	0.648	1	36
23	0.658	8.957	6	0.539	0.562	53	50
22	0.840	11.043	9	0.471	0.573	23	60
21	0.987	12.565	10	0.578	0.600	33	60
20	1.095	13.575	11	0.632	0.636	29	2
19	1.157	14.113	14	1.062	1.195	27	54
18	1.168	14.213	15	1.041	1.214	31	32
17	1.167	14.117	16	1.061	1.267	51	32
16	1.141	12.981	17	0.982	1.196	17	48
15	1.124	12.920	18	1.012	1.269	33	50
14	1.151	12.869	19	1.089	1.214	33	48
13	1.152	13.209	20	1.153	1.276	29	50
12	1.167	13.633	21	1.072	1.227	31	54
11	1.183	14.032					
10	1.192	14.347					
9	1.197	14.417					
8	1.221	14.835					
7	1.251	15.410					
6	1.268*	15.949					
5	1.254	16.115*					
4	1.179	15.324					
3	0.995	12.856					
2	0.681	8.715					
Bottom 1	0.177	2.414					
% AXIAL TILT	-7.051	-7.195					
AVG BOT 8ft/12ft	1.0458	1.0306					

Active Channel Flow: Mlb/hr 88.93

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.276	20	29	50	1.572	0.916	21	33	26	8.81	0.705	1.4	19	31	38	17	11.34	0.846	1.9	19	29	38	17
1.274	20	49	32	1.574	0.915	21	35	34	8.80	0.704	1.4	19	37	30	17	11.32	0.845	1.9	19	37	30	17
1.269	18	33	50	1.580	0.911	20	31	50	8.41	0.682	25.4	14	37	38	20	8.79	0.833	24.8	16	9	32	5
1.267	20	27	52	1.582	0.910	19	33	44	8.48	0.676	23.5	15	31	36	17	8.69	0.832	25.9	16	31	10	5
1.267	16	51	32	1.582	0.910	19	43	34	8.48	0.675	23.5	15	25	30	17	9.21	0.822	18.6	18	39	40	20
1.265	16	29	52	1.585	0.908	20	49	32	8.32	0.671	24.9	15	31	32	17	10.97	0.819	1.9	21	31	8	5
1.264	18	49	28	1.597	0.902	19	33	48	8.18	0.661	25.0	15	37	34	18	10.94	0.816	1.9	21	7	32	5
1.264	20	51	34	1.598	0.901	20	27	52	8.35	0.661	22.7	14	31	48	17	8.55	0.815	25.5	16	25	10	5
1.227	21	31	54	1.601	0.899	19	33	30	8.29	0.661	23.5	15	27	38	18	8.94	0.813	20.6	15	31	26	17
1.225	20	25	50	1.602	0.899	19	47	34	8.23	0.659	1.4	21	29	8	5	9.01	0.812	19.6	15	35	32	17

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.4 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 750.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          1000.0 ( 136.19 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -26.93
Flow: Mlb/hr                      102.54 (100.04 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- 12 -- 28 -- 12 -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- --     43
11  -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- 28 -- 20 -- -- -- 20 -- 28 -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- 12 -- 12 -- 20 -- 12 -- 12 -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- 12 -- 28 -- 12 -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.03

k-effective:                     1.00252
Void Fraction:                     0.453
Core Delta-P: psia                24.446
Core Plate Delta-P: psia          19.904
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr            86.68
Total Bypass Flow (%):              15.5
Total Water Rod Flow (%):           -0.0
Source Convergence             0.00009
```

Core Average Exposure: MWd/MTU 12634.6

	Axial Profile		Edit	Radial Power			
	N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR JR
Top	25	0.141	2.135	4	0.868	0.935	27 28
	24	0.455	6.488	5	0.558	0.646	1 36
	23	0.659	9.134	6	0.537	0.560	53 50
	22	0.840	11.270	9	0.469	0.571	23 60
	21	0.986	12.831	10	0.575	0.598	33 60
	20	1.093	13.871	11	0.629	0.633	29 2
	19	1.155	14.425	14	1.062	1.194	27 54
	18	1.167	14.528	15	1.040	1.210	31 32
	17	1.166	14.432	16	1.060	1.264	9 32
	16	1.141	13.277	17	0.980	1.195	17 48
	15	1.125	13.211	18	1.012	1.268	33 50
	14	1.152	13.141	19	1.091	1.217	33 48
	13	1.152	13.480	20	1.154	1.277	29 50
	12	1.166	13.908	21	1.072	1.228	31 54
	11	1.182	14.311				
	10	1.190	14.628				
	9	1.196	14.700				
	8	1.220	15.124				
	7	1.249	15.706				
	6	1.267*	16.249				
	5	1.254	16.412*				
	4	1.181	15.603				
	3	0.998	13.092				
	2	0.685	8.876				
Bottom	1	0.179	2.456				
% AXIAL TILT		-7.081	-7.074				
AVG BOT 8ft/12ft		1.0462	1.0302				

Active Channel Flow: Mlb/hr 86.68
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.277	20	29	50	1.562	0.922	21	33	26	8.80	0.704	1.9	19	31	38	17	11.27	0.841	2.6	19	29	38	17
1.275	20	49	32	1.563	0.922	20	31	50	8.79	0.703	1.9	19	37	30	17	11.26	0.840	2.6	19	37	30	17
1.268	18	33	50	1.563	0.921	21	35	34	8.38	0.682	25.9	14	37	38	20	8.72	0.830	25.3	16	9	32	5
1.268	20	27	52	1.568	0.918	19	33	44	8.43	0.675	24.0	15	31	26	17	8.62	0.829	26.4	16	31	10	5
1.264	16	9	32	1.569	0.918	20	49	32	8.43	0.674	23.9	15	25	30	17	9.16	0.822	19.1	18	39	40	20
1.264	20	51	34	1.569	0.918	19	43	34	8.27	0.670	25.3	15	31	32	17	8.49	0.814	26.0	16	25	10	5
1.263	16	29	52	1.579	0.912	20	27	52	8.34	0.662	23.2	14	31	48	17	10.90	0.813	2.5	21	31	8	5
1.263	18	49	28	1.579	0.912	19	33	14	8.14	0.660	25.4	15	37	34	18	8.88	0.812	21.1	15	31	26	17
1.228	21	31	54	1.585	0.908	19	47	34	8.24	0.660	24.0	15	27	38	18	10.86	0.811	2.5	21	7	32	5
1.228	20	25	50	1.585	0.908	20	51	34	8.26	0.659	23.6	14	13	30	17	8.95	0.810	20.1	15	35	32	17

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.5 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,000.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          1000.2 ( 136.22 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -25.88
Flow: Mlb/hr                     106.34 (103.75 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- 12 -- 22 -- 12 -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- 12 -- 12 -- 18 -- 12 -- 12 -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- -- 12 -- 12 -- 18 -- 12 -- 12 -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- 12 -- 22 -- 12 -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- -- --     11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.39

k-effective:                     1.00241
Void Fraction:                     0.444
Core Delta-P: psia                25.746
Core Plate Delta-P: psia          21.204
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr           90.05   Active Channel Flow: Mlb/hr        90.05
Total Bypass Flow (%):            15.3    (of total core flow)
Total Water Rod Flow (%):         -0.0    (of total core flow)
Source Convergence              0.00010

                                          Core Average Exposure: MWd/MTU    12634.8

                                                Axial Profile    Edit   Radial Power
                                          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                                          Top 25 0.147   2.135    4  0.856 0.931  27 28
                                              24 0.475   6.488    5  0.564 0.650   1 36
                                              23 0.688   9.134    6  0.542 0.567  53 50
                                              22 0.877  11.270    9  0.474 0.575  23 60
                                              21 1.028  12.832   10  0.578 0.600  33 60
                                              20 1.137  13.871   11  0.632 0.636  29  2
                                              19 1.197  14.426   14  1.052 1.195  27 54
                                              18 1.202  14.528   15  1.036 1.207  15 46
                                              17 1.190  14.432   16  1.064 1.255   9 32
                                              16 1.149  13.277   17  0.988 1.208  17 48
                                              15 1.111  13.211   18  1.018 1.254  33 50
                                              14 1.125  13.141   19  1.087 1.202  17 46
                                              13 1.106  13.481   20  1.150 1.263  27 52
                                              12 1.111  13.909   21  1.079 1.227  29 54
                                              11 1.130  14.311
                                              10 1.154  14.628
                                               9 1.173  14.700
                                               8 1.207  15.124
                                               7 1.242  15.706
                                               6 1.263* 16.249
                                               5 1.252  16.412*
                                               4 1.178  15.603
                                               3 0.996  13.092
                                               2 0.683   8.876
                                          Bottom  1 0.178   2.456
                                        % AXIAL TILT  -5.203  -7.074
                                      AVG BOT 8ft/12ft  1.0296  1.0302
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.263	20	27	52	1.572	0.916	21	33	26	8.99	0.719	1.9	19	31	38	18	9.37	0.861	21.7	14	29	48	17
1.259	20	51	34	1.574	0.915	21	35	34	8.98	0.719	1.9	19	37	30	18	11.52	0.860	2.5	19	29	38	18
1.255	16	9	32	1.589	0.906	19	33	44	8.70	0.708	25.9	14	37	38	20	11.51	0.859	2.5	19	37	30	18
1.255	16	29	52	1.591	0.905	19	43	34	8.91	0.708	23.2	14	31	48	17	9.27	0.855	22.1	14	47	30	17
1.254	18	33	50	1.599	0.900	20	27	52	8.83	0.705	23.6	14	13	30	17	9.50	0.853	19.1	18	39	40	20
1.254	20	29	50	1.600	0.900	20	31	50	8.71	0.697	1.8	19	31	46	17	8.91	0.840	24.3	14	23	24	20
1.251	20	49	32	1.604	0.898	19	33	30	8.65	0.692	1.8	19	45	30	17	8.73	0.831	25.3	16	9	32	5
1.248	18	49	28	1.606	0.897	20	51	34	8.53	0.687	24.5	15	31	36	18	8.63	0.830	26.4	16	31	10	5
1.227	21	29	54	1.606	0.897	19	31	28	8.53	0.686	24.5	15	25	30	18	8.93	0.821	21.7	15	31	26	18
1.223	21	53	32	1.606	0.897	20	49	32	8.72	0.681	21.2	18	39	40	20	9.03	0.820	20.4	15	35	32	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.6 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,000.2 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    12934.6
Exposure: MWd/MTU (GWd)          1300.0 ( 177.05 )
Delta E: MWd/MTU, (GWd)           299.8 (  40.83 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.148   2.187     4  0.854 0.928  27 28
Inlet Subcooling: Btu/lbm         -26.72                       24  0.477   6.641     5  0.562 0.648   1 36
Flow: Mlb/hr                     103.28 (100.77 %)            23  0.690   9.356     6  0.541 0.565  53 50
                                                              22  0.877  11.554     9  0.472 0.574  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  1.026  13.164    10  0.576 0.598  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.133  14.239    11  0.629 0.633  29  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.193  14.813    14  1.051 1.194  27 54
 5        -- -- -- -- -- -- -- -- -- -- --        51          18  1.197  14.917    15  1.034 1.206  15 46
 7     -- -- -- -- 12 -- 22 -- 12 -- -- -- --     47          17  1.186  14.817    16  1.063 1.252   9 32
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43          16  1.148  13.634    17  0.986 1.208  17 48
11 -- -- -- 12 -- 12 -- 18 -- 12 -- 12 -- -- -- 39          15  1.112  13.556    18  1.018 1.252  33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.127  13.459    19  1.089 1.204  17 46
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- -- 31          13  1.108  13.794    20  1.152 1.263  27 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.114  14.223    21  1.081 1.227  29 54
19 -- -- -- 12 -- 12 -- 18 -- 12 -- 12 -- -- -- 23          11  1.133  14.631
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.157  14.955
23    -- -- -- -- 12 -- 22 -- 12 -- -- -- --    15           9  1.175  15.032
25       -- -- -- -- -- -- -- -- -- -- --       11           8  1.208  15.466
27          -- -- -- -- -- -- -- -- --           7           7  1.241  16.058
29             -- -- -- -- -- -- --              3           6  1.260* 16.607
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.248  16.767*
                                                            4  1.177  15.937
Control Rod Density: %              7.39                    3  0.998  13.374
                                                            2  0.687   9.070
k-effective:                    1.00224                Bottom  1  0.180   2.507
Void Fraction:                    0.449
Core Delta-P: psia               24.639              % AXIAL TILT  -5.288  -6.891
Core Plate Delta-P: psia         20.097          AVG BOT 8ft/12ft  1.0304  1.0292
Coolant Temp: Deg-F              548.1
In Channel Flow: Mlb/hr          87.38   Active Channel Flow: Mlb/hr        87.38
Total Bypass Flow (%):            15.4   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.263	20	27	52	1.565	0.920	21	33	26	8.93	0.714	2.5	19	31	38	18	9.27	0.857	22.3	14	29	48	17
1.259	20	51	34	1.567	0.919	21	35	34	8.92	0.714	2.5	19	37	30	18	9.16	0.851	22.7	14	47	30	17
1.254	20	29	50	1.579	0.912	19	33	44	8.86	0.708	23.7	14	31	48	17	11.38	0.849	3.3	19	29	38	18
1.252	16	9	32	1.580	0.912	20	27	52	8.62	0.706	26.4	14	37	38	20	9.41	0.849	19.8	18	39	40	20
1.252	16	29	52	1.582	0.910	19	43	34	8.77	0.704	24.2	14	13	30	17	11.37	0.848	3.3	19	37	30	18
1.252	18	33	50	1.583	0.910	20	31	50	8.67	0.694	2.4	19	31	46	17	8.81	0.836	25.0	14	23	24	20
1.251	20	49	32	1.587	0.907	20	51	34	8.61	0.689	2.3	19	45	30	17	8.63	0.827	25.9	16	9	32	5
1.246	18	49	28	1.590	0.906	20	49	32	8.44	0.683	25.1	15	31	26	18	8.54	0.826	26.9	16	31	10	5
1.227	21	29	54	1.594	0.903	19	33	48	8.43	0.682	25.0	15	25	30	18	8.82	0.816	22.3	15	31	26	18
1.225	20	25	50	1.597	0.902	19	33	30	8.68	0.681	21.7	18	39	40	20	8.92	0.814	21.0	15	35	32	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.7 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,300.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          1300.2 ( 177.08 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -25.88
Flow: Mlb/hr                     106.37 (103.77 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --                59  :JR
 3           -- -- -- -- -- -- -- -- -- --          55
 5        -- -- -- -- -- -- -- -- -- -- -- --       51
 7     -- -- -- -- 12 -- 22 -- 12 -- -- -- --       47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --     43
11 -- -- -- 12 -- 10 -- 18 -- 10 -- 12 -- -- --    39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    35
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- --    31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    27
19 -- -- -- 12 -- 10 -- 18 -- 10 -- 12 -- -- --    23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    19
23    -- -- -- -- 12 -- 22 -- 12 -- -- -- --       15
25       -- -- -- -- -- -- -- -- -- -- --          11
27          -- -- -- -- -- -- -- -- --              7
29             -- -- -- -- -- -- --                 3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.48

k-effective:                     1.00225
Void Fraction:                     0.446
Core Delta-P: psia                25.780
Core Plate Delta-P: psia          21.237
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr            90.05
Total Bypass Flow (%):             15.3
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00007
```

Core Average Exposure: MWd/MTU 12934.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.147	2.187	4	0.845	0.920	27	28
24	0.475	6.641	5	0.565	0.651	1	36
23	0.686	9.356	6	0.543	0.568	53	50
22	0.871	11.554	9	0.475	0.577	23	60
21	1.016	13.164	10	0.579	0.601	33	60
20	1.118	14.239	11	0.632	0.636	29	2
19	1.168	14.813	14	1.051	1.202	27	54
18	1.181	14.918	15	1.029	1.210	15	46
17	1.177	14.817	16	1.067	1.260	9	32
16	1.143	13.634	17	0.992	1.212	17	48
15	1.111	13.556	18	1.020	1.257	33	50
14	1.129	13.459	19	1.084	1.207	17	46
13	1.114	13.794	20	1.157	1.270	27	52
12	1.121	14.223	21	1.085	1.235	29	54
11	1.142	14.631					
10	1.167	14.955					
9	1.186	15.033					
8	1.218	15.467					
7	1.251	16.059					
6	1.269*	16.607					
5	1.256	16.767*					
4	1.183	15.937					
3	1.002	13.374					
2	0.689	9.070					
Bottom 1	0.181	2.507					
% AXIAL TILT	-6.030	-6.891					
AVG BOT 8ft/12ft	1.0357	1.0292					

Active Channel Flow: Mlb/hr 90.05
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.270	20	27	52	1.594	0.903	20	27	52	8.84	0.706	23.7	14	31	48	17	9.24	0.854	22.3	14	29	48	17
1.266	20	51	34	1.599	0.901	20	31	50	8.75	0.701	24.2	14	13	30	17	9.13	0.847	22.7	14	47	30	17
1.260	16	9	32	1.602	0.899	20	51	34	8.70	0.696	2.5	19	29	24	18	8.70	0.834	25.9	16	9	32	5
1.259	16	29	52	1.607	0.896	20	49	32	8.69	0.695	2.5	19	37	30	18	8.60	0.833	26.9	16	31	10	5
1.259	20	29	50	1.613	0.893	21	33	26	8.62	0.689	2.4	19	31	46	17	11.11	0.829	3.3	19	29	38	18
1.257	18	33	50	1.614	0.892	19	33	44	8.55	0.684	2.3	19	45	30	17	11.09	0.828	3.3	19	37	30	18
1.256	20	49	32	1.614	0.892	21	35	34	8.24	0.666	25.1	15	31	26	18	8.48	0.818	26.6	16	25	10	5
1.251	18	49	28	1.616	0.891	19	33	48	8.20	0.665	25.5	15	31	44	18	10.90	0.813	3.3	21	31	8	5
1.235	21	29	54	1.616	0.891	19	43	34	8.23	0.665	25.0	15	25	30	18	10.86	0.810	3.2	21	7	32	5
1.231	21	53	32	1.623	0.887	19	47	34	8.10	0.661	26.1	15	43	32	18	8.28	0.809	27.8	16	9	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.8 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,300.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        1500.0 ( 204.29 )
Delta E: MWd/MTU, (GWd)         199.8 (  27.21 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.35
Flow: Mlb/hr                   104.61 (102.05 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- 12 -- 22 -- 12 -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- 12 -- 10 -- 18 -- 10 -- 12 -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- -- 12 -- 10 -- 18 -- 10 -- 12 -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- 12 -- 22 -- 12 -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.48

k-effective:                     1.00214
Void Fraction:                     0.448
Core Delta-P: psia                25.150
Core Plate Delta-P: psia          20.608
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr            88.51
Total Bypass Flow (%):              15.4
Total Water Rod Flow (%):           -0.0
Source Convergence              0.00008

Core Average Exposure: MWd/MTU    13134.6

                    Axial Profile      Edit   Radial Power
          N(PRA)  Power  Exposure     Zone   Avg.   Max.   IR JR
Top 25    0.148    2.222                4  0.843  0.917  27 28
    24    0.476    6.743                5  0.564  0.650   1 36
    23    0.688    9.503                6  0.542  0.567  53 50
    22    0.871   11.741                9  0.474  0.576  23 60
    21    1.015   13.384               10  0.577  0.600  33 60
    20    1.115   14.480               11  0.630  0.634  29  2
    19    1.164   15.065               14  1.051  1.201  27 54
    18    1.177   15.172               15  1.028  1.210  15 46
    17    1.173   15.071               16  1.067  1.258  29 52
    16    1.141   13.871               17  0.990  1.212  17 48
    15    1.111   13.786               18  1.019  1.256  33 50
    14    1.130   13.672               19  1.085  1.208  17 46
    13    1.115   14.004               20  1.158  1.271  27 52
    12    1.124   14.435               21  1.086  1.236  29 54
    11    1.144   14.847
    10    1.169   15.175
     9    1.188   15.257
     8    1.219   15.697
     7    1.250   16.295
     6   1.267*   16.847
     5    1.254  17.005*
     4    1.182   16.161
     3    1.004   13.564
     2    0.692    9.200
Bottom    0.182    2.542
% AXIAL TILT     -6.131   -6.787
AVG BOT 8ft/12ft  1.0365  1.0287

Active Channel Flow: Mlb/hr        88.51
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR							LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.271	20	27	52	1.584	0.909	20	27	52	8.80	0.705	24.1	14	31	48	17	9.17	0.852	22.8	14	29	48	17
1.266	20	51	34	1.590	0.906	20	31	50	8.70	0.700	24.5	14	13	30	17	9.05	0.844	23.1	14	13	30	17
1.260	20	29	50	1.592	0.905	20	9	34	8.66	0.693	2.9	19	29	24	18	8.64	0.832	26.3	16	9	32	5
1.258	16	29	52	1.598	0.901	20	49	32	8.65	0.692	2.9	19	37	30	18	8.55	0.831	27.3	16	31	10	5
1.258	16	9	32	1.607	0.896	19	33	48	8.59	0.687	2.7	19	31	46	17	11.02	0.822	3.8	19	29	38	18
1.256	18	33	50	1.609	0.895	21	33	26	8.52	0.682	2.7	19	45	30	17	11.00	0.821	3.8	19	37	30	18
1.256	20	49	32	1.609	0.895	19	33	44	8.19	0.664	25.4	15	31	26	18	8.44	0.817	27.0	16	25	10	5
1.250	18	49	28	1.611	0.894	21	35	34	8.15	0.663	25.8	15	29	44	17	10.85	0.810	3.7	21	31	8	5
1.236	21	29	54	1.612	0.893	19	43	34	8.18	0.663	25.4	15	25	30	18	8.24	0.807	28.2	16	9	26	5
1.231	21	7	32	1.616	0.891	19	47	34	8.10	0.659	25.7	15	43	32	17	10.81	0.806	3.7	21	7	32	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.9 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,500.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    13234.6
Exposure: MWd/MTU (GWd)          1600.0 ( 217.91 )
Delta E: MWd/MTU, (GWd)           100.0 (  13.62 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                     Top 25  0.149   2.239     4  0.842 0.916 27 28
Inlet Subcooling: Btu/lbm         -26.60                        24  0.477   6.795     5  0.563 0.650  1 36
Flow: Mlb/hr                     103.68 (101.15 %)             23  0.688   9.577     6  0.542 0.566 53 50
                                                               22  0.871  11.835     9  0.473 0.575 23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29               21  1.014  13.493    10  0.577 0.599 33 60
 1              -- -- -- -- -- -- --              59  :JR     20  1.113  14.600    11  0.629 0.633 29  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.163  15.191    14  1.051 1.201 27 54
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  1.176  15.299    15  1.027 1.210 15 46
 7     -- -- -- -- 12 -- 22 -- 12 -- -- -- --     47          17  1.172  15.198    16  1.067 1.257 29 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.141  13.989    17  0.990 1.212 17 48
11 -- -- -- 12 -- 10 -- 18 -- 10 -- 12 -- -- -- 39          15  1.111  13.901    18  1.019 1.256 33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.131  13.779    19  1.086 1.209 17 46
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- -- 31          13  1.116  14.109    20  1.158 1.271 27 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.124  14.541    21  1.087 1.236 29 54
19 -- -- -- 12 -- 10 -- 18 -- 10 -- 12 -- -- -- 23          11  1.145  14.955
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.170  15.286
23    -- -- -- -- 12 -- 22 -- 12 -- -- -- --    15           9  1.188  15.369
25       -- -- -- -- -- -- -- -- -- -- -- --     11           8  1.219  15.812
27          -- -- -- -- -- -- -- -- --           7           7  1.250  16.413
29             -- -- -- -- -- -- -- --           3           6  1.266* 16.967
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.253  17.123*
                                                             4  1.182  16.273
Control Rod Density: %              7.48                     3  1.005  13.659
                                                             2  0.693   9.266
k-effective:                    1.00206                Bottom  1  0.182   2.559
Void Fraction:                    0.450
Core Delta-P: psia               24.822              % AXIAL TILT  -6.172  -6.737
Core Plate Delta-P: psia         20.280          AVG BOT 8ft/12ft  1.0368  1.0285
Coolant Temp: Deg-F              548.1
In Channel Flow: Mlb/hr          87.70   Active Channel Flow: Mlb/hr        87.70
Total Bypass Flow (%):            15.4   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.271	20	27	52	1.578	0.913	20	27	52	8.78	0.705	24.3	14	31	48	17	9.14	0.850	23.0	14	29	48	17
1.266	20	9	34	1.585	0.909	20	31	50	8.68	0.700	24.7	14	13	30	17	9.02	0.842	23.3	14	13	30	17
1.260	20	29	50	1.586	0.908	20	51	34	8.65	0.692	3.1	19	29	24	18	8.62	0.831	26.5	16	9	32	5
1.257	16	29	52	1.594	0.904	20	49	32	8.64	0.691	3.1	19	37	30	18	8.52	0.830	27.5	16	31	10	5
1.257	16	9	32	1.603	0.898	19	33	48	8.58	0.686	2.9	19	31	46	17	10.98	0.819	4.1	19	29	38	18
1.256	20	49	32	1.606	0.897	19	33	44	8.51	0.681	2.9	19	45	30	17	10.96	0.818	4.1	19	37	30	18
1.256	18	33	50	1.606	0.897	21	33	26	8.16	0.663	25.6	15	31	26	18	8.42	0.817	27.2	16	25	10	5
1.249	18	49	28	1.608	0.896	19	43	34	8.13	0.663	26.0	15	29	44	17	10.82	0.807	4.0	21	31	8	5
1.236	21	29	54	1.608	0.895	21	35	34	8.15	0.662	25.6	15	25	30	18	8.21	0.807	28.4	16	9	26	5
1.231	20	25	50	1.612	0.893	19	47	34	8.08	0.658	25.9	15	43	30	17	10.78	0.804	4.0	21	7	32	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.10 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,600.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    13284.8
Exposure: MWd/MTU (GWd)          1650.2 ( 224.74 )
Delta E: MWd/MTU, (GWd)            50.2 (   6.84 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.148   2.248     4  0.852 0.930  27 28
Inlet Subcooling: Btu/lbm         -25.96                       24  0.475   6.820     5  0.562 0.649   1 36
Flow: Mlb/hr                     106.05 (103.46 %)            23  0.686   9.615     6  0.541 0.565  53 50
                                                              22  0.866  11.883     9  0.472 0.574  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  1.006  13.548    10  0.576 0.598  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.099  14.661    11  0.628 0.633  29  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.142  15.254    14  1.050 1.201  27 54
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  1.161  15.363    15  1.032 1.206  15 46
 7     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     47          17  1.163  15.261    16  1.058 1.257  29 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.136  14.048    17  0.989 1.205  17 48
11 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- --  39          15  1.109  13.959    18  1.019 1.253  33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35          14  1.132  13.832    19  1.087 1.203  17 46
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- --  31          13  1.121  14.162    20  1.156 1.270  27 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27          12  1.131  14.594    21  1.087 1.237  29 54
19 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- --  23          11  1.153  15.009
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19          10  1.179  15.341
23    -- -- -- -- 10 -- 22 -- 10 -- -- -- --     15           9  1.197  15.425
25       -- -- -- -- -- -- -- -- -- -- -- --     11           8  1.228  15.870
27          -- -- -- -- -- -- -- -- --           7           7  1.258  16.472
29             -- -- -- -- -- -- --              3           6  1.274* 17.027
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.259  17.183*
                                                            4  1.187  16.329
Control Rod Density: %             7.57                     3  1.009  13.706
                                                            2  0.696   9.299
k-effective:                    1.00205                Bottom  1  0.183   2.568
Void Fraction:                    0.447
Core Delta-P: psia               25.695              % AXIAL TILT  -6.838  -6.712
Core Plate Delta-P: psia         21.152          AVG BOT 8ft/12ft  1.0414  1.0284
Coolant Temp: Deg-F              548.2
In Channel Flow: Mlb/hr           89.76   Active Channel Flow: Mlb/hr        89.76
Total Bypass Flow (%):            15.4   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.270	20	27	52	1.582	0.910	21	33	26	8.86	0.709	3.2	19	29	24	18	9.05	0.843	23.1	14	29	48	17
1.265	20	9	34	1.585	0.909	21	35	34	8.85	0.708	3.2	19	37	30	18	11.21	0.837	4.2	19	29	38	18
1.259	20	29	50	1.601	0.899	20	27	52	8.69	0.698	24.4	14	31	48	17	8.66	0.836	26.6	16	9	32	5
1.257	16	29	52	1.608	0.896	20	31	50	8.45	0.696	27.0	14	37	38	20	8.57	0.836	27.6	16	31	10	5
1.257	16	9	32	1.610	0.894	20	51	34	8.59	0.693	24.8	14	13	30	17	11.19	0.835	4.2	19	37	30	18
1.255	20	49	32	1.610	0.894	19	33	30	8.53	0.682	3.0	19	31	46	17	8.93	0.835	23.5	14	13	30	17
1.253	18	33	50	1.612	0.894	19	33	44	8.38	0.681	25.7	15	31	26	18	9.14	0.830	20.4	18	39	40	20
1.246	18	49	28	1.612	0.893	19	31	28	8.37	0.680	25.6	15	25	30	18	9.04	0.825	20.9	14	23	24	20
1.237	21	29	54	1.615	0.892	19	43	34	8.46	0.677	3.0	19	45	30	17	8.47	0.822	27.3	16	25	10	5
1.232	21	7	32	1.617	0.891	20	49	32	8.14	0.670	26.9	15	31	32	18	8.75	0.814	23.0	15	31	26	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.11 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,650.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    13434.6
Exposure: MWd/MTU (GWd)        1800.0 ( 245.14 )
Delta E: MWd/MTU, (GWd)         149.8 (  20.40 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.149   2.274     4  0.850 0.928  27 28
Inlet Subcooling: Btu/lbm       -26.31                      24  0.477   6.897     5  0.561 0.648   1 36
Flow: Mlb/hr                   104.74 (102.18 %)            23  0.687   9.725     6  0.540 0.564  53 50
                                                            22  0.866  12.023     9  0.471 0.573  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  1.004  13.711    10  0.575 0.597  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  1.097  14.838    11  0.627 0.631  29 60
 3           -- -- -- -- -- -- -- -- --           55         19  1.139  15.438    14  1.050 1.201  27 54
 5        -- -- -- -- -- -- -- -- -- -- --        51         18  1.158  15.551    15  1.032 1.206  15 46
 7     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     47         17  1.160  15.449    16  1.058 1.256  29 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43         16  1.135  14.224    17  0.988 1.205  17 48
11 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- --  39         15  1.109  14.131    18  1.018 1.252  33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35         14  1.133  13.993    19  1.087 1.205  17 46
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- --  31         13  1.122  14.320    20  1.156 1.271  27 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27         12  1.133  14.754    21  1.088 1.237  29 54
19 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- --  23         11  1.155  15.172
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19         10  1.181  15.508
23    -- -- -- -- 10 -- 22 -- 10 -- -- -- --     15          9  1.199  15.595
25       -- -- -- -- -- -- -- -- -- -- --        11          8  1.229  16.044
27          -- -- -- -- -- -- -- -- --            7          7  1.258  16.651
29             -- -- -- -- -- -- --               3          6  1.273* 17.208
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.258  17.361*
                                                             4  1.187  16.497
Control Rod Density: %          7.57                         3  1.010  13.849
                                                             2  0.698   9.397
k-effective:                 1.00195                  Bottom  1  0.184   2.594
Void Fraction:                 0.449
Core Delta-P: psia            25.220              % AXIAL TILT  -6.910  -6.647
Core Plate Delta-P: psia      20.678          AVG BOT 8ft/12ft  1.0420  1.0281
Coolant Temp: Deg-F           548.2
In Channel Flow: Mlb/hr        88.61   Active Channel Flow: Mlb/hr       88.61
Total Bypass Flow (%):          15.4   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.271	20	27	52	1.579	0.912	21	33	26	8.84	0.707	3.5	19	29	24	18	9.00	0.841	23.4	14	29	48	17
1.266	20	9	34	1.582	0.910	21	35	34	8.83	0.706	3.5	19	37	30	18	8.62	0.835	26.9	16	9	32	5
1.260	20	29	50	1.593	0.904	20	27	52	8.66	0.698	24.7	14	31	48	17	8.53	0.834	27.9	16	31	10	5
1.256	16	29	52	1.600	0.900	20	31	50	8.42	0.695	27.3	14	37	38	20	8.88	0.833	23.8	14	13	30	17
1.255	20	49	32	1.602	0.899	20	9	34	8.56	0.692	25.1	14	13	30	17	11.14	0.832	4.6	19	29	38	18
1.255	16	9	32	1.607	0.896	19	33	30	8.51	0.681	3.3	19	31	46	17	11.12	0.830	4.6	19	37	30	18
1.252	18	33	50	1.608	0.896	19	33	44	8.34	0.680	26.0	15	31	26	18	9.10	0.829	20.8	18	39	40	20
1.245	18	49	28	1.609	0.895	19	31	28	8.43	0.679	24.6	15	35	32	18	9.02	0.825	21.3	14	23	24	20
1.237	21	29	54	1.610	0.894	20	49	32	8.44	0.675	3.3	19	45	30	17	8.43	0.821	27.5	16	25	10	5
1.232	21	7	32	1.611	0.894	19	43	34	8.10	0.668	27.2	15	31	32	18	8.70	0.812	23.3	15	31	26	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.12 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 1,800.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       2000.0 ( 272.38 )
Delta E: MWd/MTU, (GWd)        200.0 (  27.24 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -26.62
Flow: Mlb/hr                  103.61 (101.08 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- 10 -- 22 -- 10 -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.57

k-effective:                     1.00188
Void Fraction:                     0.451
Core Delta-P: psia                24.820
Core Plate Delta-P: psia          20.278
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr            87.62
Total Bypass Flow (%):             15.4
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00005
```

Core Average Exposure: MWd/MTU 13634.6

	Axial Profile		Edit	Radial Power			
	N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR JR
Top	25	0.150	2.310	4	0.849	0.926	27 28
	24	0.480	6.999	5	0.560	0.647	1 36
	23	0.690	9.873	6	0.539	0.563	53 50
	22	0.868	12.210	9	0.470	0.572	23 60
	21	1.006	13.927	10	0.573	0.595	33 60
	20	1.097	15.075	11	0.625	0.629	29 60
	19	1.138	15.684	14	1.050	1.200	27 54
	18	1.157	15.801	15	1.030	1.205	15 46
	17	1.159	15.700	16	1.058	1.255	29 52
	16	1.134	14.459	17	0.987	1.205	17 48
	15	1.109	14.361	18	1.018	1.251	33 50
	14	1.134	14.206	19	1.089	1.206	17 46
	13	1.124	14.532	20	1.157	1.272	27 52
	12	1.134	14.968	21	1.089	1.238	29 54
	11	1.156	15.390				
	10	1.182	15.731				
	9	1.199	15.822				
	8	1.228	16.276				
	7	1.255	16.889				
	6	1.269*	17.448				
	5	1.254	17.599*				
	4	1.184	16.722				
	3	1.010	14.040				
	2	0.700	9.530				
Bottom	1	0.185	2.629				
	% AXIAL TILT		-6.843	-6.563			
	AVG BOT 8ft/12ft		1.0416	1.0277			

Active Channel Flow: Mlb/hr 87.62
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.272	20	27	52	1.578	0.913	21	33	26	8.82	0.705	3.9	19	29	24	18	8.95	0.840	23.8	14	29	48	17
1.266	20	9	34	1.580	0.911	21	35	34	8.80	0.704	3.9	19	37	30	18	8.55	0.831	27.3	16	9	32	5
1.261	20	29	50	1.584	0.909	20	27	52	8.64	0.698	25.0	14	31	48	17	8.83	0.831	24.2	14	13	30	17
1.256	20	49	32	1.594	0.903	20	31	50	8.39	0.695	27.6	14	37	38	20	8.46	0.831	28.3	16	31	10	5
1.255	16	29	52	1.594	0.903	20	9	34	8.53	0.692	25.5	14	13	30	17	9.07	0.829	21.2	18	39	40	20
1.254	16	9	32	1.604	0.898	19	33	44	8.50	0.680	3.7	19	31	46	17	9.00	0.827	21.7	14	23	24	20
1.251	18	33	50	1.604	0.898	20	49	32	8.30	0.678	26.3	15	31	26	18	11.07	0.826	5.1	19	29	38	18
1.244	18	49	28	1.606	0.897	19	43	34	8.38	0.677	25.0	15	35	32	18	11.05	0.825	5.1	19	37	30	18
1.238	21	29	54	1.606	0.897	19	33	30	8.42	0.674	3.7	19	45	30	17	8.37	0.819	27.9	16	25	10	5
1.233	21	7	32	1.608	0.896	19	31	28	8.41	0.667	22.9	18	39	40	20	8.65	0.810	23.7	15	31	26	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.13 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 2,000.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          2150.0 ( 292.81 )
Delta E: MWd/MTU, (GWd)           150.0 (  20.43 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm        -26.92
Flow: Mlb/hr                     102.55 (100.05 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43
11 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- -- -- 10 -- 12 -- 18 -- 12 -- 10 -- -- -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- -- -- 10 -- 22 -- 10 -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.57

k-effective:                     1.00179
Void Fraction:                     0.452
Core Delta-P: psia                24.443
Core Plate Delta-P: psia          19.901
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr           86.70   Active Channel Flow: Mlb/hr        86.70
Total Bypass Flow (%):             15.5   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence               0.00005
```

```
Core Average Exposure: MWd/MTU    13784.7

                 Axial Profile    Edit   Radial Power
          N(PRA) Power Exposure   Zone   Avg.   Max.   IR JR
Top 25    0.151   2.336           4   0.848 0.924  27 28
    24    0.482   7.077           5   0.559 0.646   1 36
    23    0.692   9.984           6   0.538 0.563  53 50
    22    0.869  12.350           9   0.470 0.572  23 60
    21    1.005  14.090          10   0.572 0.594  33 60
    20    1.096  15.253          11   0.623 0.628  29 60
    19    1.136  15.868          14   1.049 1.200  27 54
    18    1.155  15.988          15   1.029 1.205  15 46
    17    1.157  15.887          16   1.057 1.254  29 52
    16    1.133  14.636          17   0.986 1.205  17 48
    15    1.109  14.533          18   1.018 1.251  33 50
    14    1.135  14.367          19   1.089 1.208  17 46
    13    1.125  14.691          20   1.158 1.272  27 52
    12    1.136  15.128          21   1.090 1.239  29 54
    11    1.158  15.554
    10    1.183  15.898
     9    1.200  15.992
     8    1.227  16.451
     7    1.254  17.067
     6    1.266* 17.628
     5    1.251  17.777*
     4    1.182  16.889
     3    1.010  14.184
     2    0.702   9.629
Bottom    1    0.186   2.656

% AXIAL TILT          -6.852  -6.501
AVG BOT 8ft/12ft      1.0418  1.0274
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.272	20	27	52	1.576	0.914	21	33	26	8.79	0.704	4.1	19	29	24	18	8.90	0.838	24.1	14	29	48	17
1.266	20	9	34	1.577	0.913	20	27	52	8.78	0.702	4.1	19	37	30	18	8.78	0.829	24.5	14	13	30	17
1.261	20	29	50	1.579	0.912	21	35	34	8.61	0.698	25.3	14	31	48	17	8.51	0.829	27.6	16	9	32	5
1.256	20	49	32	1.587	0.907	20	9	34	8.36	0.694	27.9	14	37	38	20	8.42	0.829	28.6	16	31	10	5
1.254	16	29	52	1.588	0.907	20	31	50	8.50	0.691	25.7	14	13	30	17	9.03	0.828	21.5	18	39	40	20
1.252	16	9	32	1.599	0.900	20	49	32	8.49	0.679	4.0	19	31	46	17	8.97	0.826	22.0	14	23	24	20
1.251	18	33	50	1.601	0.899	19	33	44	8.26	0.677	26.6	15	31	26	18	11.01	0.822	5.4	19	29	38	18
1.242	18	49	28	1.601	0.899	19	43	34	8.34	0.676	25.3	15	35	30	18	10.99	0.820	5.4	19	37	30	18
1.239	21	29	54	1.604	0.898	19	33	30	8.40	0.672	3.9	19	45	30	17	8.33	0.817	28.2	16	25	10	5
1.233	21	7	32	1.606	0.897	19	31	28	8.40	0.667	23.2	18	39	40	20	8.60	0.808	24.0	15	31	26	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.14 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 2,150.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    13784.9
Exposure: MWd/MTU (GWd)        2150.2 ( 292.84 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.150   2.336    4  0.838 0.915  27 28
Inlet Subcooling: Btu/lbm       -26.08                        24  0.479   7.077    5  0.562 0.649   1 36
Flow: Mlb/hr                   105.60 (103.03 %)             23  0.688   9.984    6  0.541 0.565  53 50
                                                             22  0.863  12.350    9  0.472 0.575  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.995  14.090   10  0.575 0.598  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.080  15.253   11  0.627 0.631  29 60
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.113  15.869   14  1.050 1.207  27 54
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  1.139  15.988   15  1.024 1.209  15 46
 7     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     47          17  1.148  15.888   16  1.061 1.261  29 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.129  14.636   17  0.992 1.209  17 48
11 -- -- -- 10 -- 10 -- 18 -- 10 -- 10 -- -- -- 39          15  1.109  14.534   18  1.020 1.256  33 50
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.138  14.367   19  1.085 1.210  17 46
15 -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- -- 31          13  1.130  14.692   20  1.163 1.279  27 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.143  15.128   21  1.095 1.247  29 54
19 -- -- -- 10 -- 10 -- 18 -- 10 -- 10 -- -- -- 23          11  1.167  15.554
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.193  15.898
23    -- -- -- -- 10 -- 22 -- 10 -- -- -- --     15           9  1.210  15.992
25       -- -- -- -- -- -- -- -- -- -- -- --     11           8  1.237  16.451
27          -- -- -- -- -- -- -- -- --           7           7  1.263  17.067
29             -- -- -- -- -- -- --              3           6  1.275* 17.629
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.258  17.777*
                                                             4  1.188  16.890
Control Rod Density: %            7.66                       3  1.015  14.184
                                                             2  0.705   9.629
k-effective:                   1.00179                Bottom  1  0.187   2.656
Void Fraction:                   0.449
Core Delta-P: psia              25.567            % AXIAL TILT  -7.582  -6.501
Core Plate Delta-P: psia        21.025          AVG BOT 8ft/12ft  1.0470  1.0274
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          89.34   Active Channel Flow: Mlb/hr        89.34
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.279	20	27	52	1.592	0.905	20	27	52	8.59	0.696	25.3	14	31	48	17	8.83	0.836	24.7	14	31	48	17
1.273	20	9	34	1.602	0.899	20	9	34	8.47	0.689	25.7	14	13	30	17	8.57	0.835	27.6	16	9	32	5
1.266	20	29	50	1.605	0.897	20	31	50	8.56	0.685	4.1	19	29	24	18	8.48	0.835	28.6	16	31	10	5
1.261	16	29	52	1.616	0.891	20	49	32	8.55	0.684	4.1	19	37	30	18	8.69	0.827	25.3	14	47	32	17
1.261	20	49	32	1.624	0.886	21	33	26	8.43	0.674	4.0	19	31	46	17	8.40	0.823	28.2	16	25	10	5
1.259	16	9	32	1.627	0.885	21	35	34	8.34	0.668	3.9	19	45	30	17	8.19	0.813	29.4	16	9	26	5
1.256	18	33	50	1.633	0.882	19	33	48	8.27	0.662	3.9	21	29	8	5	10.81	0.807	5.3	21	31	8	5
1.248	18	49	28	1.635	0.881	21	31	8	8.06	0.660	26.6	15	31	26	18	8.20	0.805	28.4	16	29	6	5
1.247	21	29	54	1.636	0.880	19	43	34	8.14	0.660	25.3	15	35	30	18	10.77	0.804	5.3	21	7	32	5
1.241	21	7	32	1.637	0.880	19	33	44	7.85	0.659	29.1	16	51	32	5	8.11	0.802	29.1	16	55	32	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.15 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 2,150.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    14225.9
Exposure: MWd/MTU (GWd)        2591.3 ( 352.91 )
Delta E: MWd/MTU, (GWd)         441.1 (  60.08 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.153   2.414     4  0.835 0.910  27 28
Inlet Subcooling: Btu/lbm       -26.76                      24  0.485   7.304     5  0.560 0.647   1 36
Flow: Mlb/hr                   103.12 (100.61 %)            23  0.694  10.310     6  0.539 0.563  53 50
                                                            22  0.867  12.761     9  0.470 0.572  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.996  14.564    10  0.572 0.594  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  1.078  15.767    11  0.622 0.627  29 60
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.108  16.398    14  1.049 1.206  27 54
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  1.134  16.530    15  1.021 1.209  15 46
 7     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     47         17  1.144  16.434    16  1.061 1.258  29 52
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43         16  1.126  15.152    17  0.989 1.209  17 48
11  -- -- -- 10 -- 10 -- 18 -- 10 -- 10 -- -- -- 39         15  1.109  15.040    18  1.019 1.253  33 50
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.141  14.841    19  1.087 1.214  17 46
15  -- -- -- 22 -- 18 -- -- -- 18 -- 22 -- -- -- 31         13  1.134  15.162    20  1.165 1.281  27 52
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.148  15.604    21  1.098 1.248  29 54
19  -- -- -- 10 -- 10 -- 18 -- 10 -- 10 -- -- -- 23         11  1.171  16.040
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.195  16.395
23     -- -- -- -- 10 -- 22 -- 10 -- -- -- --     15          9  1.211  16.497
25        -- -- -- -- -- -- -- -- -- -- -- --     11          8  1.236  16.967
27           -- -- -- -- -- -- -- -- -- --        7          7  1.258  17.594
29              -- -- -- -- -- -- -- --           3          6  1.267* 18.161
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58               5  1.250  18.302*
                                                              4  1.183  17.385
Control Rod Density: %           7.66                         3  1.015  14.607
                                                              2  0.709   9.923
k-effective:                  1.00151                  Bottom  1  0.189   2.734
Void Fraction:                  0.452
Core Delta-P: psia             24.658              % AXIAL TILT  -7.536  -6.349
Core Plate Delta-P: psia       20.116          AVG BOT 8ft/12ft  1.0469  1.0268
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          87.19   Active Channel Flow: Mlb/hr        87.19
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.281	20	27	52	1.575	0.914	20	27	52	8.51	0.695	26.1	14	31	48	17	8.72	0.833	25.6	14	31	48	17
1.274	20	9	34	1.586	0.908	20	9	34	8.39	0.687	26.5	14	13	30	17	8.43	0.829	28.5	16	9	32	5
1.267	20	29	50	1.592	0.905	20	31	50	8.52	0.682	5.0	19	29	24	18	8.34	0.829	29.5	16	31	10	5
1.261	20	49	32	1.605	0.897	20	49	32	8.50	0.680	5.0	19	37	30	18	8.57	0.823	26.1	14	47	32	17
1.258	16	29	52	1.618	0.890	21	31	8	8.40	0.672	4.8	19	31	46	17	8.28	0.819	29.1	16	25	10	5
1.255	16	9	32	1.621	0.888	19	33	48	8.30	0.664	4.7	19	45	30	17	8.07	0.809	30.3	16	9	26	5
1.253	18	33	50	1.621	0.888	21	33	26	7.96	0.657	27.3	15	31	26	18	8.06	0.799	29.2	16	29	6	5
1.248	21	29	54	1.623	0.887	19	33	44	8.21	0.657	4.7	21	29	8	5	10.67	0.797	6.4	21	31	8	5
1.244	18	11	28	1.625	0.886	21	35	34	8.05	0.657	26.0	15	35	30	18	7.98	0.796	29.9	16	55	32	5
1.242	21	7	32	1.625	0.886	19	43	34	7.73	0.654	29.8	16	51	32	5	10.63	0.793	6.4	21	7	32	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.16 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 2,591.3 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    14226.1
Exposure: MWd/MTU (GWd)          2591.5 ( 352.94 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )                Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.147   2.414     4  0.775 0.812  41 34
Inlet Subcooling: Btu/lbm         -25.82                       24  0.467   7.304     5  0.577 0.647   1 36
Flow: Mlb/hr                     106.59 (103.99 %)            23  0.668  10.311     6  0.548 0.584  53 50
                                                              22  0.830  12.761     9  0.481 0.566  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.948  14.564    10  0.562 0.585  59 34
 1              -- -- -- -- -- -- --              59  :JR    20  1.016  15.767    11  0.604 0.614   1 32
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.046  16.399    14  1.072 1.241  23 50
 5        -- -- -- -- -- 12 -- -- -- -- --        51          18  1.059  16.531    15  0.933 1.288  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- --        47          17  1.050  16.434    16  1.130 1.293  45 42
 9 -- -- -- -- --  8 -- 14 --  8 -- -- -- -- --  43          16  1.033  15.152    17  1.001 1.301  13 44
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39          15  1.033  15.041    18  1.063 1.292  43 44
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35          14  1.087  14.841    19  1.093 1.310  15 44
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31          13  1.115  15.162    20  1.132 1.256  25 50
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27          12  1.154  15.605    21  1.103 1.269  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23          11  1.195  16.040
21 -- -- -- -- --  8 -- 14 --  8 -- -- -- -- --  19          10  1.234  16.395
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15           9  1.258  16.497
25       -- -- -- -- -- -- 12 -- -- -- -- --     11           8  1.291  16.967
27          -- -- -- -- -- -- -- -- -- --        7           7  1.321  17.594
29             -- -- -- -- -- -- --              3           6  1.340* 18.161
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.334  18.302*
                                                            4  1.277  17.386
Control Rod Density: %              7.48                    3  1.108  14.607
                                                            2  0.780   9.923
k-effective:                    1.00153                Bottom  1  0.208   2.734
Void Fraction:                    0.456
Core Delta-P: psia               26.107              % AXIAL TILT -13.037  -6.349
Core Plate Delta-P: psia         21.564          AVG BOT 8ft/12ft  1.0724  1.0268
Coolant Temp: Deg-F              548.3
In Channel Flow: Mlb/hr           90.09   Active Channel Flow: Mlb/hr        90.09
Total Bypass Flow (%):            15.5   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.310	19	15	44	1.583	0.910	19	15	44	8.16	0.690	29.8	16	51	32	5	8.87	0.872	28.5	16	9	32	5
1.301	17	13	44	1.592	0.905	19	13	42	8.08	0.684	30.1	17	47	44	5	8.49	0.851	30.3	16	9	26	5
1.298	19	17	46	1.599	0.901	19	17	46	8.54	0.683	4.7	21	53	32	5	8.95	0.850	25.1	15	15	16	5
1.297	19	13	42	1.603	0.898	21	17	50	8.06	0.683	30.0	17	17	48	5	8.43	0.840	29.7	18	41	50	5
1.295	17	17	48	1.604	0.898	21	49	18	8.51	0.681	4.7	20	51	34	5	8.44	0.839	29.6	18	49	42	5
1.293	16	45	42	1.608	0.896	19	19	48	7.96	0.680	30.9	18	19	50	5	11.15	0.832	6.4	21	7	32	5
1.292	18	43	44	1.630	0.883	19	43	42	7.95	0.678	30.8	18	49	42	5	8.31	0.830	29.9	16	55	32	5
1.288	15	15	46	1.633	0.882	19	45	40	8.42	0.674	4.3	21	17	50	5	8.85	0.828	23.6	16	15	42	5
1.284	19	19	48	1.650	0.873	19	23	48	8.16	0.673	27.2	15	15	46	5	8.60	0.825	26.0	16	47	40	5
1.270	19	43	42	1.651	0.872	19	13	46	7.80	0.669	31.2	16	51	36	5	11.04	0.824	5.8	21	17	50	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.17 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 2,591.5 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        3000.0 ( 408.57 )
Delta E: MWd/MTU, (GWd)         408.5 (  55.63 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -26.35
Flow: Mlb/hr                   104.61 (102.05 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 12 -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- -- --  8 -- 14 --  8 -- -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- -- --  8 -- 14 --  8 -- -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- --        15
25       -- -- -- -- -- 12 -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.48

k-effective:                   1.00131
Void Fraction:                   0.458
Core Delta-P: psia              25.378
Core Plate Delta-P: psia        20.835
Coolant Temp: Deg-F              548.3
In Channel Flow: Mlb/hr           88.36
Total Bypass Flow (%):            15.5
Total Water Rod Flow (%):         -0.0
Source Convergence             0.00008
```

Core Average Exposure: MWd/MTU 14634.7

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.149	2.485	4	0.774	0.810	41	34
24	0.473	7.509	5	0.574	0.644	1	36
23	0.674	10.604	6	0.546	0.582	53	50
22	0.834	13.127	9	0.479	0.564	23	60
21	0.950	14.982	10	0.559	0.581	59	34
20	1.015	16.215	11	0.600	0.609	1	32
19	1.044	16.860	14	1.071	1.239	23	50
18	1.057	16.998	15	0.932	1.286	15	46
17	1.049	16.897	16	1.128	1.291	45	42
16	1.033	15.589	17	0.998	1.298	13	44
15	1.035	15.478	18	1.061	1.290	43	44
14	1.091	15.260	19	1.095	1.312	15	44
13	1.119	15.592	20	1.134	1.258	25	50
12	1.158	16.049	21	1.105	1.272	17	50
11	1.199	16.501					
10	1.236	16.871					
9	1.259	16.983					
8	1.288	17.466					
7	1.315	18.105					
6	1.330*	18.678					
5	1.324	18.818*					
4	1.269	17.879					
3	1.105	15.036					
2	0.782	10.224					
Bottom 1	0.210	2.816					
% AXIAL TILT	-12.865	-6.371					
AVG BOT 8ft/12ft	1.0717	1.0270					

Active Channel Flow: Mlb/hr 88.36

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.312	19	15	44	1.568	0.918	19	15	44	8.04	0.684	30.5	16	51	32	5	8.72	0.865	29.3	16	9	32	5
1.300	19	17	46	1.576	0.913	19	13	42	7.98	0.681	30.8	17	47	44	5	8.84	0.847	25.9	15	15	16	5
1.299	19	13	42	1.584	0.909	19	17	46	7.97	0.680	30.7	17	17	48	5	8.37	0.845	31.1	16	9	26	5
1.298	17	13	44	1.588	0.907	21	17	50	8.48	0.678	5.5	21	53	32	5	8.33	0.836	30.5	18	41	50	5
1.293	17	17	48	1.589	0.906	21	49	18	7.88	0.678	31.6	18	19	50	5	8.33	0.835	30.4	18	49	42	5
1.291	16	45	42	1.592	0.905	19	19	48	7.86	0.675	31.5	18	49	42	5	8.73	0.824	24.4	16	15	42	5
1.290	18	43	44	1.612	0.893	19	43	42	8.44	0.675	5.4	20	51	34	5	8.18	0.823	30.7	16	55	32	5
1.287	19	19	48	1.617	0.890	19	45	40	8.39	0.671	5.1	21	17	50	5	11.00	0.821	7.4	21	7	32	5
1.286	15	15	46	1.633	0.882	19	23	48	8.07	0.670	27.9	15	15	46	5	8.48	0.820	26.9	16	47	40	5
1.272	21	17	50	1.636	0.880	19	13	46	8.32	0.666	5.0	21	49	44	5	8.21	0.817	29.7	16	25	10	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.18 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 3,000.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        3250.0 ( 442.62 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.68
Flow: Mlb/hr                   103.42 (100.90 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              --  --  --  --  --  --  --              59  :JR
 3           --  --  --  --  --  --  --  --  --  --     55
 5        --  --  --  --  --  12  --  --  --  --  --     51
 7     --  --  --  --  --  --  --  --  --  --  --  --     47
 9  --  --  --  --  --   8  --  14  --   8  --  --  --  --  43
11  --  --  --  --  --  --  --  --  --  --  --  --  --  --  39
13  --  --  --  10  --  14  --  10  --  14  --  10  --  --  35
15  --  --  --  --  --  --  --  --  --  --  --  --  --  --  31
17  --  --  --  10  --  14  --  10  --  14  --  10  --  --  27
19  --  --  --  --  --  --  --  --  --  --  --  --  --  --  23
21  --  --  --  --  --   8  --  14  --   8  --  --  --  --  19
23     --  --  --  --  --  --  --  --  --  --  --  --  --     15
25        --  --  --  --  --  12  --  --  --  --  --        11
27           --  --  --  --  --  --  --  --  --              7
29              --  --  --  --  --  --  --                  3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.48

k-effective:                     1.00110
Void Fraction:                     0.460
Core Delta-P: psia                24.911
Core Plate Delta-P: psia          20.369
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr            87.35
Total Bypass Flow (%):              15.5
Total Water Rod Flow (%):           -0.0
Source Convergence              0.00007
```

Core Average Exposure: MWd/MTU 14884.6

	Axial Profile		Edit	Radial Power			
	N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR JR
Top	25	0.151	2.529	4	0.773	0.809	41 34
	24	0.476	7.636	5	0.573	0.642	1 36
	23	0.677	10.785	6	0.545	0.580	53 50
	22	0.836	13.352	9	0.478	0.563	23 60
	21	0.950	15.239	10	0.558	0.579	59 34
	20	1.014	16.489	11	0.598	0.607	1 32
	19	1.042	17.142	14	1.070	1.238	23 50
	18	1.054	17.283	15	0.931	1.285	15 46
	17	1.046	17.180	16	1.127	1.290	45 42
	16	1.032	15.857	17	0.997	1.297	13 44
	15	1.035	15.746	18	1.061	1.288	43 44
	14	1.092	15.518	19	1.096	1.314	15 44
	13	1.121	15.856	20	1.135	1.260	25 50
	12	1.160	16.323	21	1.107	1.274	17 50
	11	1.201	16.784				
	10	1.237	17.163				
	9	1.259	17.281				
	8	1.287	17.771				
	7	1.312	18.416				
	6	1.327*	18.993				
	5	1.320	19.131*				
	4	1.267	18.179				
	3	1.106	15.297				
	2	0.786	10.409				
Bottom	1	0.212	2.866				

% AXIAL TILT -12.854 -6.381

AVG BOT 8ft/12ft 1.0718 1.0270

Active Channel Flow: Mlb/hr 87.35
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.314	19	15	44	1.559	0.924	19	15	44	7.97	0.681	30.9	16	51	32	5	8.64	0.862	29.8	16	9	32	5
1.302	19	17	46	1.568	0.918	19	13	42	7.94	0.680	31.2	17	47	44	5	8.79	0.846	26.4	15	15	16	5
1.301	19	13	42	1.573	0.916	19	17	46	7.93	0.679	31.2	17	17	48	5	8.31	0.844	31.5	16	9	26	5
1.297	17	13	44	1.579	0.912	21	17	50	7.84	0.677	32.0	18	19	50	5	8.28	0.836	31.0	18	41	50	5
1.292	17	17	48	1.581	0.911	21	49	18	8.45	0.676	6.0	21	53	32	5	8.28	0.835	30.9	18	49	42	5
1.290	16	45	42	1.582	0.910	19	19	48	7.82	0.675	31.9	18	49	42	5	8.67	0.823	24.9	16	15	42	5
1.289	19	19	48	1.602	0.899	19	43	42	8.42	0.673	5.9	20	51	34	5	8.11	0.820	31.2	16	55	32	5
1.288	18	43	44	1.608	0.896	19	45	40	8.38	0.671	5.5	21	17	50	5	8.42	0.818	27.3	16	47	40	5
1.285	15	15	46	1.623	0.887	19	23	48	8.03	0.669	28.3	15	15	46	5	8.17	0.817	30.1	16	25	10	5
1.274	21	17	50	1.627	0.885	19	13	46	8.32	0.666	5.5	21	49	44	5	10.92	0.815	8.0	21	7	32	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.19 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 3,250.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    14984.7
Exposure: MWd/MTU (GWd)          3350.0 ( 456.24 )
Delta E: MWd/MTU, (GWd)           100.0 (  13.62 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                     Top 25  0.151   2.547    4  0.772 0.809  41 34
Inlet Subcooling: Btu/lbm         -26.76                        24  0.478   7.687    5  0.572 0.641   1 36
Flow: Mlb/hr                     103.14 (100.63 %)             23  0.679  10.858    6  0.544 0.580  53 50
                                                               22  0.838  13.443    9  0.478 0.562  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29               21  0.951  15.341   10  0.557 0.578  59 34
 1              -- -- -- -- -- -- --              59  :JR     20  1.014  16.599   11  0.597 0.606   1 32
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.042  17.254   14  1.070 1.238  23 50
 5        -- -- -- -- -- 12 -- -- -- -- --        51          18  1.054  17.396   15  0.930 1.285  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- --        47          17  1.046  17.293   16  1.127 1.289  45 42
 9 -- -- -- -- --  8 -- 14 --  8 -- -- -- -- --  43          16  1.032  15.964   17  0.996 1.296  13 44
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39          15  1.035  15.853   18  1.060 1.288  43 44
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35          14  1.093  15.621   19  1.097 1.315  15 44
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31          13  1.122  15.962   20  1.135 1.260  25 50
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27          12  1.162  16.432   21  1.107 1.275  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23          11  1.202  16.897
21 -- -- -- -- --  8 -- 14 --  8 -- -- -- -- --  19          10  1.237  17.279
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15           9  1.259  17.400
25       -- -- -- -- -- 12 -- -- -- -- --        11           8  1.286  17.892
27          -- -- -- -- -- -- -- -- --            7           7  1.311  18.540
29             -- -- -- -- -- -- --               3           6  1.324* 19.118
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58                5  1.317  19.256*
                                                               4  1.264  18.299
Control Rod Density: %              7.48                       3  1.105  15.402
                                                               2  0.786  10.484
k-effective:                     1.00109                Bottom  1  0.212   2.886
Void Fraction:                     0.460
Core Delta-P: psia                24.837          % AXIAL TILT -12.785  -6.385
Core Plate Delta-P: psia          20.294       AVG BOT 8ft/12ft  1.0714  1.0271
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr           87.10   Active Channel Flow: Mlb/hr       87.10
Total Bypass Flow (%):             15.6   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence              0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.315	19	15	44	1.556	0.926	19	15	44	7.95	0.680	31.1	16	51	32	5	8.61	0.860	30.0	16	9	32	5
1.303	19	17	46	1.565	0.920	19	13	42	7.92	0.680	31.4	17	47	44	5	8.76	0.846	26.6	15	15	16	5
1.302	19	13	42	1.569	0.918	19	17	46	7.91	0.679	31.3	17	17	48	5	8.28	0.843	31.7	16	9	26	5
1.296	17	13	44	1.577	0.913	21	17	50	7.83	0.677	32.2	18	19	50	5	8.26	0.835	31.2	18	41	50	5
1.291	17	17	48	1.578	0.912	19	19	48	8.44	0.675	6.1	21	53	32	5	8.26	0.834	31.1	18	49	42	5
1.290	19	19	48	1.578	0.912	21	49	18	7.80	0.675	32.1	18	49	42	5	8.65	0.822	25.1	16	15	42	5
1.289	16	45	42	1.599	0.901	19	43	42	8.40	0.672	6.1	20	51	34	5	8.07	0.818	31.4	16	55	32	5
1.288	18	43	44	1.605	0.897	19	45	40	8.38	0.670	5.7	21	17	50	5	8.39	0.817	27.5	16	47	40	5
1.285	15	15	46	1.620	0.889	19	23	48	8.01	0.669	28.5	15	15	46	5	8.14	0.816	30.3	16	25	10	5
1.275	21	17	50	1.624	0.887	19	13	46	8.32	0.665	5.6	21	49	44	5	8.11	0.813	30.3	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.20 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 3,350.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    14984.9
Exposure: MWd/MTU (GWd)          3350.2 ( 456.27 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.148   2.547     4  0.757 0.805  41 34
Inlet Subcooling: Btu/lbm         -25.83                      24  0.468   7.687     5  0.576 0.646   1 36
Flow: Mlb/hr                     106.56 (103.96 %)           23  0.664  10.858     6  0.548 0.583  53 50
                                                             22  0.817  13.443     9  0.481 0.567  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.923  15.341    10  0.562 0.582  59 34
 1              -- -- -- -- -- -- --              59  :JR   20  0.991  16.599    11  0.602 0.610   1 32
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.021  17.254    14  1.073 1.241  23 50
 5        -- -- -- -- -- 14 -- -- -- -- --        51         18  1.041  17.397    15  0.920 1.290  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  1.040  17.293    16  1.134 1.293  45 42
 9 -- -- -- -- --  6 -- 10 --  6 -- -- -- -- --  43         16  1.031  15.964    17  1.004 1.303  13 44
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  1.038  15.853    18  1.065 1.287  43 44
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35         14  1.100  15.621    19  1.090 1.319  15 44
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.132  15.962    20  1.145 1.265  25 50
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27         12  1.173  16.433    21  1.114 1.282  11 44
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.215  16.897
21 -- -- -- -- --  6 -- 10 --  6 -- -- -- -- --  19         10  1.252  17.280
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.273  17.400
25       -- -- -- -- -- 14 -- -- -- -- --        11          8  1.301  17.893
27          -- -- -- -- -- -- -- -- --            7          7  1.324  18.540
29             -- -- -- -- -- -- --               3          6  1.337* 19.119
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.328  19.256*
                                                             4  1.272  18.299
Control Rod Density: %              7.61                     3  1.110  15.402
                                                             2  0.790  10.484
k-effective:                     1.00110                Bottom  1  0.213   2.886
Void Fraction:                     0.457
Core Delta-P: psia                26.116          % AXIAL TILT -13.843  -6.385
Core Plate Delta-P: psia          21.572        AVG BOT 8ft/12ft  1.0796  1.0271
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr           90.05   Active Channel Flow: Mlb/hr        90.05
Total Bypass Flow (%):            15.5    (of total core flow)
Total Water Rod Flow (%):         -0.0    (of total core flow)
Source Convergence             0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.319	19	15	44	1.584	0.909	19	15	44	8.02	0.687	31.1	16	51	32	5	8.69	0.868	30.0	16	9	32	5
1.308	19	13	42	1.590	0.906	19	13	42	8.00	0.686	31.4	17	47	44	5	8.85	0.854	26.6	15	15	16	5
1.304	19	17	46	1.596	0.902	21	49	18	7.99	0.685	31.3	17	17	48	5	8.36	0.850	31.7	16	9	26	5
1.303	17	13	44	1.603	0.898	21	17	50	7.90	0.684	32.2	18	19	50	5	8.34	0.844	31.2	18	41	50	5
1.295	17	17	48	1.610	0.894	19	17	46	8.52	0.681	6.1	21	53	32	5	8.34	0.842	31.1	18	49	42	5
1.293	16	45	42	1.620	0.889	19	19	48	7.88	0.681	32.1	18	49	42	5	8.73	0.830	25.1	16	15	42	5
1.291	19	19	48	1.634	0.881	19	45	40	8.48	0.678	6.1	20	51	34	5	8.15	0.825	31.4	16	55	32	5
1.290	15	15	46	1.645	0.875	19	43	42	8.46	0.677	5.7	21	17	50	5	8.47	0.825	27.5	16	47	40	5
1.287	18	43	44	1.647	0.874	19	13	46	8.09	0.675	28.5	15	15	46	5	8.21	0.823	30.3	16	25	10	5
1.282	21	11	44	1.650	0.873	19	15	48	8.40	0.672	5.6	21	49	44	5	8.19	0.821	30.4	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.21 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 3,350.2 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)        3750.0 ( 510.72 )
Delta E: MWd/MTU, (GWd)         399.8 (  54.45 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.26
Flow: Mlb/hr                   104.93 (102.37 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --             59  :JR
 3           -- -- -- -- -- -- -- -- -- --       55
 5        -- -- -- -- -- 14 -- -- -- -- --       51
 7     -- -- -- -- -- -- -- -- -- -- -- --       47
 9 -- -- -- -- --  6 -- 10 --  6 -- -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- -- --  6 -- 10 --  6 -- -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- --       15
25       -- -- -- -- -- 14 -- -- -- -- --       11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %           7.61

k-effective:                  1.00082
Void Fraction:                  0.459
Core Delta-P: psia             25.492
Core Plate Delta-P: psia       20.950
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          88.66
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00009
```

Core Average Exposure: MWd/MTU 15384.6

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.150	2.617	4	0.755	0.803	41	34
24	0.473	7.888	5	0.573	0.643	1	36
23	0.670	11.143	6	0.545	0.581	53	50
22	0.820	13.795	9	0.479	0.564	23	60
21	0.924	15.740	10	0.559	0.578	59	34
20	0.989	17.026	11	0.598	0.606	1	32
19	1.018	17.695	14	1.072	1.239	23	50
18	1.037	17.846	15	0.919	1.288	15	46
17	1.036	17.742	16	1.132	1.291	45	42
16	1.029	16.391	17	1.002	1.301	13	44
15	1.038	16.283	18	1.063	1.285	43	44
14	1.101	16.036	19	1.092	1.322	15	44
13	1.134	16.389	20	1.147	1.267	25	50
12	1.176	16.875	21	1.117	1.285	11	44
11	1.217	17.356					
10	1.253	17.752					
9	1.273	17.881					
8	1.299	18.385					
7	1.320	19.041					
6	1.331*	19.624					
5	1.322	19.758*					
4	1.269	18.780					
3	1.112	15.822					
2	0.795	10.782					
Bottom 1	0.215	2.967					
% AXIAL TILT	-13.822	-6.425					
AVG BOT 8ft/12ft	1.0795	1.0274					

Active Channel Flow: Mlb/hr 88.66

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.322	19	15	44	1.571	0.917	19	15	44	7.95	0.686	32.0	17	47	44	5	8.58	0.864	30.8	16	9	32	5
1.311	19	13	42	1.577	0.913	19	13	42	7.94	0.686	32.0	17	17	48	5	8.78	0.855	27.5	15	15	16	5
1.308	19	17	46	1.584	0.909	21	49	18	7.86	0.684	32.9	18	19	50	5	8.27	0.848	32.5	16	9	26	5
1.301	17	13	44	1.591	0.905	21	17	50	7.93	0.683	31.8	16	51	32	5	8.28	0.844	32.0	18	41	50	5
1.294	19	19	48	1.594	0.903	19	17	46	7.83	0.682	32.8	18	49	42	5	8.28	0.843	31.8	18	49	42	5
1.293	17	17	48	1.603	0.898	19	19	48	8.48	0.678	6.9	21	53	32	5	8.65	0.829	25.9	16	15	42	5
1.291	16	45	42	1.620	0.889	19	45	40	8.47	0.678	6.5	21	17	50	5	8.39	0.824	28.3	16	47	40	5
1.288	15	15	46	1.630	0.884	19	43	42	8.45	0.676	6.8	20	51	34	5	8.14	0.823	31.1	16	25	10	5
1.285	18	43	44	1.634	0.881	19	13	46	8.04	0.676	29.2	15	15	46	5	8.04	0.821	32.1	16	55	32	5
1.285	21	11	44	1.637	0.880	19	15	48	8.40	0.672	6.4	21	49	44	5	8.12	0.820	31.1	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.22 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 3,750.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        4000.0 ( 544.76 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -26.57
Flow: Mlb/hr                   103.79 (101.26 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 14 -- -- -- -- --       51
 7     -- -- -- -- -- -- -- -- -- -- -- --       47
 9  -- -- -- -- --  6 -- 10 --  6 -- -- -- -- -- 43
11  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13  -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- -- 35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17  -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- -- 27
19  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21  -- -- -- -- --  6 -- 10 --  6 -- -- -- -- -- 19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- 14 -- -- -- -- -- --     11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.61

k-effective:                   1.00074
Void Fraction:                   0.459
Core Delta-P: psia              25.222
Core Plate Delta-P: psia        20.683
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          88.01
Total Bypass Flow (%):           15.2
Total Water Rod Flow (%):        -0.0
Source Convergence             0.00010
```

Core Average Exposure: MWd/MTU 15634.7

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.152	2.661	4	0.754	0.802	41	34
24	0.477	8.016	5	0.572	0.641	1	36
23	0.674	11.324	6	0.544	0.579	53	50
22	0.823	14.017	9	0.477	0.563	23	60
21	0.925	15.989	10	0.557	0.576	59	34
20	0.989	17.293	11	0.595	0.603	1	32
19	1.016	17.969	14	1.071	1.239	23	50
18	1.035	18.125	15	0.918	1.287	15	46
17	1.034	18.021	16	1.131	1.290	45	42
16	1.027	16.657	17	1.000	1.300	13	44
15	1.037	16.552	18	1.063	1.284	43	44
14	1.102	16.296	19	1.094	1.324	15	44
13	1.136	16.657	20	1.148	1.268	25	50
12	1.177	17.153	21	1.118	1.287	11	44
11	1.218	17.643					
10	1.253	18.048					
9	1.273	18.182					
8	1.297	18.692					
7	1.318	19.353					
6	1.328*	19.939					
5	1.319	20.070*					
4	1.266	19.080					
3	1.112	16.085					
2	0.797	10.970					
Bottom 1	0.216	3.019					
% AXIAL TILT	-13.755	-6.449					
AVG BOT 8ft/12ft	1.0791	1.0276					

Active Channel Flow: Mlb/hr 88.01
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.324	19	15	44	1.562	0.922	19	15	44	7.92	0.687	32.5	17	47	44	5	8.51	0.862	31.3	16	9	32	5
1.313	19	13	42	1.569	0.918	19	13	42	7.91	0.686	32.4	17	17	48	5	8.74	0.855	28.0	15	15	16	5
1.310	19	17	46	1.579	0.912	21	49	18	7.83	0.685	33.3	18	19	50	5	8.22	0.847	33.0	16	9	26	5
1.300	17	13	44	1.585	0.909	21	17	50	7.81	0.682	33.2	18	49	42	5	8.24	0.845	32.4	18	41	50	5
1.297	19	19	48	1.585	0.908	19	17	46	7.87	0.681	32.2	16	51	32	5	8.24	0.844	32.3	18	49	42	5
1.292	17	17	48	1.594	0.903	19	19	48	8.48	0.678	6.9	21	17	50	5	8.61	0.829	26.5	16	15	42	5
1.290	16	45	42	1.613	0.893	19	45	40	8.46	0.677	7.4	21	53	32	5	8.35	0.823	28.8	16	47	40	5
1.287	21	11	44	1.622	0.888	19	43	42	8.01	0.676	29.6	15	15	46	5	8.10	0.822	31.6	16	25	10	5
1.287	15	15	46	1.628	0.885	19	13	46	8.43	0.675	7.3	20	51	34	5	8.07	0.820	31.6	18	17	18	5
1.287	21	17	50	1.630	0.883	19	15	48	8.41	0.673	6.9	21	49	44	5	8.06	0.820	31.6	18	17	10	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.23 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 4,000.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    15784.7
Exposure: MWd/MTU (GWd)        4150.0 ( 565.19 )
Delta E: MWd/MTU, (GWd)         150.0 (  20.43 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.153   2.688     4  0.753 0.801  41 34
Inlet Subcooling: Btu/lbm       -26.70                      24  0.479   8.092     5  0.571 0.640   1 36
Flow: Mlb/hr                   103.35 (100.83 %)            23  0.676  11.432     6  0.543 0.578  53 50
                                                            22  0.824  14.150     9  0.477 0.562  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.925  16.139    10  0.555 0.574  59 34
 1              -- -- -- -- -- -- --              59  :JR   20  0.988  17.453    11  0.594 0.601   1 32
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.015  18.134    14  1.070 1.238  23 50
 5        -- -- -- -- -- 14 -- -- -- -- --        51         18  1.033  18.293    15  0.917 1.287  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  1.032  18.189    16  1.130 1.289  45 42
 9 -- -- -- -- --  6 -- 10 --  6 -- -- -- -- --  43         16  1.026  16.817    17  0.999 1.299  13 44
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  1.037  16.713    18  1.062 1.283  43 44
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35         14  1.102  16.452    19  1.094 1.325  15 44
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.136  16.818    20  1.149 1.269  25 50
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27         12  1.178  17.319    21  1.120 1.289  11 44
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.218  17.815
21 -- -- -- -- --  6 -- 10 --  6 -- -- -- -- --  19         10  1.253  18.225
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.273  18.363
25       -- -- -- -- -- 14 -- -- -- -- --        11          8  1.297  18.876
27          -- -- -- -- -- -- -- -- --            7          7  1.317  19.540
29             -- -- -- -- -- -- --               3          6  1.327* 20.127
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.318  20.258*
                                                             4  1.266  19.260
Control Rod Density: %           7.61                        3  1.113  16.242
                                                             2  0.800  11.083
k-effective:                  1.00063                Bottom  1  0.217   3.050
Void Fraction:                  0.460
Core Delta-P: psia             25.053              % AXIAL TILT -13.778  -6.463
Core Plate Delta-P: psia       20.512            AVG BOT 8ft/12ft  1.0793  1.0277
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr         87.42   Active Channel Flow: Mlb/hr        87.42
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.325	19	15	44	1.556	0.925	19	15	44	7.90	0.687	32.7	17	47	44	5	8.47	0.861	31.6	16	9	32	5
1.314	19	13	42	1.563	0.921	19	13	42	7.90	0.686	32.7	17	17	48	5	8.72	0.856	28.3	15	15	16	5
1.311	19	17	46	1.574	0.915	21	49	18	7.82	0.686	33.5	18	19	50	5	8.19	0.847	33.3	16	9	26	5
1.299	17	13	44	1.579	0.912	19	17	46	7.80	0.683	33.4	18	49	42	5	8.23	0.846	32.7	18	41	50	5
1.298	19	19	48	1.580	0.912	21	17	50	7.85	0.681	32.4	16	51	32	5	8.22	0.844	32.6	18	49	42	5
1.292	17	17	48	1.588	0.907	19	19	48	8.49	0.679	7.2	21	17	50	5	8.58	0.829	26.8	16	15	42	5
1.289	16	45	42	1.607	0.896	19	45	40	8.00	0.677	29.9	15	15	46	5	8.32	0.824	29.1	16	47	40	5
1.289	21	11	44	1.616	0.891	19	43	42	8.46	0.677	7.6	21	53	32	5	8.08	0.823	31.8	16	25	10	5
1.289	21	17	50	1.621	0.888	19	13	46	8.43	0.674	7.6	20	51	34	5	8.06	0.821	31.9	18	17	18	5
1.287	15	15	46	1.624	0.887	19	15	48	8.42	0.674	7.1	21	49	44	5	8.05	0.820	31.9	18	17	10	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.24 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 4,150.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          4150.2 ( 565.22 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -25.84
Flow: Mlb/hr                     106.52 (103.92 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 16 -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- --        15
25       -- -- -- -- -- 16 -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.84

k-effective:                     1.00060
Void Fraction:                     0.458
Core Delta-P: psia                26.128
Core Plate Delta-P: psia          21.584
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr           90.00
Total Bypass Flow (%):             15.5
Total Water Rod Flow (%):          -0.0
Source Convergence             0.00008
```

Core Average Exposure: MWd/MTU 15784.9

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.143	2.688	4	0.744	0.796	41	34
24	0.448	8.093	5	0.573	0.644	1	36
23	0.636	11.432	6	0.546	0.580	7	50
22	0.785	14.150	9	0.479	0.567	23	60
21	0.896	16.139	10	0.560	0.577	59	34
20	0.969	17.454	11	0.599	0.605	1	32
19	1.005	18.134	14	1.074	1.243	23	50
18	1.033	18.293	15	0.908	1.288	15	46
17	1.041	18.189	16	1.136	1.289	45	42
16	1.036	16.817	17	1.006	1.302	13	44
15	1.047	16.713	18	1.064	1.278	43	44
14	1.114	16.452	19	1.088	1.325	15	44
13	1.149	16.818	20	1.159	1.277	25	50
12	1.191	17.319	21	1.126	1.294	11	44
11	1.232	17.816					
10	1.267	18.225					
9	1.286	18.363					
8	1.310	18.876					
7	1.329	19.540					
6	1.338*	20.127					
5	1.327	20.258*					
4	1.274	19.260					
3	1.119	16.242					
2	0.804	11.084					
Bottom 1	0.218	3.050					
% AXIAL TILT	-14.845	-6.463					
AVG BOT 8ft/12ft	1.0888	1.0277					

Active Channel Flow: Mlb/hr 90.00

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.325	19	15	44	1.593	0.904	19	15	44	7.97	0.693	32.7	17	47	44	5	8.54	0.868	31.6	16	9	32	5
1.317	19	13	42	1.594	0.903	21	49	18	7.97	0.693	32.7	17	17	48	5	8.80	0.863	28.3	15	15	16	5
1.309	19	17	46	1.599	0.901	19	13	42	7.89	0.692	33.5	18	19	50	5	8.26	0.854	33.3	16	9	26	5
1.302	17	13	44	1.607	0.896	21	17	50	7.87	0.689	33.4	18	49	42	5	8.30	0.853	32.7	18	41	50	5
1.297	19	19	48	1.640	0.878	19	45	40	7.91	0.686	32.5	16	51	32	5	8.29	0.852	32.6	18	49	42	5
1.294	21	11	44	1.641	0.877	19	17	46	8.56	0.685	7.2	21	17	50	5	8.66	0.836	26.8	16	15	42	5
1.293	17	17	48	1.646	0.875	19	19	48	8.07	0.683	29.9	15	15	46	5	8.39	0.831	29.1	16	47	40	5
1.293	21	17	50	1.648	0.874	19	13	46	8.53	0.682	7.6	21	53	32	5	8.14	0.829	31.8	16	25	10	5
1.289	16	45	42	1.649	0.873	19	15	48	8.50	0.680	7.6	20	51	34	5	8.13	0.828	31.9	18	17	18	5
1.288	15	15	46	1.652	0.872	19	21	50	8.49	0.680	7.1	21	49	44	5	8.12	0.827	31.9	18	17	10	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.25 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 4,150.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    16134.6
Exposure: MWd/MTU (GWd)        4500.0 ( 612.86 )
Delta E: MWd/MTU, (GWd)         349.8 (  47.64 )                Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.145   2.747    4  0.743 0.795  41 34
Inlet Subcooling: Btu/lbm       -26.20                        24  0.453   8.261    5  0.571 0.641   1 36
Flow: Mlb/hr                   105.16 (102.60 %)             23  0.642  11.672    6  0.544 0.578   7 50
                                                             22  0.788  14.446    9  0.477 0.565  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.898  16.477   10  0.557 0.574  59 34
 1              -- -- -- -- -- -- --              59  :JR   20  0.969  17.819   11  0.595 0.600   1 32
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.003  18.514   14  1.072 1.241  23 50
 5        -- -- -- -- -- 16 -- -- -- -- --        51         18  1.030  18.683   15  0.907 1.287  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  1.038  18.582   16  1.134 1.287  45 42
 9 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- --  43         16  1.034  17.193   17  1.003 1.300  13 44
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  1.046  17.093   18  1.063 1.276  43 44
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35         14  1.115  16.820   19  1.091 1.328  15 44
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.151  17.198   20  1.160 1.279  25 50
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27         12  1.193  17.713   21  1.128 1.298  11 44
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.234  18.223
21 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- --  19         10  1.268  18.644
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.286  18.789
25       -- -- -- -- -- 16 -- -- -- -- --        11          8  1.308  19.309
27          -- -- -- -- -- -- -- -- -- --         7          7  1.326  19.980
29             -- -- -- -- -- -- --               3          6  1.334* 20.570
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.323  20.697*
                                                            4  1.272  19.682
Control Rod Density: %          7.84                        3  1.120  16.613
                                                            2  0.807  11.350
k-effective:                1.00046                 Bottom  1  0.219   3.123
Void Fraction:                0.459
Core Delta-P: psia           25.753            % AXIAL TILT -14.804  -6.517
Core Plate Delta-P: psia     21.213         AVG BOT 8ft/12ft  1.0884  1.0281
Coolant Temp: Deg-F           548.3
In Channel Flow: Mlb/hr       89.21   Active Channel Flow: Mlb/hr        89.21
Total Bypass Flow (%):         15.2   (of total core flow)
Total Water Rod Flow (%):      -0.0   (of total core flow)
Source Convergence          0.00010
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.328	19	15	44	1.584	0.909	19	15	44	7.94	0.695	33.3	17	47	44	5	8.76	0.865	29.0	15	15	16	5
1.320	19	13	42	1.587	0.907	21	49	18	7.94	0.694	33.3	17	17	48	5	8.45	0.865	32.3	16	9	32	5
1.312	19	17	46	1.590	0.905	19	13	42	7.87	0.694	34.1	18	19	50	5	8.25	0.855	33.4	18	41	50	5
1.300	17	13	44	1.600	0.900	21	17	50	7.84	0.690	34.0	18	49	42	5	8.19	0.854	33.9	16	9	26	5
1.300	19	19	48	1.630	0.883	19	45	40	8.59	0.687	7.9	21	17	50	5	8.25	0.853	33.3	18	49	42	5
1.298	21	11	44	1.634	0.881	19	17	46	8.04	0.684	30.5	15	15	46	5	8.60	0.837	27.5	16	15	42	5
1.296	21	17	50	1.639	0.879	19	19	48	7.84	0.684	33.0	16	51	32	5	8.34	0.831	29.8	16	47	40	5
1.291	17	17	48	1.640	0.878	19	13	46	8.52	0.681	7.8	21	49	44	5	8.09	0.830	32.5	16	25	10	5
1.287	16	45	42	1.641	0.877	19	15	48	8.51	0.681	8.3	21	53	32	5	8.07	0.829	32.6	18	17	10	5
1.287	19	21	50	1.642	0.877	19	11	40	8.48	0.678	8.2	20	51	34	5	8.08	0.829	32.5	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.26 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 4,500.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)        4750.0 ( 646.91 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.39
Flow: Mlb/hr                   104.44 (101.90 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 16 -- -- -- -- --       51
 7     -- -- -- -- -- -- -- -- -- -- -- --       47
 9 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15
25       -- -- -- -- -- 16 -- -- -- -- --       11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            7.84

k-effective:                   1.00029
Void Fraction:                   0.460
Core Delta-P: psia              25.498
Core Plate Delta-P: psia        20.959
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          88.58
Total Bypass Flow (%):           15.2
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00007
```

Core Average Exposure: MWd/MTU 16384.7

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.146	2.790	4	0.741	0.794	41	34
24	0.455	8.383	5	0.569	0.639	1	36
23	0.644	11.844	6	0.542	0.577	7	50
22	0.789	14.659	9	0.476	0.563	23	60
21	0.897	16.719	10	0.555	0.571	59	34
20	0.967	18.081	11	0.592	0.598	1	32
19	1.000	18.784	14	1.071	1.240	23	50
18	1.026	18.961	15	0.906	1.286	15	46
17	1.034	18.862	16	1.133	1.286	45	42
16	1.031	17.460	17	1.002	1.299	13	44
15	1.044	17.364	18	1.062	1.274	43	44
14	1.115	17.083	19	1.092	1.330	15	44
13	1.151	17.469	20	1.162	1.280	25	50
12	1.193	17.994	21	1.130	1.300	11	44
11	1.234	18.514					
10	1.267	18.943					
9	1.286	19.093					
8	1.308	19.619					
7	1.325	20.293					
6	1.333*	20.885					
5	1.323	21.010*					
4	1.273	19.982					
3	1.123	16.877					
2	0.812	11.540					
Bottom 1	0.221	3.175					

% AXIAL TILT -14.877 -6.554
AVG BOT 8ft/12ft 1.0888 1.0284

Active Channel Flow: Mlb/hr 88.58
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.330	19	15	44	1.577	0.913	19	15	44	7.93	0.696	33.7	17	47	44	5	8.74	0.868	29.5	15	15	16	5
1.323	19	13	42	1.582	0.910	21	49	18	7.92	0.696	33.7	17	17	48	5	8.40	0.865	32.8	16	9	32	5
1.314	19	17	46	1.584	0.909	19	13	42	7.86	0.696	34.5	18	19	50	5	8.23	0.857	33.9	18	41	50	5
1.302	19	19	48	1.594	0.903	21	17	50	7.83	0.693	34.4	18	49	42	5	8.23	0.856	33.8	18	49	42	5
1.300	21	11	44	1.624	0.887	19	45	40	8.62	0.689	8.4	21	17	50	5	8.16	0.854	34.4	16	9	26	5
1.299	17	13	44	1.629	0.884	19	17	46	8.03	0.686	30.9	15	15	46	5	8.57	0.838	28.0	16	15	42	5
1.299	21	17	50	1.633	0.882	19	19	48	7.81	0.684	33.5	16	51	32	5	8.31	0.832	30.2	16	47	40	5
1.290	17	17	48	1.634	0.881	19	13	46	8.55	0.684	8.3	21	49	44	5	8.06	0.831	33.1	18	17	10	5
1.290	19	21	50	1.635	0.881	19	15	48	8.52	0.682	8.2	21	19	52	5	8.06	0.831	33.0	16	25	10	5
1.286	15	15	46	1.635	0.881	19	11	40	8.51	0.681	8.8	21	53	32	5	8.05	0.830	33.0	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.27 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 4,750.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       5000.0 ( 680.95 )
Delta E: MWd/MTU, (GWd)        250.0 (  34.05 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -26.59
Flow: Mlb/hr                  103.75 (101.22 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 16 -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- 10 -- 14 -- 10 -- 14 -- 10 -- -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- --        15
25       -- -- -- -- -- 16 -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          7.84

k-effective:                 1.00014
Void Fraction:                 0.461
Core Delta-P: psia            25.251
Core Plate Delta-P: psia      20.712
Coolant Temp: Deg-F           548.3
In Channel Flow: Mlb/hr       87.99
Total Bypass Flow (%):         15.2
Total Water Rod Flow (%):      -0.0
Source Convergence          0.00007
```

```
Core Average Exposure: MWd/MTU    16634.7

                 Axial Profile     Edit   Radial Power
          N(PRA) Power Exposure    Zone   Avg.   Max.   IR JR
      Top 25  0.147   2.833        4   0.740 0.793   41 34
          24  0.458   8.505        5   0.568 0.637    1 36
          23  0.647  12.018        6   0.541 0.575   11 54
          22  0.791  14.872        9   0.474 0.561   23 60
          21  0.897  16.961       10   0.553 0.569   59 34
          20  0.965  18.341       11   0.590 0.595    1 32
          19  0.998  19.054       14   1.070 1.239   23 50
          18  1.023  19.238       15   0.905 1.285   15 46
          17  1.031  19.141       16   1.132 1.285   45 42
          16  1.029  17.727       17   1.000 1.298   13 44
          15  1.043  17.634       18   1.061 1.273   43 44
          14  1.114  17.346       19   1.094 1.333   15 44
          13  1.151  17.741       20   1.163 1.282   25 50
          12  1.193  18.276       21   1.132 1.303   11 44
          11  1.234  18.805
          10  1.267  19.242
           9  1.285  19.397
           8  1.307  19.928
           7  1.324  20.607
           6  1.332* 21.201
           5  1.323  21.323*
           4  1.274  20.283
           3  1.126  17.143
           2  0.817  11.732
      Bottom  1  0.223   3.228

          % AXIAL TILT -14.926  -6.590
     AVG BOT 8ft/12ft  1.0889  1.0287

Active Channel Flow: Mlb/hr        87.99
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.333	19	15	44	1.569	0.918	19	15	44	7.92	0.699	34.2	17	47	44	5	8.72	0.871	30.0	15	15	16	5
1.325	19	13	42	1.576	0.914	19	13	42	7.85	0.698	35.0	18	19	50	5	8.35	0.864	33.3	16	9	32	5
1.317	19	17	46	1.577	0.913	21	49	18	7.92	0.698	34.1	17	17	48	5	8.22	0.860	34.4	18	41	50	5
1.305	19	19	48	1.589	0.906	21	17	50	7.82	0.695	34.8	18	49	42	5	8.21	0.858	34.2	18	49	42	5
1.303	21	11	44	1.617	0.890	19	45	40	8.65	0.692	8.8	21	17	50	5	8.12	0.855	34.9	16	9	26	5
1.302	21	17	50	1.622	0.888	19	17	46	8.02	0.689	31.4	15	15	46	5	8.55	0.840	28.5	16	15	42	5
1.298	17	13	44	1.626	0.886	19	11	40	8.58	0.686	8.7	21	49	44	5	8.04	0.834	33.5	18	17	10	5
1.293	19	21	50	1.628	0.885	19	13	46	8.56	0.685	8.7	21	19	52	5	8.28	0.834	30.7	16	47	40	5
1.289	17	17	48	1.628	0.885	19	19	48	7.77	0.683	33.9	16	51	32	5	8.04	0.833	33.4	16	25	10	5
1.287	19	11	40	1.628	0.884	19	15	48	8.51	0.681	9.2	21	53	32	5	8.03	0.832	33.4	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.28 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 5,000.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    16634.8
Exposure: MWd/MTU (GWd)          5000.2 ( 680.98 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                     Top 25  0.145   2.833     4  0.737 0.782  41 34
Inlet Subcooling: Btu/lbm         -25.95                        24  0.453   8.505     5  0.569 0.635   1 36
Flow: Mlb/hr                     106.08 (103.49 %)             23  0.639  12.018     6  0.542 0.578  11 54
                                                               22  0.779  14.872     9  0.475 0.565  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29               21  0.881  16.961    10  0.553 0.566  59 34
 1              -- -- -- -- -- -- --              59  :JR     20  0.944  18.342    11  0.590 0.592   1 32
 3           -- -- -- -- -- -- -- -- -- --        55          19  0.983  19.054    14  1.068 1.247  23 50
 5        -- -- -- -- -- 16 -- -- -- -- --       51          18  1.014  19.238    15  0.903 1.290  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- --       47          17  1.026  19.141    16  1.132 1.285  15 42
 9 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- -- 43          16  1.027  17.728    17  1.003 1.300  13 44
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39          15  1.043  17.634    18  1.064 1.276  43 44
13 -- -- --  8 -- 14 -- 10 -- 14 --  8 -- -- -- 35          14  1.118  17.346    19  1.092 1.335  15 44
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.157  17.741    20  1.163 1.290  25 50
17 -- -- --  8 -- 14 -- 10 -- 14 --  8 -- -- -- 27          12  1.201  18.276    21  1.135 1.309  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23          11  1.242  18.805
21 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- -- 19          10  1.277  19.242
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.295  19.397
25       -- -- -- -- -- 16 -- -- -- -- --       11           8  1.317  19.928
27          -- -- -- -- -- -- -- -- --           7           7  1.334  20.607
29             -- -- -- -- -- -- --              3           6  1.341* 21.201
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.331  21.323*
                                                            4  1.280  20.283
Control Rod Density: %            7.93                      3  1.131  17.143
                                                            2  0.820  11.733
k-effective:                   1.00014                Bottom  1  0.224   3.228
Void Fraction:                   0.459
Core Delta-P: psia              26.139          % AXIAL TILT -15.689  -6.590
Core Plate Delta-P: psia        21.599       AVG BOT 8ft/12ft  1.0946  1.0287
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          90.04   Active Channel Flow: Mlb/hr        90.04
Total Bypass Flow (%):           15.1   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.335	19	15	44	1.594	0.904	19	15	44	7.98	0.704	34.2	17	47	44	5	8.78	0.877	30.0	15	15	16	5
1.324	19	13	42	1.597	0.902	21	17	50	7.97	0.703	34.1	17	17	48	5	8.41	0.870	33.3	16	9	32	5
1.322	19	17	46	1.599	0.901	21	49	18	7.90	0.703	35.0	18	19	50	5	8.27	0.866	34.4	18	41	50	5
1.312	19	19	48	1.604	0.898	19	13	42	7.88	0.700	34.8	18	49	42	5	8.27	0.864	34.2	18	49	42	5
1.309	21	17	50	1.635	0.880	19	17	46	8.71	0.697	8.8	21	17	50	5	8.18	0.861	34.9	16	9	26	5
1.305	21	11	44	1.638	0.879	19	21	50	8.08	0.693	31.4	15	15	46	5	8.61	0.846	28.5	16	15	42	5
1.301	19	21	50	1.639	0.878	19	19	48	8.64	0.691	8.7	21	49	44	5	8.34	0.840	30.7	16	47	40	5
1.300	17	13	44	1.642	0.877	19	15	48	8.62	0.689	8.7	21	19	52	5	8.09	0.839	33.5	18	17	10	5
1.296	17	17	48	1.642	0.877	19	13	46	7.82	0.688	33.9	16	51	32	5	8.09	0.838	33.4	16	25	10	5
1.290	20	25	50	1.647	0.874	21	41	10	8.57	0.686	9.2	21	53	32	5	8.09	0.838	33.4	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.29 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 5,000.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        5237.2 ( 713.26 )
Delta E: MWd/MTU, (GWd)         237.0 (  32.28 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -26.15
Flow: Mlb/hr                   105.34 (102.77 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 16 -- -- -- -- --       51
 7     -- -- -- -- -- -- -- -- -- -- -- --       47
 9 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- -- --  8 -- 14 -- 10 -- 14 --  8 -- -- -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- -- --  8 -- 14 -- 10 -- 14 --  8 -- -- -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- -- -- --  0 -- 10 --  0 -- -- -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15
25       -- -- -- -- -- 16 -- -- -- -- --       11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              7.93

k-effective:                   1.00003
Void Fraction:                   0.460
Core Delta-P: psia              25.876
Core Plate Delta-P: psia        21.336
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          89.37
Total Bypass Flow (%):           15.2
Total Water Rod Flow (%):        -0.0
Source Convergence             0.00008
```

Core Average Exposure: MWd/MTU 16871.9

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.146	2.874	4	0.736	0.781	41	34
24	0.455	8.621	5	0.568	0.633	1	36
23	0.641	12.181	6	0.541	0.576	11	54
22	0.780	15.072	9	0.474	0.564	23	60
21	0.881	17.187	10	0.551	0.564	59	34
20	0.942	18.583	11	0.587	0.589	1	32
19	0.981	19.306	14	1.067	1.246	23	50
18	1.011	19.497	15	0.902	1.289	15	46
17	1.023	19.404	16	1.131	1.283	15	42
16	1.025	17.980	17	1.001	1.299	13	44
15	1.042	17.891	18	1.063	1.275	43	44
14	1.117	17.596	19	1.093	1.338	15	44
13	1.157	18.000	20	1.165	1.292	25	50
12	1.201	18.545	21	1.137	1.312	17	50
11	1.243	19.083					
10	1.277	19.528					
9	1.295	19.687					
8	1.317	20.223					
7	1.333	20.906					
6	1.340*	21.501					
5	1.330	21.621*					
4	1.281	20.570					
3	1.133	17.397					
2	0.824	11.916					
Bottom 1	0.225	3.278					

% AXIAL TILT -15.745 -6.635
AVG BOT 8ft/12ft 1.0948 1.0290

Active Channel Flow: Mlb/hr 89.37
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.338	19	15	44	1.585	0.908	19	15	44	7.97	0.706	34.6	17	47	44	5	8.77	0.880	30.5	15	15	16	5
1.327	19	13	42	1.591	0.905	21	17	50	7.90	0.705	35.4	18	19	50	5	8.36	0.869	33.7	16	9	32	5
1.324	19	17	46	1.593	0.904	21	49	18	7.96	0.705	34.5	17	17	48	5	8.26	0.868	34.8	18	41	50	5
1.314	19	19	48	1.596	0.902	19	13	42	7.87	0.702	35.2	18	49	42	5	8.25	0.867	34.7	18	49	42	5
1.312	21	17	50	1.629	0.884	19	17	46	8.74	0.699	9.3	21	17	50	5	8.15	0.862	35.3	16	9	26	5
1.308	21	11	44	1.631	0.883	19	21	50	8.07	0.696	31.8	15	15	46	5	8.58	0.848	28.9	16	15	42	5
1.304	19	21	50	1.633	0.882	19	19	48	8.67	0.694	9.2	21	49	44	5	8.08	0.842	34.0	18	17	10	5
1.299	17	13	44	1.635	0.881	19	15	48	8.66	0.692	9.2	21	19	52	5	8.32	0.841	31.2	16	47	40	5
1.295	17	17	48	1.635	0.881	19	13	46	7.79	0.688	34.3	16	51	32	5	8.07	0.840	33.9	16	25	10	5
1.293	19	13	46	1.640	0.878	21	41	10	8.60	0.688	9.1	21	51	42	5	8.06	0.840	33.9	18	17	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.30 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 5,237.2 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)        5237.4 ( 713.28 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.02 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.82
Flow: Mlb/hr                   106.60 (104.00 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --                59  :JR
 3           -- -- -- -- -- -- -- -- -- --          55
 5        -- -- -- -- 18 -- 18 -- -- -- --          51
 7     -- -- -- -- -- -- -- -- -- -- -- --          47
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --    43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    39
13 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- --    35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    31
17 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- --    27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --    23
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --    19
23    -- -- -- -- -- -- -- -- -- -- -- -- --       15
25       -- -- -- -- 18 -- 18 -- -- -- --          11
27          -- -- -- -- -- -- -- -- --             7
29             -- -- -- -- -- -- --                3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %             8.20

k-effective:                    1.00001
Void Fraction:                    0.446
Core Delta-P: psia               25.961
Core Plate Delta-P: psia         21.418
Coolant Temp: Deg-F              548.3
In Channel Flow: Mlb/hr          90.21
Total Bypass Flow (%):            15.4
Total Water Rod Flow (%):         -0.0
Source Convergence             0.00008
```

Core Average Exposure: MWd/MTU 16872.1

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.164	2.874	4	0.813	0.958	27	28
24	0.510	8.621	5	0.555	0.616	1	36
23	0.716	12.181	6	0.530	0.563	11	54
22	0.864	15.072	9	0.466	0.553	23	60
21	0.961	17.187	10	0.539	0.555	33	60
20	1.018	18.583	11	0.576	0.582	29	60
19	1.064	19.306	14	1.075	1.165	31	48
18	1.102	19.497	15	1.001	1.222	29	30
17	1.122	19.404	16	1.075	1.218	21	48
16	1.113	17.980	17	0.970	1.224	17	48
15	1.097	17.891	18	0.983	1.219	19	50
14	1.147	17.597	19	1.119	1.259	31	28
13	1.164	18.000	20	1.074	1.221	21	52
12	1.191	18.545	21	1.122	1.261	17	50
11	1.218	19.083					
10	1.241	19.528					
9	1.249	19.687					
8	1.262	20.223					
7	1.267*	20.906					
6	1.259	21.502					
5	1.227	21.621*					
4	1.152	20.570					
3	0.992	17.397					
2	0.708	11.917					
Bottom 1	0.192	3.279					
% AXIAL TILT	-8.719	-6.635					
AVG BOT 8ft/12ft	1.0556	1.0290					

Active Channel Flow: Mlb/hr 90.21

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR							LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.261	21	17	50	1.620	0.889	21	17	50	8.14	0.694	30.7	18	33	12	17	8.36	0.835	30.0	18	27	50	17
1.259	19	31	28	1.629	0.884	21	33	26	8.01	0.688	31.4	18	11	28	17	8.18	0.828	31.3	16	35	10	17
1.257	19	33	30	1.632	0.883	21	49	18	7.69	0.660	31.4	16	35	10	17	8.23	0.828	30.7	18	11	28	17
1.254	19	19	48	1.633	0.882	21	35	34	7.74	0.660	30.7	16	9	36	17	8.24	0.825	30.2	16	9	36	17
1.253	21	11	44	1.649	0.874	19	19	48	7.94	0.636	7.5	20	35	12	17	7.37	0.776	34.8	18	41	50	5
1.248	19	13	42	1.650	0.873	21	41	10	7.94	0.635	7.3	20	33	52	17	7.81	0.771	28.8	16	29	52	17
1.247	19	21	50	1.651	0.872	19	21	50	7.89	0.631	9.3	21	17	50	5	7.41	0.769	33.6	18	49	42	6
1.241	19	11	40	1.656	0.869	19	13	42	7.14	0.631	34.3	18	19	50	6	7.37	0.768	34.0	18	17	10	5
1.236	21	35	28	1.658	0.869	21	9	42	7.89	0.631	7.1	20	11	36	17	7.57	0.762	30.7	16	9	32	17
1.236	21	33	26	1.660	0.868	19	11	40	7.88	0.630	7.2	20	9	34	17	7.54	0.760	30.9	15	15	16	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.31 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 5,237.4 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    17134.7
Exposure: MWd/MTU (GWd)        5500.0 ( 749.05 )
Delta E: MWd/MTU, (GWd)         262.6 (  35.77 )                Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.165   2.925    4  0.811 0.954  27 28
Inlet Subcooling: Btu/lbm       -26.03                        24  0.515   8.765    5  0.554 0.614   1 36
Flow: Mlb/hr                   105.79 (103.21 %)             23  0.721  12.383    6  0.528 0.562  11 54
                                                             22  0.868  15.317    9  0.465 0.552  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.963  17.459   10  0.537 0.553  33 60
 1              --  --  --  --  --  --  --                59  :JR  20  1.017  18.872   11  0.574 0.579  29 60
 3           --  --  --  --  --  --  --  --  --  --        55        19  1.062  19.608   14  1.074 1.163  31 48
 5        --  --  --  --  18  --  18  --  --  --  --     51        18  1.100  19.810   15  0.999 1.215  29 30
 7     --  --  --  --  --  --  --  --  --  --  --  --     47        17  1.118  19.722   16  1.074 1.218  21 48
 9 --  --  --  --   6  --   8  --   8  --   6  --  --  --  43        16  1.110  18.283   17  0.969 1.223  17 48
11 --  --  --  --  --  --  --  --  --  --  --  --  --  --  39        15  1.094  18.189   18  0.983 1.219  19 50
13 --  -- 18  --   8  --  --  --  --  --   8  --  18  --  35        14  1.145  17.881   19  1.120 1.257  19 48
15 --  --  --  --  --  --  --  --  --  --  --  --  --  --  31        13  1.163  18.288   20  1.076 1.224  21 52
17 --  -- 18  --   8  --  --  --  --  --   8  --  18  --  27        12  1.190  18.840   21  1.124 1.264  17 50
19 --  --  --  --  --  --  --  --  --  --  --  --  --  --  23        11  1.217  19.385
21 --  --  --  --   6  --   8  --   8  --   6  --  --  --  19        10  1.239  19.835
23    --  --  --  --  --  --  --  --  --  --  --  --  --     15         9  1.248  19.998
25       --  --  --  --  --  18  --  18  --  --  --  --        11         8  1.260  20.537
27          --  --  --  --  --  --  --  --  --  --              7         7  1.266* 21.221
29             --  --  --  --  --  --  --  --                   3         6  1.258  21.814
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58                          5  1.227  21.926*
                                                                         4  1.153  20.857
Control Rod Density: %              8.20                                 3  0.995  17.644
                                                                         2  0.712  12.092
k-effective:                   0.99984                        Bottom    1  0.194   3.327
Void Fraction:                   0.447
Core Delta-P: psia              25.652                  % AXIAL TILT      -8.723  -6.576
Core Plate Delta-P: psia        21.109               AVG BOT 8ft/12ft     1.0552  1.0288
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          89.51   Active Channel Flow: Mlb/hr          89.51
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence             0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.264	21	17	50	1.610	0.895	21	17	50	8.08	0.692	31.2	18	33	12	17	8.29	0.832	30.5	18	27	50	17
1.257	19	19	48	1.621	0.888	21	49	18	7.97	0.687	31.9	18	11	28	17	8.12	0.826	31.8	16	35	10	17
1.256	21	11	44	1.627	0.885	21	33	26	7.69	0.659	31.1	16	9	36	17	8.17	0.826	31.2	18	11	28	17
1.255	19	31	28	1.630	0.883	21	35	34	7.64	0.658	31.8	16	35	10	17	8.18	0.824	30.7	16	9	36	17
1.254	19	33	30	1.639	0.879	21	41	10	7.93	0.635	9.7	21	17	50	5	7.37	0.779	35.3	18	41	50	5
1.251	19	13	42	1.639	0.879	19	19	48	7.93	0.634	8.0	20	35	12	17	7.40	0.772	34.0	18	49	42	6
1.250	19	21	50	1.641	0.878	19	21	50	7.14	0.633	34.7	18	19	50	6	7.36	0.771	34.4	18	17	10	5
1.244	19	11	40	1.647	0.875	19	13	42	7.92	0.633	7.8	20	33	52	17	7.76	0.769	29.3	16	29	52	17
1.236	21	19	52	1.647	0.874	21	9	42	7.88	0.630	7.6	20	11	36	17	7.51	0.763	31.6	15	15	16	5
1.234	21	35	28	1.649	0.873	19	11	40	7.87	0.629	7.6	20	9	34	17	7.52	0.761	31.2	16	9	32	17

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.32 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 5,500.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    17384.7
Exposure: MWd/MTU (GWd)          5750.0 ( 783.10 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.167   2.974     4  0.810 0.952  27 28
Inlet Subcooling: Btu/lbm,       -26.17                        24  0.519   8.903     5  0.552 0.612   1 36
Flow: Mlb/hr                     105.28 (102.71 %)             23  0.725  12.577     6  0.527 0.561  11 54
                                                               22  0.870  15.551     9  0.463 0.550  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29               21  0.963  17.719    10  0.535 0.550  33 60
 1              -- -- -- -- -- -- --              59  :JR     20  1.016  19.146    11  0.571 0.576  29 60
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.060  19.894    14  1.073 1.161  31 48
 5        -- -- -- -- 18 -- 18 -- -- -- --        51          18  1.096  20.106    15  0.998 1.211  29 30
 7     -- -- -- -- -- -- -- -- -- -- -- --        47          17  1.114  20.023    16  1.073 1.217  21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43          16  1.106  18.570    17  0.967 1.223  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39          15  1.091  18.473    18  0.982 1.219  19 50
13 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- -- 35          14  1.143  18.151    19  1.122 1.260  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.162  18.563    20  1.077 1.228  21 52
17 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- -- 27          12  1.189  19.121    21  1.126 1.267  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23          11  1.216  19.672
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19          10  1.239  20.128
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.248  20.293
25       -- -- -- -- 18 -- 18 -- -- -- --       11           8  1.260  20.835
27          -- -- -- -- -- -- -- -- --           7           7  1.266* 21.520
29             -- -- -- -- -- -- --              3           6  1.258  22.112
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.228  22.216*
                                                            4  1.155  21.129
Control Rod Density: %             8.20                     3  0.999  17.879
                                                            2  0.716  12.261
k-effective:                    0.99971                Bottom  1  0.195   3.373
Void Fraction:                    0.448
Core Delta-P: psia               25.482          % AXIAL TILT  -8.810  -6.522
Core Plate Delta-P: psia         20.940        AVG BOT 8ft/12ft  1.0553  1.0286
Coolant Temp: Deg-F              548.2
In Channel Flow: Mlb/hr          89.06   Active Channel Flow: Mlb/hr        89.06
Total Bypass Flow (%):            15.4   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.267	21	17	50	1.603	0.899	21	17	50	8.02	0.690	31.6	18	33	12	17	8.21	0.829	31.0	18	27	50	17
1.260	19	19	48	1.614	0.892	21	49	18	7.89	0.683	32.3	18	11	28	17	8.05	0.823	32.3	16	35	10	17
1.260	21	11	44	1.623	0.887	21	33	26	7.58	0.656	32.2	16	35	10	17	8.08	0.821	31.7	18	11	28	17
1.254	19	31	28	1.627	0.885	21	35	34	7.62	0.655	31.6	16	9	36	17	8.10	0.820	31.2	16	9	36	17
1.254	19	13	42	1.631	0.883	21	41	10	7.98	0.639	10.2	21	17	50	5	7.37	0.783	35.7	18	41	50	5
1.254	19	21	50	1.632	0.882	19	19	48	7.14	0.636	35.1	18	19	50	6	7.37	0.775	34.8	18	17	10	5
1.253	19	33	30	1.634	0.881	19	21	50	7.90	0.632	8.4	20	35	12	17	7.40	0.775	34.5	18	49	42	6
1.248	19	11	40	1.640	0.878	21	9	42	7.89	0.631	8.2	20	33	52	17	7.53	0.768	32.0	15	15	16	5
1.240	21	19	52	1.640	0.878	19	13	42	7.08	0.630	35.0	18	49	42	6	7.69	0.766	29.7	16	29	52	17
1.234	21	35	28	1.643	0.877	19	11	40	7.87	0.629	10.0	21	19	52	5	7.08	0.764	37.2	18	15	50	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.33 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 5,750.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    17634.7
Exposure: MWd/MTU (GWd)          6000.0 ( 817.14 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.169   3.023     4  0.810 0.952  27 28
Inlet Subcooling: Btu/lbm         -26.33                      24  0.522   9.042     5  0.551 0.610   1 36
Flow: Mlb/hr                     104.68 (102.13 %)           23  0.729  12.771     6  0.525 0.559  11 54
                                                             22  0.873  15.786     9  0.462 0.548  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.964  17.979    10  0.533 0.548  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.015  19.420    11  0.568 0.573  29 60
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.057  20.180    14  1.071 1.159  23 50
 5        -- -- -- -- 18 -- 18 -- -- -- --        51          18  1.092  20.402    15  0.996 1.208  29 30
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47          17  1.110  20.324    16  1.071 1.216  21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43          16  1.102  18.857    17  0.965 1.222  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39          15  1.088  18.755    18  0.981 1.219  19 50
13 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- -- 35          14  1.141  18.421    19  1.124 1.263  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.161  18.837    20  1.079 1.231  21 52
17 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- -- 27          12  1.188  19.401    21  1.128 1.270  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23          11  1.215  19.959
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19          10  1.238  20.420
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.247  20.588
25       -- -- -- -- 18 -- 18 -- -- -- --       11           8  1.259  21.133
27          -- -- -- -- -- -- -- -- --           7           7  1.266* 21.820
29             -- -- -- -- -- -- --              3           6  1.259  22.409
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.229  22.506*
                                                             4  1.158  21.402
Control Rod Density: %             8.20                      3  1.003  18.115
                                                             2  0.721  12.430
k-effective:                    0.99958                Bottom  1  0.197   3.420
Void Fraction:                    0.449
Core Delta-P: psia               25.268              % AXIAL TILT  -8.874  -6.470
Core Plate Delta-P: psia         20.726          AVG BOT 8ft/12ft  1.0553  1.0284
Coolant Temp: Deg-F              548.2
In Channel Flow: Mlb/hr           88.54   Active Channel Flow: Mlb/hr        88.54
Total Bypass Flow (%):            15.4   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00005
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.270	21	17	50	1.595	0.903	21	17	50	7.96	0.688	32.0	18	33	12	17	8.14	0.826	31.5	18	27	50	17
1.263	19	19	48	1.607	0.896	21	49	18	7.83	0.681	32.7	18	11	28	17	7.98	0.821	32.7	16	35	10	17
1.262	21	11	44	1.618	0.890	21	33	26	7.52	0.654	32.6	16	35	10	17	8.01	0.818	32.1	18	11	28	17
1.257	19	21	50	1.621	0.888	21	35	34	7.56	0.653	32.0	16	9	36	17	8.03	0.817	31.7	16	9	36	17
1.257	19	13	42	1.623	0.887	21	41	10	8.03	0.642	10.6	21	17	50	5	7.37	0.787	36.1	18	41	50	5
1.255	19	31	28	1.625	0.886	19	19	48	7.07	0.639	36.5	18	19	50	5	7.36	0.778	35.3	18	17	10	5
1.254	19	33	30	1.626	0.886	19	21	50	7.92	0.634	10.5	21	19	52	5	7.30	0.778	36.0	18	49	42	5
1.250	19	11	40	1.632	0.882	21	9	42	7.08	0.633	35.4	18	49	42	6	7.53	0.772	32.4	15	15	16	5
1.243	21	19	52	1.633	0.882	19	13	42	7.90	0.632	10.5	21	49	44	5	7.08	0.768	37.6	18	15	50	5
1.236	21	35	28	1.635	0.881	19	11	40	7.11	0.631	34.7	17	17	48	6	7.64	0.764	30.2	16	29	52	17

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.34 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 6,000.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    17884.7
Exposure: MWd/MTU (GWd)          6250.0 ( 851.19 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.170   3.073     4  0.810 0.952  27 28
Inlet Subcooling: Btu/lbm         -26.51                      24  0.526   9.183     5  0.549 0.607   1 36
Flow: Mlb/hr                     104.03 (101.49 %)           23  0.733  12.967     6  0.524 0.558  11 54
                                                             22  0.875  16.021     9  0.461 0.546  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.964  18.239    10  0.530 0.545  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.014  19.694    11  0.564 0.570  29 60
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.055  20.465    14  1.069 1.158  23 50
 5        -- -- -- -- 18 -- 18 -- -- -- --        51          18  1.089  20.697    15  0.995 1.205  29 30
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47          17  1.106  20.624    16  1.070 1.215  21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43          16  1.099  19.142    17  0.963 1.221  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39          15  1.085  19.037    18  0.981 1.218  19 50
13 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- -- 35          14  1.139  18.690    19  1.125 1.265  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.159  19.111    20  1.080 1.234  21 52
17 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- -- 27          12  1.186  19.682    21  1.130 1.273  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23          11  1.213  20.246
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19          10  1.236  20.712
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.246  20.882
25       -- -- -- -- 18 -- 18 -- -- -- --       11           8  1.259  21.430
27          -- -- -- -- -- -- -- -- --           7           7  1.265* 22.119
29             -- -- -- -- -- -- --              3           6  1.259  22.707
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.231  22.797*
                                                            4  1.160  21.676
Control Rod Density: %            8.20                      3  1.007  18.352
                                                            2  0.725  12.601
k-effective:                   0.99944                Bottom  1  0.198   3.466
Void Fraction:                   0.450
Core Delta-P: psia              25.035              % AXIAL TILT  -8.933  -6.420
Core Plate Delta-P: psia        20.493          AVG BOT 8ft/12ft  1.0552  1.0283
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          87.97   Active Channel Flow: Mlb/hr        87.97
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00005
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.273	21	17	50	1.587	0.907	21	17	50	7.91	0.686	32.5	18	33	12	17	8.08	0.823	32.0	18	27	50	17
1.265	21	11	44	1.599	0.900	21	49	18	7.78	0.679	33.1	18	11	28	17	7.92	0.819	33.2	16	35	10	17
1.265	19	19	48	1.611	0.894	21	33	26	7.47	0.652	33.0	16	35	10	17	7.94	0.815	32.6	18	11	28	17
1.260	19	21	50	1.615	0.892	21	41	10	7.51	0.651	32.4	16	9	36	17	7.97	0.814	32.2	16	9	36	17
1.259	19	13	42	1.615	0.892	21	35	34	8.08	0.646	11.1	21	17	50	5	7.37	0.790	36.5	18	41	50	5
1.256	19	31	28	1.618	0.890	19	19	48	7.08	0.642	36.9	18	19	50	5	7.36	0.782	35.7	18	17	10	5
1.256	19	33	30	1.618	0.890	19	21	50	7.97	0.638	10.9	21	19	52	5	7.30	0.782	36.4	18	49	42	5
1.253	19	11	40	1.624	0.887	21	9	42	7.94	0.635	10.9	21	49	44	5	7.54	0.777	32.9	15	15	16	5
1.246	21	19	52	1.626	0.886	19	13	42	7.08	0.635	35.8	18	49	42	6	7.08	0.771	38.0	18	15	50	5
1.238	21	9	42	1.628	0.885	19	11	40	7.05	0.634	36.0	17	17	48	5	6.97	0.765	38.6	18	9	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.35 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 6,250.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          6500.0 ( 885.24 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -26.69
Flow: Mlb/hr                     103.37 (100.85 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- 18 -- 18 -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- 18 --  8 -- -- -- -- --  8 -- 18 -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- -- 18 -- 18 -- -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %             8.20

k-effective:                    0.99930
Void Fraction:                    0.451
Core Delta-P: psia               24.802
Core Plate Delta-P: psia         20.260
Coolant Temp: Deg-F              548.2
In Channel Flow: Mlb/hr          87.39   Active Channel Flow: Mlb/hr      87.39
Total Bypass Flow (%):            15.5   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00006

Core Average Exposure: MWd/MTU    18134.7

                    Axial Profile     Edit   Radial Power
              N(PRA) Power Exposure   Zone  Avg.   Max.   IR JR
          Top 25  0.172   3.123       4  0.810  0.952  27 28
              24  0.530   9.324       5  0.547  0.605   1 36
              23  0.737  13.164       6  0.522  0.556  11 54
              22  0.877  16.257       9  0.459  0.544  23 60
              21  0.965  18.499      10  0.528  0.543  33 60
              20  1.013  19.968      11  0.561  0.567  29 60
              19  1.053  20.750      14  1.068  1.157  23 50
              18  1.086  20.990      15  0.994  1.203  29 30
              17  1.103  20.922      16  1.068  1.213  21 48
              16  1.095  19.427      17  0.961  1.220  17 48
              15  1.082  19.318      18  0.980  1.217  19 50
              14  1.137  18.959      19  1.127  1.268  19 48
              13  1.157  19.384      20  1.081  1.238  21 52
              12  1.184  19.962      21  1.132  1.276  17 50
              11  1.212  20.532
              10  1.234  21.004
               9  1.244  21.177
               8  1.258  21.728
               7  1.265* 22.418
               6  1.260  23.005
               5  1.233  23.088*
               4  1.164  21.950
               3  1.012  18.590
               2  0.730  12.772
          Bottom  1  0.200   3.514

                % AXIAL TILT  -9.003  -6.373
          AVG BOT 8ft/12ft    1.0552  1.0281
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.276	21	17	50	1.579	0.912	21	17	50	7.85	0.684	32.9	18	33	12	17	8.01	0.821	32.4	18	27	50	17
1.268	21	11	44	1.592	0.905	21	49	18	7.72	0.677	33.6	18	11	28	17	7.86	0.817	33.7	16	35	10	17
1.268	19	19	48	1.605	0.897	21	33	26	8.13	0.650	11.5	21	17	50	5	7.91	0.812	32.6	16	9	36	17
1.263	19	21	50	1.606	0.896	21	41	10	7.42	0.650	33.4	16	35	10	17	7.87	0.812	33.1	18	11	28	17
1.262	19	13	42	1.609	0.895	21	35	34	7.46	0.649	32.8	16	9	36	17	7.38	0.794	37.0	18	41	50	5
1.258	19	31	28	1.610	0.894	19	21	50	7.09	0.646	37.3	18	19	50	5	7.31	0.786	36.8	18	49	42	5
1.258	19	33	30	1.610	0.894	19	19	48	8.03	0.642	11.4	21	19	52	5	7.36	0.786	36.1	18	17	10	5
1.256	19	11	40	1.616	0.891	21	9	42	7.99	0.640	11.4	21	49	44	5	7.55	0.781	33.3	15	15	16	5
1.250	21	19	52	1.619	0.890	19	13	42	7.08	0.638	36.2	18	49	42	6	7.08	0.776	38.4	18	15	50	5
1.241	21	9	42	1.620	0.889	19	11	40	7.06	0.637	36.4	17	17	48	5	6.97	0.768	39.0	18	9	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.36 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 6,500.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    18134.9
Exposure: MWd/MTU (GWd)          6500.2 ( 885.27 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                     Top 25  0.174   3.123    4  0.815 0.960  27 28
Inlet Subcooling: Btu/lbm         -25.77                        24  0.538   9.324    5  0.549 0.602   1 36
Flow: Mlb/hr                     106.76 (104.15 %)             23  0.748  13.165    6  0.522 0.559  11 54
                                                               22  0.889  16.257    9  0.460 0.543  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29                21  0.975  18.499   10  0.525 0.539  33 60
 1              -- -- -- -- -- -- --              59  :JR      20  1.019  19.968   11  0.558 0.563  29 60
 3           -- -- -- -- -- -- -- -- -- --        55           19  1.052  20.750   14  1.064 1.151  23 50
 5        -- -- -- -- 16 -- 16 -- -- -- --        51           18  1.076  20.991   15  0.998 1.214  29 30
 7     -- -- -- -- -- -- -- -- -- -- -- --        47           17  1.080  20.922   16  1.063 1.215  21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43           16  1.056  19.427   17  0.960 1.227  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39           15  1.055  19.318   18  0.980 1.221  19 50
13 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 35           14  1.120  18.959   19  1.130 1.272  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31           13  1.149  19.385   20  1.067 1.237  21 52
17 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 27           12  1.182  19.962   21  1.133 1.282  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23           11  1.215  20.532
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19           10  1.241  21.004
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15            9  1.253  21.177
25       -- -- -- -- 16 -- 16 -- -- -- --       11            8  1.268  21.728
27          -- -- -- -- -- -- -- -- --           7            7  1.276* 22.418
29             -- -- -- -- -- -- --              3            6  1.270  23.005
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.241  23.088*
                                                             4  1.171  21.951
Control Rod Density: %            8.38                       3  1.017  18.591
                                                             2  0.734  12.772
k-effective:                   0.99925                Bottom  1  0.201   3.514
Void Fraction:                   0.447
Core Delta-P: psia              26.039              % AXIAL TILT  -9.579  -6.373
Core Plate Delta-P: psia        21.496          AVG BOT 8ft/12ft  1.0543  1.0281
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          90.34   Active Channel Flow: Mlb/hr        90.34
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.282	21	17	50	1.597	0.901	21	17	50	7.59	0.665	33.5	18	33	50	18	7.44	0.801	37.0	18	41	50	5
1.274	21	11	44	1.610	0.895	21	49	18	7.45	0.658	34.2	18	11	28	18	7.70	0.795	33.1	18	27	50	18
1.272	19	19	48	1.614	0.892	21	33	26	8.20	0.656	11.5	21	17	50	5	7.37	0.793	36.8	18	49	42	5
1.270	19	31	28	1.617	0.890	21	35	34	7.16	0.652	37.3	18	19	50	5	7.43	0.792	36.1	18	17	10	5
1.269	19	33	30	1.629	0.884	21	41	10	8.10	0.648	11.4	21	19	52	5	7.58	0.791	34.0	16	35	10	18
1.266	19	13	42	1.630	0.883	19	19	48	8.06	0.645	11.4	21	49	44	5	7.62	0.788	33.3	15	15	16	5
1.263	19	21	50	1.636	0.880	19	21	50	7.15	0.644	36.2	18	49	42	6	7.55	0.786	33.9	18	11	28	18
1.256	19	11	40	1.638	0.879	21	9	42	7.12	0.643	36.4	17	17	48	5	7.51	0.783	34.0	16	9	36	18
1.253	21	19	52	1.639	0.879	19	13	42	7.13	0.640	35.8	18	17	52	5	7.14	0.782	38.4	18	15	50	5
1.250	21	35	28	1.646	0.875	19	11	40	7.98	0.638	11.2	21	51	42	5	7.03	0.775	39.0	18	9	18	5

```
  * LHGR calculated with pin-power reconstruction
  * CPR calculated with pin-power reconstruction & CPR limit type 3
  * Thermal limit file:
```

Figure A.37 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 6,500.2 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    18384.6
Exposure: MWd/MTU (GWd)          6750.0 ( 919.29 )
Delta E: MWd/MTU, (GWd)           249.8 (  34.02 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                     Top 25  0.176   3.174     4  0.815 0.960  27 28
Inlet Subcooling: Btu/lbm         -25.92                        24  0.543   9.469     5  0.547 0.600   1 36
Flow: Mlb/hr                     106.21 (103.62 %)             23  0.753  13.366     6  0.521 0.557  11 54
                                                               22  0.892  16.497     9  0.458 0.541  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29               21  0.976  18.762    10  0.523 0.537  33 60
 1              -- -- -- -- -- -- --              59  :JR     20  1.018  20.242    11  0.555 0.560  29 60
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.050  21.034    14  1.063 1.150  23 50
 5        -- -- -- -- 16 -- 16 -- -- -- --        51          18  1.073  21.281    15  0.997 1.212  29 30
 7     -- -- -- -- -- -- -- -- -- -- -- --        47          17  1.077  21.213    16  1.061 1.214  21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --  43          16  1.053  19.700    17  0.958 1.226  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39          15  1.052  19.591    18  0.979 1.220  19 50
13 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  35          14  1.118  19.223    19  1.132 1.275  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31          13  1.146  19.655    20  1.069 1.241  21 52
17 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  27          12  1.180  20.241    21  1.135 1.285  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23          11  1.212  20.819
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --  19          10  1.238  21.297
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15           9  1.251  21.473
25       -- -- -- -- 16 -- 16 -- -- -- --        11           8  1.266  22.028
27          -- -- -- -- -- -- -- -- --            7           7  1.275* 22.720
29             -- -- -- -- -- -- --               3           6  1.270  23.305
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.243  23.381*
                                                             4  1.175  22.227
Control Rod Density: %            8.38                       3  1.022  18.831
                                                             2  0.739  12.946
k-effective:                   0.99914                Bottom  1  0.202   3.562
Void Fraction:                   0.448
Core Delta-P: psia              25.838            % AXIAL TILT  -9.615  -6.336
Core Plate Delta-P: psia        21.295         AVG BOT 8ft/12ft  1.0540  1.0279
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          89.86   Active Channel Flow: Mlb/hr        89.86
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence             0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.285	21	17	50	1.590	0.905	21	17	50	7.55	0.664	33.9	18	33	50	18	7.44	0.806	37.4	18	41	50	5
1.277	21	11	44	1.603	0.898	21	49	18	8.26	0.660	12.0	21	17	50	5	7.37	0.797	37.3	18	49	42	5
1.275	19	19	48	1.608	0.895	21	33	26	7.41	0.657	34.6	18	11	28	18	7.43	0.796	36.6	18	17	10	5
1.271	19	33	30	1.612	0.894	21	35	34	7.17	0.655	37.6	18	19	50	5	8.07	0.794	28.5	18	33	50	18
1.271	19	31	28	1.621	0.888	21	41	10	8.16	0.653	11.8	21	19	52	5	7.63	0.793	33.7	15	15	16	5
1.269	19	13	42	1.624	0.887	19	19	48	8.12	0.649	11.8	21	49	44	5	7.54	0.790	34.5	16	35	10	18
1.266	19	21	50	1.629	0.884	19	21	50	7.08	0.647	37.5	18	49	42	5	7.15	0.786	38.8	18	15	50	5
1.259	19	11	40	1.631	0.883	21	9	42	7.13	0.646	36.8	17	17	48	5	7.50	0.784	34.3	18	11	28	18
1.256	21	19	52	1.632	0.882	19	13	42	8.04	0.643	11.7	21	51	42	5	7.46	0.782	34.5	16	9	36	18
1.252	21	35	28	1.639	0.879	19	11	40	7.13	0.643	36.2	18	17	52	5	7.03	0.779	39.4	18	9	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.38 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 6,750.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    18634.7
Exposure: MWd/MTU (GWd)          7000.0 ( 953.34 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.177   3.226     4  0.815 0.960  27 28
Inlet Subcooling: Btu/lbm         -26.14                      24  0.546   9.615     5  0.545 0.597   1 36
Flow: Mlb/hr                     105.39 (102.82 %)           23  0.757  13.568     6  0.519 0.556  11 54
                                                             22  0.894  16.738     9  0.457 0.539  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.976  19.025    10  0.520 0.534  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  1.017  20.517    11  0.552 0.557  29 60
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.047  21.317    14  1.061 1.149  23 50
 5        -- -- -- -- 16 -- 16 -- -- -- --        51         18  1.070  21.570    15  0.996 1.209  29 30
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  1.073  21.504    16  1.060 1.213  21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43         16  1.049  19.973    17  0.956 1.225  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39         15  1.048  19.864    18  0.978 1.220  19 50
13 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 35         14  1.114  19.487    19  1.134 1.278  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.143  19.926    20  1.070 1.244  21 52
17 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 27         12  1.177  20.519    21  1.137 1.288  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23         11  1.209  21.105
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19         10  1.236  21.589
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15          9  1.249  21.769
25       -- -- -- -- 16 -- 16 -- -- -- --       11          8  1.265  22.327
27          -- -- -- -- -- -- -- -- -- --        7          7  1.275* 23.021
29             -- -- -- -- -- -- -- --           3          6  1.272  23.605
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.247  23.675*
                                                            4  1.180  22.505
Control Rod Density: %             8.38                     3  1.028  19.072
                                                            2  0.745  13.120
k-effective:                    0.99900                Bottom  1  0.204   3.610
Void Fraction:                    0.449
Core Delta-P: psia               25.547              % AXIAL TILT  -9.725  -6.300
Core Plate Delta-P: psia         21.005          AVG BOT 8ft/12ft  1.0541  1.0277
Coolant Temp: Deg-F              548.3
In Channel Flow: Mlb/hr           89.14   Active Channel Flow: Mlb/hr        89.14
Total Bypass Flow (%):            15.4   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence              0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.288	21	17	50	1.582	0.910	21	17	50	8.32	0.666	12.4	21	17	50	5	7.45	0.811	37.8	18	41	50	5
1.280	21	11	44	1.595	0.903	21	49	18	7.50	0.663	34.3	18	33	50	18	7.38	0.802	37.7	18	49	42	5
1.278	19	19	48	1.601	0.899	21	33	26	7.19	0.660	38.0	18	19	50	5	7.44	0.801	37.0	18	17	10	5
1.273	19	33	30	1.604	0.897	21	35	34	8.23	0.659	12.2	21	19	52	5	7.64	0.798	34.2	15	15	16	5
1.272	19	31	28	1.612	0.893	21	41	10	7.36	0.655	35.0	18	11	28	18	8.03	0.794	29.0	18	33	50	18
1.271	19	13	42	1.616	0.891	19	19	48	8.18	0.655	12.3	21	49	44	5	7.16	0.792	39.2	18	15	50	5
1.269	19	21	50	1.620	0.889	19	21	50	7.10	0.651	37.9	18	49	42	5	7.48	0.788	34.9	16	35	10	18
1.262	19	11	40	1.622	0.888	21	9	42	7.15	0.651	37.2	17	17	48	5	7.04	0.784	39.8	18	9	18	5
1.260	21	19	52	1.624	0.887	19	13	42	8.11	0.648	12.1	21	51	42	5	7.84	0.783	29.9	18	49	34	18
1.255	19	15	48	1.630	0.883	19	11	40	7.15	0.647	36.6	18	17	52	5	7.41	0.780	34.9	16	9	36	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.39 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 7,000.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          7250.0 ( 987.38 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -26.21
Flow: Mlb/hr                      105.12 (102.56 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- 16 -- 16 -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9  -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43
11  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13  -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17  -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 27
19  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21  -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19
23     -- -- -- -- -- -- -- -- -- -- -- -- --    15
25        -- -- -- -- 16 -- 16 -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              8.38

k-effective:                     0.99900
Void Fraction:                     0.450
Core Delta-P: psia                25.452
Core Plate Delta-P: psia          20.910
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr           88.91   Active Channel Flow: Mlb/hr        88.91
Total Bypass Flow (%):             15.4   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence              0.00010
```

Core Average Exposure: MWd/MTU 18884.7

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.179	3.279	4	0.815	0.960	27	28
24	0.550	9.761	5	0.543	0.595	1	36
23	0.761	13.772	6	0.517	0.554	11	54
22	0.897	16.979	9	0.455	0.537	23	60
21	0.977	19.288	10	0.518	0.531	33	60
20	1.016	20.791	11	0.548	0.554	29	60
19	1.046	21.600	14	1.059	1.148	23	50
18	1.067	21.859	15	0.994	1.207	29	30
17	1.070	21.793	16	1.058	1.211	21	48
16	1.045	20.245	17	0.953	1.224	17	48
15	1.045	20.135	18	0.977	1.219	19	50
14	1.112	19.750	19	1.136	1.280	19	48
13	1.140	20.196	20	1.072	1.248	21	52
12	1.174	20.797	21	1.139	1.291	17	50
11	1.207	21.390					
10	1.234	21.881					
9	1.248	22.065					
8	1.265	22.626					
7	1.275*	23.323					
6	1.274	23.906					
5	1.249	23.970*					
4	1.183	22.784					
3	1.032	19.315					
2	0.749	13.296					
Bottom 1	0.205	3.659					
% AXIAL TILT	-9.769	-6.266					
AVG BOT 8ft/12ft	1.0538	1.0275					

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.291	21	17	50	1.577	0.913	21	17	50	8.38	0.671	12.9	21	17	50	5	7.46	0.816	38.3	18	41	50	5
1.283	21	11	44	1.590	0.906	21	49	18	8.30	0.664	12.7	21	19	52	5	7.39	0.807	38.1	18	49	42	5
1.280	19	19	48	1.598	0.901	21	33	26	7.21	0.664	38.4	18	19	50	5	7.44	0.806	37.4	18	17	10	5
1.275	19	33	30	1.601	0.899	21	35	34	7.47	0.662	34.7	18	33	50	18	7.66	0.804	34.6	15	15	16	5
1.274	19	31	28	1.607	0.896	21	41	10	8.25	0.660	12.7	21	49	44	5	7.26	0.797	38.6	18	15	50	5
1.274	19	13	42	1.611	0.894	19	19	48	7.12	0.655	38.3	18	49	42	5	7.99	0.794	29.4	18	33	50	18
1.272	19	21	50	1.615	0.892	19	21	50	7.17	0.655	37.6	17	17	48	5	7.05	0.788	40.2	18	9	18	5
1.265	19	11	40	1.617	0.891	21	9	42	7.33	0.655	35.4	18	11	28	18	7.44	0.787	35.4	16	35	10	18
1.263	21	19	52	1.620	0.889	19	13	42	8.18	0.654	12.6	21	51	42	5	7.01	0.785	40.3	18	49	16	5
1.258	19	15	48	1.625	0.886	19	11	40	7.02	0.651	39.1	18	15	50	5	7.80	0.783	30.4	18	49	34	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.40 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 7,250.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)        7500.0 (1021.40 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.30
Flow: Mlb/hr                   104.81 (102.25 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- 16 -- 16 -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9  -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43
11  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13  -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17  -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 27
19  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21  -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19
23     -- -- -- -- -- -- -- -- -- -- -- -- --    15
25        -- -- -- -- 16 -- 16 -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %           8.38

k-effective:                  0.99900
Void Fraction:                  0.451
Core Delta-P: psia             25.341
Core Plate Delta-P: psia       20.799
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          88.63   Active Channel Flow: Mlb/hr        88.63
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00010-

                                        Core Average Exposure: MWd/MTU    19134.7

                                                Axial Profile    Edit   Radial Power
                                      N(PRA)  Power Exposure   Zone  Avg.  Max.  IR JR
                                    Top 25  0.180    3.331      4  0.815 0.959  27 28
                                       24  0.554    9.909      5  0.541 0.592   1 36
                                       23  0.766   13.976      6  0.515 0.552  11 54
                                       22  0.899   17.221      9  0.453 0.535  23 60
                                       21  0.977   19.552     10  0.515 0.528  33 60
                                       20  1.015   21.066     11  0.545 0.550  29 60
                                       19  1.044   21.882     14  1.058 1.148  23 50
                                       18  1.064   22.147     15  0.993 1.204  29 30
                                       17  1.066   22.082     16  1.057 1.210  21 48
                                       16  1.042   20.515     17  0.951 1.223  17 48
                                       15  1.041   20.406     18  0.976 1.219  19 50
                                       14  1.108   20.012     19  1.138 1.283  19 48
                                       13  1.137   20.465     20  1.074 1.252  21 52
                                       12  1.171   21.074     21  1.141 1.294  17 50
                                       11  1.204   21.675
                                       10  1.231   22.172
                                        9  1.246   22.360
                                        8  1.264   22.926
                                        7  1.276*  23.624
                                        6  1.276   24.207
                                        5  1.253   24.266*
                                        4  1.187   23.064
                                        3  1.037   19.559
                                        2  0.754   13.474
                                   Bottom  1  0.207    3.708

                                % AXIAL TILT  -9.845  -6.235
                              AVG BOT 8ft/12ft  1.0536  1.0274
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.294	21	17	50	1.572	0.916	21	17	50	8.46	0.677	13.4	21	17	50	5	7.48	0.821	38.7	18	41	50	5
1.286	21	11	44	1.585	0.908	21	49	18	8.38	0.671	13.2	21	19	52	5	7.41	0.813	38.5	18	49	42	5
1.283	19	19	48	1.594	0.904	21	33	26	7.23	0.669	38.8	18	19	50	5	7.46	0.811	37.9	18	17	10	5
1.277	19	13	42	1.597	0.902	21	35	34	8.32	0.665	13.2	21	49	44	5	7.69	0.811	35.1	15	15	16	5
1.276	19	33	30	1.601	0.899	21	41	10	7.43	0.662	35.1	18	33	50	18	7.29	0.804	39.1	18	15	50	5
1.276	19	21	50	1.606	0.896	19	19	48	7.15	0.660	38.6	18	49	42	5	7.95	0.794	29.9	18	33	50	18
1.276	19	31	28	1.609	0.895	19	21	50	8.25	0.660	13.0	21	51	42	5	7.06	0.794	40.6	18	9	18	5
1.268	19	11	40	1.611	0.894	21	9	42	7.19	0.659	37.9	17	17	48	5	7.04	0.792	40.7	18	49	16	5
1.267	21	19	52	1.615	0.892	19	13	42	8.21	0.657	12.6	21	13	48	5	7.39	0.786	35.8	16	35	10	18
1.262	19	15	48	1.620	0.889	19	11	40	7.04	0.656	39.5	18	15	50	5	7.74	0.783	31.2	18	41	8	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.41 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 7,500.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    19384.7
Exposure: MWd/MTU (GWd)          7750.0 (1055.50 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)         N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.182   3.385    4  0.815 0.959 27 28
Inlet Subcooling: Btu/lbm         -26.39                       24  0.558  10.058    5  0.539 0.589  1 36
Flow: Mlb/hr                     104.46 (101.91 %)            23  0.770  14.182    6  0.513 0.550 11 54
                                                              22  0.901  17.463    9  0.451 0.533 23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.978  19.816   10  0.513 0.526 33 60
 1              -- -- -- -- -- -- --             59  :JR     20  1.014  21.340   11  0.541 0.547 29 60
 3           -- -- -- -- -- -- -- -- -- --       55          19  1.041  22.163   14  1.056 1.147 23 50
 5        -- -- -- -- 16 -- 16 -- -- -- --       51          18  1.061  22.434   15  0.991 1.202 29 30
 7     -- -- -- -- -- -- -- -- -- -- -- --       47          17  1.062  22.370   16  1.055 1.209 21 48
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 43          16  1.037  20.785   17  0.949 1.222 17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39          15  1.037  20.676   18  0.975 1.218 19 50
13 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 35          14  1.104  20.274   19  1.140 1.286 19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.134  20.733   20  1.075 1.256 21 52
17 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 27          12  1.168  21.350   21  1.143 1.298 17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23          11  1.200  21.959
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- -- 19          10  1.228  22.462
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.245  22.654
25       -- -- -- -- 16 -- 16 -- -- -- --       11           8  1.264  23.224
27          -- -- -- -- -- -- -- -- --          7           7  1.277  23.926
29             -- -- -- -- -- -- --             3           6  1.278* 24.509
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.258  24.562*
                                                             4  1.193  23.344
Control Rod Density: %            8.38                       3  1.043  19.804
                                                             2  0.759  13.652
k-effective:                   0.99900                Bottom  1  0.209   3.757
Void Fraction:                   0.451
Core Delta-P: psia              25.220              % AXIAL TILT  -9.956  -6.205
Core Plate Delta-P: psia        20.678          AVG BOT 8ft/12ft  1.0536  1.0272
Coolant Temp: Deg-F              548.3
In Channel Flow: Mlb/hr          88.32   Active Channel Flow: Mlb/hr        88.32
Total Bypass Flow (%):           15.4    (of total core flow)
Total Water Rod Flow (%):        -0.0    (of total core flow)
Source Convergence             0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.298	21	17	50	1.567	0.919	21	17	50	8.54	0.683	13.8	21	17	50	5	7.50	0.828	39.1	18	41	50	5
1.289	21	11	44	1.580	0.911	21	49	18	8.47	0.678	13.6	21	19	52	5	7.43	0.819	39.0	18	49	42	5
1.286	19	19	48	1.590	0.906	21	33	26	7.27	0.675	39.2	18	19	50	5	7.72	0.818	35.5	15	15	16	5
1.280	19	13	42	1.593	0.904	21	35	34	8.40	0.672	13.6	21	49	44	5	7.48	0.818	38.3	18	17	10	5
1.279	19	21	50	1.595	0.903	21	41	10	8.34	0.667	13.5	21	51	42	5	7.33	0.812	39.5	18	15	50	5
1.278	19	33	30	1.601	0.899	19	19	48	7.18	0.666	39.0	18	49	42	5	7.08	0.800	41.1	18	49	16	5
1.277	19	31	28	1.603	0.898	19	21	50	7.22	0.665	38.3	17	17	48	5	7.08	0.800	41.1	18	9	18	5
1.272	19	11	40	1.606	0.897	21	9	42	8.31	0.665	13.1	21	13	48	5	7.91	0.793	30.4	18	33	50	18
1.271	21	19	52	1.610	0.894	19	13	42	7.08	0.662	39.8	18	15	50	5	7.76	0.789	31.7	18	41	8	5
1.266	19	15	48	1.614	0.892	19	11	40	8.26	0.661	13.2	19	15	48	5	7.67	0.789	32.8	17	17	48	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.42 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 7,750.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)        7910.3 (1077.30 )
Delta E: MWd/MTU, (GWd)         160.3 (  21.84 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -26.46
Flow: Mlb/hr                   104.19 (101.65 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- 16 -- 16 -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- --  6 --  8 --  8 --  6 -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- -- 16 -- 16 -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %           8.38

k-effective:                  0.99900
Void Fraction:                  0.452
Core Delta-P: psia             25.130
Core Plate Delta-P: psia       20.588
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          88.09
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00010
```

```
Core Average Exposure: MWd/MTU    19545.0

                  Axial Profile     Edit   Radial Power
          N(PRA)  Power Exposure   Zone   Avg.   Max.   IR JR
Top 25    0.183    3.419            4   0.815 0.959   27 28
    24    0.560   10.154            5   0.538 0.588    1 36
    23    0.772   14.315            6   0.512 0.549   11 54
    22    0.902   17.619            9   0.450 0.531   23 60
    21    0.978   19.985           10   0.511 0.524   33 60
    20    1.013   21.515           11   0.539 0.545   29 60
    19    1.040   22.343           14   1.055 1.146   23 50
    18    1.059   22.618           15   0.990 1.200   29 30
    17    1.059   22.553           16   1.054 1.208   21 48
    16    1.034   20.957           17   0.947 1.222   17 48
    15    1.034   20.848           18   0.974 1.218   19 50
    14    1.101   20.441           19   1.141 1.288   19 48
    13    1.131   20.905           20   1.076 1.258   21 52
    12    1.165   21.527           21   1.144 1.300   17 50
    11    1.198   22.141
    10    1.226   22.648
     9    1.243   22.843
     8    1.263   23.416
     7    1.278   24.120
     6    1.281*  24.703
     5    1.261   24.753*
     4    1.198   23.525
     3    1.048   19.963
     2    0.764   13.767
Bottom    0.210    3.789

% AXIAL TILT -10.051  -6.187
AVG BOT 8ft/12ft  1.0538  1.0271

Active Channel Flow: Mlb/hr        88.09
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.300	21	17	50	1.564	0.921	21	17	50	8.60	0.688	14.1	21	17	50	5	7.52	0.833	39.4	18	41	50	5
1.291	21	11	44	1.577	0.913	21	49	18	8.54	0.683	13.9	21	19	52	5	7.45	0.824	39.3	18	49	42	5
1.288	19	19	48	1.587	0.908	21	33	26	7.29	0.679	39.4	18	19	50	5	7.74	0.823	35.8	15	15	16	5
1.282	19	21	50	1.590	0.906	21	35	34	8.46	0.677	13.9	21	49	44	5	7.50	0.822	38.6	18	17	10	5
1.282	19	13	42	1.592	0.905	21	41	10	8.40	0.672	13.8	21	51	42	5	7.35	0.818	39.8	18	15	50	5
1.280	19	33	30	1.598	0.901	19	19	48	8.38	0.671	13.4	21	13	48	5	7.10	0.805	41.4	18	49	16	5
1.279	19	31	28	1.600	0.900	19	21	50	7.21	0.670	39.3	18	49	42	5	7.10	0.804	41.3	18	9	18	5
1.274	19	11	40	1.602	0.899	21	9	42	7.25	0.669	38.6	17	17	48	5	7.69	0.794	33.1	17	17	48	5
1.273	21	19	52	1.607	0.896	19	13	42	8.33	0.667	13.5	19	15	48	5	7.78	0.794	32.0	18	41	8	5
1.268	19	15	48	1.610	0.894	19	11	40	7.11	0.667	40.1	18	15	50	5	7.89	0.793	30.6	18	33	50	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.43 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 7,910.3 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        7910.5 (1077.30 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -25.92
Flow: Mlb/hr                   106.22 (103.63 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- 28 -- 28 -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              9.28

k-effective:                   0.99900
Void Fraction:                   0.431
Core Delta-P: psia              25.629
Core Plate Delta-P: psia        21.087
Coolant Temp: Deg-F              548.1
In Channel Flow: Mlb/hr          90.04   Active Channel Flow: Mlb/hr        90.04
Total Bypass Flow (%):           15.2    (of total core flow)
Total Water Rod Flow (%):        -0.0    (of total core flow)
Source Convergence             0.00009

                                        Core Average Exposure: MWd/MTU    19545.2

                                        Axial Profile    Edit   Radial Power
                                  N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                                  Top 25 0.198   3.419    4  0.916 0.948  27 42
                                     24  0.609  10.154    5  0.526 0.583   1 36
                                     23  0.841  14.315    6  0.504 0.536   7 50
                                     22  0.986  17.619    9  0.442 0.527  23 60
                                     21  1.074  19.985   10  0.505 0.516  33 60
                                     20  1.105  21.515   11  0.537 0.541  29 60
                                     19  1.118  22.344   14  1.026 1.187  23 38
                                     18  1.114  22.618   15  0.996 1.200  45 28
                                     17  1.104  22.554   16  1.047 1.174  29 52
                                     16  1.081  20.958   17  0.911 1.195  13 44
                                     15  1.083  20.848   18  1.005 1.175  21 40
                                     14  1.154  20.441   19  1.150 1.280  45 30
                                     13  1.181  20.905   20  1.113 1.244  29 50
                                     12  1.208  21.527   21  1.105 1.243  11 44
                                     11  1.225  22.141
                                     10  1.226* 22.648
                                      9  1.218  22.843
                                      8  1.214  23.416
                                      7  1.203  24.120
                                      6  1.178  24.703
                                      5  1.129  24.753*
                                      4  1.044  23.525
                                      3  0.892  19.963
                                      2  0.641  13.767
                                 Bottom  1  0.175   3.789

                                % AXIAL TILT  -3.720  -6.187
                              AVG BOT 8ft/12ft  1.0192  1.0271
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.280	19	45	30	1.583	0.909	19	43	34	7.68	0.680	34.5	14	11	38	18	8.33	0.833	30.1	14	49	24	18
1.265	19	23	40	1.591	0.905	21	49	18	7.26	0.634	33.1	16	41	46	20	7.56	0.786	33.7	16	9	32	20
1.261	19	33	40	1.593	0.904	19	15	30	7.58	0.632	28.4	14	27	54	12	7.58	0.783	33.2	16	41	16	20
1.258	19	17	34	1.597	0.902	19	35	42	7.88	0.631	10.8	19	11	40	18	8.00	0.759	24.9	14	33	8	15
1.256	19	35	42	1.612	0.893	19	13	42	7.19	0.631	33.6	16	9	30	20	7.23	0.739	32.2	16	13	40	18
1.256	19	13	34	1.619	0.889	19	37	22	7.40	0.624	29.5	17	43	14	20	7.39	0.737	29.9	16	29	52	15
1.255	19	35	38	1.622	0.888	19	29	24	7.72	0.618	10.8	19	9	38	18	7.73	0.735	29.7	17	43	14	20
1.246	19	15	44	1.622	0.888	19	15	44	7.69	0.615	10.0	21	35	8	12	6.86	0.732	36.1	16	9	36	19
1.245	19	21	42	1.623	0.887	19	13	34	7.68	0.614	10.8	20	11	32	20	7.35	0.728	29.2	16	25	10	12
1.245	19	13	42	1.626	0.886	21	41	10	6.93	0.608	33.6	16	13	22	19	7.21	0.722	30.3	14	47	26	19

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.44 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 7,910.5 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          8000.0 (1089.50 )
Delta E: MWd/MTU, (GWd)            89.5 (  12.19 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -26.02
Flow: Mlb/hr                     105.83 (103.25 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --             59  :JR
 3           -- -- -- 28 -- 28 -- -- --          55
 5        -- -- -- -- -- -- -- -- -- -- --       51
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --    47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- 28 -- 28 -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              9.28

k-effective:                     0.99902
Void Fraction:                     0.432
Core Delta-P: psia                25.493
Core Plate Delta-P: psia          20.950
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr            89.69   Active Channel Flow: Mlb/hr        89.69
Total Bypass Flow (%):              15.2   (of total core flow)
Total Water Rod Flow (%):           -0.0   (of total core flow)
Source Convergence               0.00006
```

Core Average Exposure: MWd/MTU 19634.7

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.199	3.440	4	0.916	0.947	27	42
24	0.611	10.213	5	0.525	0.582	1	36
23	0.843	14.396	6	0.503	0.535	7	50
22	0.987	17.715	9	0.442	0.527	23	60
21	1.074	20.089	10	0.504	0.515	33	60
20	1.105	21.622	11	0.536	0.540	29	60
19	1.118	22.452	14	1.026	1.187	23	38
18	1.113	22.726	15	0.996	1.200	45	28
17	1.103	22.660	16	1.046	1.173	29	52
16	1.081	21.058	17	0.910	1.195	13	44
15	1.082	20.948	18	1.004	1.175	21	40
14	1.153	20.539	19	1.150	1.280	45	30
13	1.181	21.005	20	1.113	1.245	29	50
12	1.208	21.629	21	1.105	1.244	11	44
11	1.225	22.244					
10	1.225*	22.752					
9	1.217	22.946					
8	1.213	23.519					
7	1.203	24.222					
6	1.178	24.802					
5	1.129	24.848*					
4	1.043	23.614					
3	0.892	20.038					
2	0.641	13.821					
Bottom 1	0.175	3.804					
% AXIAL TILT	-3.698	-6.148					
AVG BOT 8ft/12ft	1.0190	1.0269					

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.280	19	45	30	1.580	0.911	19	43	34	7.68	0.681	34.7	14	11	38	18	8.33	0.834	30.3	14	49	24	18
1.266	19	23	40	1.587	0.907	21	49	18	7.60	0.635	28.6	14	27	54	12	7.55	0.786	33.9	16	9	32	20
1.262	19	33	40	1.590	0.906	19	15	30	7.26	0.634	33.2	16	41	46	20	7.57	0.784	33.4	16	41	16	20
1.259	19	17	34	1.593	0.904	19	35	42	7.89	0.631	11.0	19	11	40	18	8.00	0.759	25.0	14	33	8	15
1.257	19	35	42	1.609	0.895	19	13	42	7.18	0.631	33.8	16	9	30	20	7.23	0.739	32.3	16	13	40	18
1.256	19	13	34	1.616	0.891	19	37	22	7.40	0.624	29.6	17	43	14	20	7.38	0.737	30.1	16	29	52	15
1.256	19	35	38	1.618	0.890	19	15	44	7.73	0.618	10.9	19	9	38	18	7.72	0.735	29.8	17	43	14	20
1.247	19	15	44	1.619	0.889	19	29	24	7.71	0.617	10.2	21	35	8	12	6.85	0.732	36.2	16	9	36	19
1.246	19	21	42	1.620	0.889	19	13	34	7.69	0.615	10.9	20	11	32	20	7.36	0.730	29.4	16	25	10	12
1.246	19	13	42	1.621	0.888	21	41	10	6.93	0.609	33.7	16	13	22	19	7.20	0.723	30.4	14	47	26	19

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.45 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 8,000.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    19884.8
Exposure: MWd/MTU (GWd)          8250.0 (1123.60 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.201   3.499     4  0.915 0.945  27 42
Inlet Subcooling: Btu/lbm         -26.13                       24  0.615  10.377     5  0.523 0.579   1 36
Flow: Mlb/hr                     105.43 (102.85 %)            23  0.848  14.623     6  0.501 0.534   7 50
                                                              22  0.990  17.981     9  0.440 0.524  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  1.075  20.378    10  0.502 0.512  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.104  21.920    11  0.532 0.536  29 60
 3           -- -- -- 28 -- 28 -- -- --           55          19  1.115  22.753    14  1.024 1.185  23 38
 5        -- -- -- -- -- -- -- -- -- -- --        51          18  1.110  23.026    15  0.994 1.196  45 28
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47          17  1.099  22.958    16  1.045 1.169  29 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.076  21.338    17  0.908 1.194  13 44
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 39          15  1.077  21.229    18  1.003 1.173  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.148  20.811    19  1.152 1.281  45 30
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- -- 31          13  1.176  21.283    20  1.115 1.245  21 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.203  21.914    21  1.108 1.248  11 44
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 23          11  1.219  22.533
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.221* 23.041
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --    15           9  1.215  23.234
25       -- -- -- -- -- -- -- -- -- -- --       11           8  1.212  23.806
27          -- -- -- 28 -- 28 -- -- --           7           7  1.204  24.506
29             -- -- -- -- -- -- --              3           6  1.181  25.081
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.135  25.115*
                                                             4  1.051  23.860
Control Rod Density: %            9.28                       3  0.899  20.249
                                                             2  0.648  13.973
k-effective:                   0.99896                Bottom  1  0.177   3.846
Void Fraction:                   0.433
Core Delta-P: psia              25.314              % AXIAL TILT  -3.804  -6.042
Core Plate Delta-P: psia        20.772          AVG BOT 8ft/12ft  1.0187  1.0263
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          89.36   Active Channel Flow: Mlb/hr        89.36
Total Bypass Flow (%):           15.2   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence             0.00010
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.281	19	45	30	1.579	0.912	19	43	34	7.63	0.680	35.1	14	11	38	18	8.28	0.834	30.7	14	49	24	18
1.266	19	23	40	1.582	0.910	21	49	18	7.22	0.634	33.6	16	41	46	20	7.53	0.787	34.3	16	9	32	20
1.263	19	33	40	1.588	0.907	19	15	30	7.53	0.631	29.0	14	27	54	12	7.53	0.783	33.8	16	41	16	20
1.259	19	17	34	1.592	0.905	19	35	42	7.16	0.631	34.1	16	9	30	20	7.94	0.757	25.5	14	33	8	15
1.257	19	35	38	1.604	0.897	19	13	42	7.88	0.631	11.4	19	11	40	18	7.05	0.739	34.4	16	13	40	19
1.257	19	35	42	1.613	0.893	19	37	22	7.36	0.624	30.0	17	43	14	20	7.31	0.734	30.5	16	29	52	15
1.257	19	13	34	1.614	0.892	19	15	44	7.73	0.618	11.4	19	9	38	18	7.67	0.734	30.3	17	43	14	20
1.250	19	15	44	1.615	0.892	19	29	24	7.70	0.616	11.3	20	11	32	20	6.83	0.733	36.6	16	9	36	19
1.249	19	13	42	1.615	0.891	21	41	10	7.68	0.615	10.6	21	35	8	12	7.29	0.727	29.8	16	25	10	12
1.248	21	11	44	1.618	0.890	19	13	34	6.79	0.609	35.8	18	11	28	20	6.44	0.726	40.9	18	49	16	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.46 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 8,250.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)        8500.0 (1157.60 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.18
Flow: Mlb/hr                   105.22 (102.65 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- 28 -- 28 -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.28

k-effective:                 0.99903
Void Fraction:                 0.433
Core Delta-P: psia            25.279
Core Plate Delta-P: psia      20.737
Coolant Temp: Deg-F           548.1
In Channel Flow: Mlb/hr        89.15
Total Bypass Flow (%):          15.3
Total Water Rod Flow (%):       -0.0
Source Convergence          0.00007
```

Core Average Exposure: MWd/MTU 20134.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.202	3.558	4	0.914	0.944	27	42
24	0.620	10.542	5	0.521	0.577	1	36
23	0.853	14.851	6	0.500	0.532	7	50
22	0.993	18.248	9	0.438	0.522	23	60
21	1.076	20.669	10	0.499	0.509	33	60
20	1.104	22.218	11	0.529	0.532	29	60
19	1.114	23.054	14	1.022	1.183	23	38
18	1.108	23.325	15	0.993	1.194	45	28
17	1.096	23.254	16	1.043	1.166	29	52
16	1.072	21.616	17	0.906	1.194	13	44
15	1.072	21.508	18	1.002	1.171	21	40
14	1.143	21.082	19	1.155	1.282	15	32
13	1.171	21.561	20	1.116	1.249	21	52
12	1.198	22.198	21	1.110	1.252	11	44
11	1.215	22.821					
10	1.217*	23.329					
9	1.212	23.521					
8	1.212	24.092					
7	1.205	24.791					
6	1.185	25.360					
5	1.140	25.384*					
4	1.056	24.109					
3	0.904	20.462					
2	0.652	14.126					
Bottom 1	0.178	3.888					
% AXIAL TILT	-3.867	-5.940					
AVG BOT 8ft/12ft	1.0183	1.0257					

Active Channel Flow: Mlb/hr 89.15

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.282	19	15	32	1.577	0.913	19	43	34	7.60	0.679	35.5	14	11	38	18	8.24	0.834	31.2	14	49	24	18
1.268	19	23	40	1.578	0.912	21	49	18	7.20	0.634	34.0	16	41	46	20	7.50	0.788	34.8	16	9	32	20
1.264	19	33	40	1.585	0.908	19	15	30	7.14	0.632	34.5	16	9	30	20	7.49	0.783	34.2	16	41	16	20
1.260	19	17	34	1.590	0.906	19	35	42	7.88	0.631	11.8	19	11	40	18	7.88	0.755	25.9	14	33	8	15
1.259	19	35	38	1.601	0.899	19	13	42	7.48	0.630	29.4	14	27	54	12	7.02	0.739	34.8	16	13	40	19
1.258	19	35	42	1.610	0.894	19	37	22	7.32	0.623	30.4	17	43	14	20	6.80	0.733	37.0	16	9	36	19
1.258	19	13	34	1.611	0.894	21	41	10	7.73	0.618	11.8	19	9	38	18	6.47	0.733	41.3	18	49	16	6
1.253	19	15	44	1.611	0.894	19	15	44	7.72	0.617	11.8	20	11	32	20	7.63	0.733	30.7	17	43	14	20
1.252	19	13	42	1.611	0.894	19	29	24	7.67	0.613	11.0	21	35	8	12	7.25	0.732	30.9	16	29	52	15
1.252	21	11	44	1.616	0.891	19	23	52	6.78	0.610	36.2	18	11	28	20	6.71	0.729	37.7	18	17	10	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.47 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 8,500.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)        8750.0 (1191.70 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.34
Flow: Mlb/hr                   104.65 (102.10 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- 28 -- 28 -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.28

k-effective:                 0.99901
Void Fraction:                 0.434
Core Delta-P: psia            25.076
Core Plate Delta-P: psia      20.534
Coolant Temp: Deg-F           548.1
In Channel Flow: Mlb/hr        88.66
Total Bypass Flow (%):          15.3
Total Water Rod Flow (%):       -0.0
Source Convergence           0.00006
```

Core Average Exposure: MWd/MTU 20384.7

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.204	3.618	4	0.914	0.944	27	42
24	0.624	10.709	5	0.519	0.574	1	36
23	0.858	15.080	6	0.498	0.530	11	54
22	0.996	18.516	9	0.437	0.520	23	60
21	1.077	20.959	10	0.496	0.506	33	60
20	1.102	22.515	11	0.525	0.528	29	60
19	1.112	23.355	14	1.021	1.181	23	38
18	1.105	23.624	15	0.992	1.191	45	28
17	1.092	23.550	16	1.041	1.163	15	42
16	1.067	21.894	17	0.903	1.192	13	44
15	1.067	21.785	18	1.001	1.169	21	40
14	1.138	21.352	19	1.157	1.283	15	32
13	1.166	21.837	20	1.118	1.253	21	52
12	1.193	22.481	21	1.112	1.255	11	44
11	1.210	23.108					
10	1.213*	23.616					
9	1.210	23.808					
8	1.211	24.379					
7	1.207	25.076					
6	1.189	25.640					
5	1.147	25.654*					
4	1.064	24.359					
3	0.912	20.676					
2	0.658	14.280					
Bottom 1	0.180	3.931					
% AXIAL TILT	-3.992	-5.841					
AVG BOT 8ft/12ft	1.0182	1.0252					

Active Channel Flow: Mlb/hr 88.66
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.283	19	15	32	1.573	0.915	21	49	18	7.58	0.679	35.8	14	11	38	19	8.21	0.834	31.7	14	49	24	18
1.270	19	23	40	1.573	0.915	19	43	34	7.17	0.633	34.4	16	41	46	20	7.47	0.789	35.2	16	9	32	20
1.267	19	33	40	1.581	0.911	19	15	30	7.11	0.632	34.9	16	9	30	20	7.45	0.783	34.7	16	41	16	20
1.262	19	35	38	1.586	0.908	19	35	42	7.88	0.630	12.3	19	11	40	18	7.83	0.754	26.4	14	33	8	15
1.262	19	17	34	1.596	0.902	19	13	42	7.43	0.628	29.8	14	27	54	12	6.50	0.740	41.7	18	49	16	6
1.260	19	35	42	1.604	0.898	21	41	10	7.29	0.622	30.8	17	43	14	20	6.99	0.739	35.3	16	13	40	19
1.260	19	13	34	1.605	0.897	19	37	22	7.73	0.620	15.3	21	19	52	5	6.66	0.736	39.1	18	17	10	5
1.256	19	15	44	1.605	0.897	19	15	44	7.73	0.618	12.2	20	11	32	20	6.87	0.735	36.3	15	15	16	6
1.255	19	13	42	1.606	0.897	19	29	24	7.73	0.618	12.2	19	9	38	18	6.78	0.734	37.4	16	9	36	19
1.255	21	11	44	1.609	0.895	19	23	52	7.65	0.612	11.4	21	35	8	12	7.58	0.732	31.1	17	43	14	20

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.48 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 8,750.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    20634.7
Exposure: MWd/MTU (GWd)          9000.0 (1225.70 )
Delta E: MWd/MTU, (GWd)           250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                     Top 25  0.206   3.678    4  0.914 0.943  27 42
Inlet Subcooling: Btu/lbm         -26.55                        24  0.628  10.877    5  0.517 0.572   1 36
Flow: Mlb/hr                     103.87 (101.34 %)             23  0.861  15.311    6  0.496 0.529  11 54
                                                               22  0.997  18.785    9  0.435 0.517  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29                21  1.076  21.249   10  0.494 0.502  33 60
 1              -- -- -- -- -- -- --              59  :JR      20  1.101  22.813   11  0.522 0.525  29 60
 3           -- -- -- 28 -- 28 -- -- --           55           19  1.109  23.654   14  1.019 1.180  23 38
 5        -- -- -- -- -- -- -- -- -- -- --        51           18  1.101  23.922   15  0.990 1.189  15 34
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47           17  1.087  23.844   16  1.039 1.162  15 42
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43           16  1.062  22.170   17  0.900 1.191  13 44
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 39           15  1.062  22.062   18  0.999 1.168  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35           14  1.133  21.620   19  1.159 1.285  15 32
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- -- 31           13  1.161  22.112   20  1.119 1.257  21 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27           12  1.188  22.762   21  1.114 1.258  11 44
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- -- 23           11  1.206  23.394
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19           10  1.210  23.903
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --    15            9  1.208  24.094
25       -- -- -- -- -- -- -- -- -- -- --       11            8  1.211* 24.665
27          -- -- -- 28 -- 28 -- -- --           7            7  1.209  25.361
29             -- -- -- -- -- -- --              3            6  1.194  25.921
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58               5  1.154  25.925*
                                                              4  1.072  24.610
Control Rod Density: %             9.28                       3  0.919  20.891
                                                              2  0.664  14.436
k-effective:                    0.99900                Bottom  1  0.182   3.974
Void Fraction:                    0.436
Core Delta-P: psia               24.802              % AXIAL TILT  -4.162  -5.746
Core Plate Delta-P: psia         20.261          AVG BOT 8ft/12ft  1.0184  1.0246
Coolant Temp: Deg-F              548.0
In Channel Flow: Mlb/hr          87.98   Active Channel Flow: Mlb/hr        87.98
Total Bypass Flow (%):            15.3   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.285	19	15	32	1.566	0.919	21	49	18	7.54	0.679	36.2	14	11	38	19	8.16	0.834	32.2	14	49	24	18
1.272	19	23	40	1.568	0.918	19	43	34	7.13	0.633	34.7	16	41	46	20	7.43	0.789	35.6	16	9	32	20
1.269	19	33	40	1.575	0.914	19	15	30	7.08	0.632	35.3	16	9	30	20	7.41	0.782	35.1	16	41	16	20
1.265	19	35	38	1.580	0.911	19	35	42	7.84	0.631	15.7	21	19	52	5	7.78	0.752	26.8	14	33	8	15
1.263	19	17	34	1.589	0.906	19	13	42	7.87	0.630	12.7	19	11	40	18	6.54	0.747	42.1	18	49	16	6
1.262	19	35	42	1.596	0.902	21	41	10	7.39	0.626	30.2	14	27	54	12	6.71	0.744	39.5	18	17	10	5
1.261	19	13	34	1.599	0.901	19	15	44	7.76	0.622	15.2	21	13	48	5	6.90	0.741	36.7	15	15	16	6
1.259	19	15	44	1.599	0.901	19	37	22	7.25	0.621	31.2	17	43	14	20	6.96	0.738	35.7	16	13	40	19
1.258	19	13	42	1.599	0.901	19	29	24	7.74	0.619	12.6	20	11	32	20	6.58	0.738	40.5	18	41	50	6
1.258	21	11	44	1.601	0.899	19	23	52	7.72	0.618	12.6	19	9	38	18	6.75	0.733	37.8	16	9	36	19

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.49 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 9,000.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    20884.7
Exposure: MWd/MTU (GWd)        9250.0 (1259.80 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.207   3.739     4  0.913 0.943  27 42
Inlet Subcooling: Btu/lbm       -26.69                      24  0.632  11.045     5  0.515 0.569   1 36
Flow: Mlb/hr                   103.37 (100.85 %)            23  0.866  15.542     6  0.494 0.527  11 54
                                                            22  0.999  19.054     9  0.433 0.515  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  1.077  21.540    10  0.491 0.499  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  1.100  23.110    11  0.518 0.521  29 60
 3           -- -- -- 28 -- 28 -- -- --           55        19  1.107  23.954    14  1.018 1.178  23 38
 5        -- -- -- -- -- -- -- -- -- -- --        51        18  1.098  24.219    15  0.989 1.187  45 28
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47        17  1.083  24.138    16  1.038 1.161  15 42
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43        16  1.057  22.445    17  0.898 1.190  13 44
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  39        15  1.057  22.337    18  0.998 1.166  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35        14  1.127  21.888    19  1.162 1.287  15 32
15 -- -- 12 -- -- -- --  8 --  8 -- -- -- 12 --  31        13  1.155  22.386    20  1.121 1.261  21 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27        12  1.182  23.043    21  1.116 1.261  11 44
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  23        11  1.200  23.678
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19        10  1.205  24.188
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --     15         9  1.205  24.380
25       -- -- -- -- -- -- -- -- -- -- --        11         8  1.210  24.952
27          -- -- -- 28 -- 28 -- -- --            7         7  1.211* 25.647
29             -- -- -- -- -- -- --               3         6  1.199  26.204*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.161  26.198
                                                             4  1.081  24.864
Control Rod Density: %          9.28                         3  0.928  21.108
                                                             2  0.671  14.593
k-effective:                 0.99902                  Bottom  1  0.184   4.018
Void Fraction:                 0.437
Core Delta-P: psia            24.635              % AXIAL TILT  -4.301  -5.655
Core Plate Delta-P: psia      20.093          AVG BOT 8ft/12ft  1.0183  1.0241
Coolant Temp: Deg-F           548.0
In Channel Flow: Mlb/hr        87.53   Active Channel Flow: Mlb/hr        87.53
Total Bypass Flow (%):          15.3   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.287	19	15	32	1.561	0.922	21	49	18	7.52	0.680	36.6	14	11	38	19	8.13	0.835	32.6	14	49	24	18
1.274	19	23	40	1.565	0.920	19	43	34	7.95	0.642	16.2	21	19	52	5	7.40	0.789	36.1	16	9	32	20
1.272	19	33	40	1.571	0.917	19	15	30	7.89	0.634	15.6	21	13	48	5	7.37	0.782	35.5	16	41	16	20
1.267	19	35	38	1.576	0.913	19	35	42	7.10	0.633	35.1	16	41	46	20	6.50	0.756	43.5	18	11	46	5
1.265	19	17	34	1.584	0.909	19	13	42	7.06	0.633	35.7	16	9	30	20	6.75	0.752	39.9	18	17	10	5
1.263	19	35	42	1.589	0.906	21	41	10	7.87	0.630	13.1	19	11	40	18	7.73	0.751	27.3	14	33	8	15
1.263	19	13	34	1.594	0.904	19	15	44	7.80	0.628	15.8	20	21	52	5	6.93	0.747	37.1	15	15	16	6
1.262	19	15	44	1.594	0.903	19	29	24	7.78	0.626	15.6	19	47	46	5	6.61	0.744	40.8	18	41	50	6
1.261	20	21	52	1.594	0.903	19	37	22	7.74	0.625	16.1	21	49	44	5	7.09	0.740	34.1	18	41	8	5
1.261	19	13	42	1.595	0.903	19	23	52	7.34	0.625	30.6	14	27	54	12	6.50	0.740	41.7	18	15	50	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.50 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 9,250.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    21084.7
Exposure: MWd/MTU (GWd)        9450.0 (1287.00 )
Delta E: MWd/MTU, (GWd)         200.0 (  27.24 )                Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.208   3.788     4  0.913 0.942  27 42
Inlet Subcooling: Btu/lbm       -26.85                      24  0.634  11.181     5  0.514 0.567   1 36
Flow: Mlb/hr                   102.80 (100.29 %)            23  0.868  15.728     6  0.492 0.526  11 54
                                                            22  1.000  19.270     9  0.432 0.513  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  1.076  21.772    10  0.489 0.497  33 60
 1              -- -- -- -- -- -- --            59  :JR     20  1.098  23.347    11  0.515 0.518  29 60
 3           -- -- -- 28 -- 28 -- -- --         55          19  1.104  24.193    14  1.016 1.177  23 38
 5        -- -- -- -- -- -- -- -- -- -- --      51          18  1.095  24.456    15  0.988 1.185  15 34
 7     -- -- -- -- 12 --  8 --  8 -- 12 -- -- --  47         17  1.079  24.372    16  1.036 1.160  15 42
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43         16  1.053  22.664    17  0.896 1.189  13 44
11 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  39         15  1.052  22.556    18  0.997 1.165  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35         14  1.122  22.100    19  1.163 1.288  15 32
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31         13  1.150  22.604    20  1.122 1.265  21 52
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27         12  1.177  23.266    21  1.118 1.264  11 44
19 -- -- 16 --  8 -- -- -- -- --  8 -- 16 -- --  23         11  1.195  23.905
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19         10  1.201  24.416
23    -- -- -- 12 --  8 --  8 -- 12 -- -- --     15          9  1.203  24.607
25       -- -- -- -- -- -- -- -- -- -- --        11          8  1.210  25.181
27 ~        -- -- -- 28 -- 28 -- -- --           7          7  1.213* 25.876
29             -- -- -- -- -- -- --              3          6  1.204  26.430*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.169  26.417
                                                            4  1.090  25.068
Control Rod Density: %          9.28                        3  0.936  21.284
                                                            2  0.677  14.720
k-effective:                 0.99901                Bottom  1  0.186   4.053
Void Fraction:                 0.439
Core Delta-P: psia            24.438          % AXIAL TILT  -4.486  -5.586
Core Plate Delta-P: psia      19.897       AVG BOT 8ft/12ft  1.0187  1.0237
Coolant Temp: Deg-F           548.0
In Channel Flow: Mlb/hr        87.03   Active Channel Flow: Mlb/hr        87.03
Total Bypass Flow (%):          15.3   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.288	19	15	32	1.556	0.925	21	49	18	7.49	0.680	36.9	14	11	38	19	8.11	0.835	32.8	14	49	24	19
1.275	19	23	40	1.561	0.923	19	43	34	8.05	0.652	16.5	21	19	52	5	7.38	0.789	36.4	16	9	32	20
1.274	19	33	40	1.567	0.919	19	15	30	8.00	0.645	15.9	21	13	48	5	7.34	0.781	35.9	16	41	16	20
1.269	19	35	38	1.573	0.916	19	35	42	7.89	0.637	16.1	20	21	52	5	6.55	0.764	43.8	18	11	46	5
1.267	19	17	34	1.580	0.912	19	13	42	7.88	0.635	16.0	19	47	46	5	6.79	0.759	40.2	18	17	10	5
1.265	19	35	42	1.583	0.909	21	41	10	7.82	0.633	16.5	21	49	44	5	6.96	0.754	37.6	15	15	16	5
1.265	19	15	44	1.589	0.906	19	15	44	7.04	0.633	36.0	16	9	30	20	6.64	0.750	41.2	18	41	50	6
1.265	20	21	52	1.590	0.906	19	23	52	7.08	0.632	35.4	16	41	46	20	7.68	0.749	27.6	14	33	8	15
1.264	19	13	34	1.590	0.906	19	29	24	7.87	0.629	13.5	19	11	40	18	6.55	0.749	42.0	18	15	50	5
1.264	21	11	44	1.590	0.906	19	37	22	7.30	0.623	30.9	14	27	54	12	7.14	0.748	34.4	18	41	8	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.51 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 9,450.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    21084.9
Exposure: MWd/MTU (GWd)          9450.2 (1287.00 )
Delta E: MWd/MTU, (GWd)             0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                       3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia              1050.0                    Top 25  0.209   3.788     4  0.916 0.947  27 42
Inlet Subcooling: Btu/lbm         -26.34                       24  0.638  11.181     5  0.513 0.562   1 36
Flow: Mlb/hr                     104.63 (102.08 %)            23  0.873  15.729     6  0.491 0.527  11 54
                                                              22  1.005  19.270     9  0.431 0.516  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  1.079  21.773    10  0.488 0.499  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.098  23.348    11  0.515 0.521  29 60
 3           -- -- -- 28 -- 28 -- -- --           55          19  1.100  24.193    14  1.015 1.181  23 38
 5        -- -- -- -- -- -- -- -- -- -- --        51          18  1.084  24.457    15  0.990 1.190  23 42
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47          17  1.060  24.372    16  1.035 1.160  29 52
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- --     43          16  1.040  22.664    17  0.896 1.186  13 44
11  -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- -- 39          15  1.044  22.556    18  0.997 1.168  21 40
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.119  22.101    19  1.164 1.286  15 32
15  -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- -- 31          13  1.149  22.604    20  1.119 1.272  21 52
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.179  23.266    21  1.117 1.258  11 44
19  -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- -- 23          11  1.199  23.905
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.206  24.416
23     -- -- -- 12 --  8 --  8 -- 12 -- -- --     15           9  1.208  24.608
25        -- -- -- -- -- -- -- -- -- -- --        11           8  1.216  25.181
27           -- -- -- 28 -- 28 -- -- --           7           7  1.219* 25.876
29              -- -- -- -- -- -- --              3           6  1.208  26.431*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58               5  1.172  26.417
                                                              4  1.092  25.068
Control Rod Density: %              9.37                      3  0.938  21.284
                                                              2  0.678  14.720
k-effective:                     0.99901                Bottom 1  0.186   4.053
Void Fraction:                     0.436
Core Delta-P: psia                25.096              % AXIAL TILT  -4.825  -5.585
Core Plate Delta-P: psia          20.554          AVG BOT 8ft/12ft  1.0197  1.0237
Coolant Temp: Deg-F              548.1
In Channel Flow: Mlb/hr           88.64   Active Channel Flow: Mlb/hr        88.64
Total Bypass Flow (%):             15.3   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence               0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.286	19	15	32	1.575	0.914	19	43	34	7.32	0.664	36.9	14	11	38	19	7.95	0.818	32.8	14	49	24	19
1.280	19	23	40	1.576	0.913	19	35	42	8.08	0.654	16.5	21	19	52	5	7.36	0.783	35.9	16	41	16	20
1.280	19	33	40	1.579	0.912	21	49	18	8.03	0.648	15.9	21	13	48	5	7.31	0.783	36.4	16	9	32	20
1.274	19	35	38	1.584	0.909	19	15	30	7.92	0.639	16.1	20	21	52	5	6.57	0.767	43.8	18	11	46	5
1.272	20	21	52	1.588	0.907	21	41	10	7.92	0.638	16.0	19	47	46	5	6.82	0.762	40.2	18	17	10	5
1.271	19	35	42	1.592	0.904	19	23	52	7.86	0.636	16.5	21	49	44	5	6.98	0.757	37.6	15	15	16	5
1.266	19	17	34	1.593	0.904	19	29	24	7.10	0.634	35.4	16	41	46	20	7.74	0.754	27.6	14	33	8	15
1.264	19	23	52	1.595	0.903	19	37	22	7.35	0.627	30.9	14	27	54	12	6.67	0.754	41.2	18	41	50	6
1.264	19	15	44	1.602	0.899	21	33	36	6.98	0.627	36.0	16	9	30	20	6.58	0.752	42.0	18	15	50	5
1.262	19	21	50	1.604	0.898	20	21	52	6.42	0.623	43.3	18	49	46	5	7.16	0.750	34.4	18	41	8	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.52 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 9,450.2 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)          9750.0 (1327.90 )
Delta E: MWd/MTU, (GWd)           299.8 (  40.83 )
Power: MWt                       3952.0 (100.00 %)
Core Pressure: psia              1050.0
Inlet Subcooling: Btu/lbm         -26.59
Flow: Mlb/hr                     103.72 (101.19 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- 12 --  8 --  8 -- 12 -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- 28 -- 28 -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              9.37

k-effective:                     0.99902
Void Fraction:                     0.438
Core Delta-P: psia                24.787
Core Plate Delta-P: psia          20.245
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr           87.82   Active Channel Flow: Mlb/hr        87.82
Total Bypass Flow (%):             15.3   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence               0.00008
```

```
Core Average Exposure: MWd/MTU    21384.7

                  Axial Profile     Edit   Radial Power
          N(PRA)  Power  Exposure   Zone   Avg.   Max.   IR JR
Top 25    0.211    3.862      4    0.916  0.946  27 42
    24    0.642   11.387      5    0.511  0.559   1 36
    23    0.876   16.010      6    0.489  0.525  11 54
    22    1.005   19.595      9    0.429  0.513  23 60
    21    1.078   22.122     10    0.485  0.495  33 60
    20    1.095   23.703     11    0.511  0.516  29 60
    19    1.096   24.549     14    1.013  1.179  23 38
    18    1.079   24.807     15    0.988  1.188  23 42
    17    1.055   24.715     16    1.033  1.156  29 52
    16    1.034   22.987     17    0.892  1.185  13 44
    15    1.038   22.880     18    0.995  1.166  21 40
    14    1.111   22.417     19    1.167  1.288  15 32
    13    1.142   22.929     20    1.121  1.277  21 52
    12    1.172   23.599     21    1.120  1.263  19 52
    11    1.193   24.244
    10    1.201   24.757
     9    1.205   24.950
     8    1.216   25.525
     7   1.223*   26.222
     6    1.216   26.773*
     5    1.183   26.750
     4    1.105   25.378
     3    0.950   21.550
     2    0.688   14.912
Bottom    0.189    4.106

% AXIAL TILT   -5.123   -5.491
AVG BOT 8ft/12ft  1.0205  1.0231
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.288	19	15	32	1.570	0.917	19	43	34	8.22	0.669	17.1	21	19	52	5	7.90	0.818	33.4	14	49	24	19
1.283	19	33	40	1.571	0.917	19	35	42	8.20	0.664	16.5	21	13	48	5	7.24	0.782	37.2	16	9	30	20
1.283	19	23	40	1.572	0.916	21	49	18	7.28	0.664	37.4	14	11	38	19	7.31	0.782	36.4	16	41	16	20
1.277	19	35	38	1.578	0.913	19	15	30	8.06	0.653	16.6	20	21	52	5	6.65	0.780	44.3	18	11	46	5
1.277	20	21	52	1.578	0.912	21	41	10	8.06	0.653	16.5	19	47	46	5	6.87	0.772	40.7	18	17	10	5
1.273	19	35	42	1.583	0.909	19	23	52	7.99	0.649	17.0	21	49	44	5	7.04	0.768	38.1	15	15	16	5
1.268	19	23	52	1.586	0.908	19	29	24	7.04	0.633	36.0	16	41	16	20	6.65	0.764	42.5	18	15	50	5
1.268	19	17	34	1.589	0.906	19	37	22	6.49	0.633	43.7	18	49	46	5	6.71	0.762	41.6	18	41	50	6
1.268	19	15	44	1.594	0.904	20	21	52	6.61	0.627	41.1	17	47	44	5	7.23	0.761	34.9	18	41	8	5
1.267	19	21	50	1.595	0.903	21	33	36	6.94	0.627	36.4	16	9	30	20	7.67	0.752	28.2	14	33	8	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.53 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 9,750.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       10000.0 (1361.90 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.80
Flow: Mlb/hr                    102.97 (100.46 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 12 --  8 --  8 -- 12 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- 12 --  8 --  8 -- 12 -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- 28 -- 28 -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            9.37

k-effective:                   0.99901
Void Fraction:                   0.440
Core Delta-P: psia              24.527
Core Plate Delta-P: psia        19.985
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          87.17   Active Channel Flow: Mlb/hr        87.17
Total Bypass Flow (%):            15.3   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00009
```

Core Average Exposure: MWd/MTU 21634.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.212	3.924	4	0.916	0.946	27	42
24	0.644	11.560	5	0.509	0.557	1	36
23	0.878	16.246	6	0.488	0.523	11	54
22	1.004	19.866	9	0.428	0.510	23	60
21	1.075	22.412	10	0.482	0.492	33	60
20	1.092	23.998	11	0.507	0.513	29	60
19	1.091	24.844	14	1.012	1.177	23	38
18	1.074	25.098	15	0.987	1.186	23	42
17	1.049	24.999	16	1.031	1.154	15	42
16	1.028	23.255	17	0.890	1.183	13	44
15	1.031	23.149	18	0.994	1.165	21	40
14	1.104	22.679	19	1.169	1.290	15	32
13	1.135	23.199	20	1.122	1.281	21	52
12	1.165	23.876	21	1.122	1.267	19	52
11	1.187	24.525					
10	1.197	25.040					
9	1.203	25.235					
8	1.217	25.813					
7	1.227*	26.511					
6	1.224	27.061*					
5	1.194	27.030					
4	1.118	25.639					
3	0.963	21.775					
2	0.698	15.075					
Bottom 1	0.191	4.151					
% AXIAL TILT	-5.456	-5.417					
AVG BOT 8ft/12ft	1.0215	1.0226					

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.290	19	15	32	1.566	0.920	21	49	18	8.34	0.681	17.5	21	19	52	5	7.86	0.818	33.8	14	49	24	19
1.285	19	33	40	1.566	0.919	19	43	34	8.35	0.678	16.9	21	13	48	5	6.71	0.792	44.7	18	11	46	5
1.285	19	23	40	1.567	0.919	19	35	42	8.19	0.665	16.9	19	47	46	5	6.93	0.782	41.1	18	17	10	5
1.281	20	21	52	1.571	0.916	21	41	10	8.18	0.665	17.1	20	21	52	5	7.20	0.781	37.6	16	9	30	20
1.280	19	35	38	1.573	0.915	19	15	30	7.24	0.663	37.8	14	11	38	19	7.26	0.780	36.8	16	41	16	20
1.275	19	35	42	1.577	0.913	19	23	52	8.09	0.660	17.4	21	49	44	5	7.10	0.778	38.5	15	15	16	5
1.272	19	23	52	1.581	0.911	19	29	24	6.55	0.641	44.0	18	49	46	5	6.72	0.776	42.9	18	15	50	5
1.271	19	21	50	1.584	0.909	19	37	22	6.67	0.634	41.4	17	47	44	5	6.68	0.772	43.0	18	41	50	5
1.271	19	15	44	1.586	0.908	20	21	52	7.00	0.632	36.4	16	41	16	20	7.29	0.771	35.4	18	41	8	5
1.270	19	17	34	1.590	0.905	21	33	36	7.72	0.630	17.4	21	17	50	5	6.46	0.758	44.4	18	9	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.54 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,000.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      10000.2 (1361.90 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -26.16
Flow: Mlb/hr                  105.32 (102.75 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 10 --  8 --  8 -- 10 -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- 10 --  8 --  8 -- 10 -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- 28 -- 28 -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            9.46

k-effective:                   0.99902
Void Fraction:                   0.438
Core Delta-P: psia              25.397
Core Plate Delta-P: psia        20.855
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          89.20
Total Bypass Flow (%):           15.3
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00009

                                    Core Average Exposure: MWd/MTU    21635.0

                                    Axial Profile     Edit   Radial Power
                                N(PRA) Power Exposure Zone  Avg.  Max.  IR JR
                                Top 25  0.211   3.924    4  0.919 0.948 27 42
                                    24  0.643  11.560    5  0.508 0.559  1 36
                                    23  0.876  16.246    6  0.487 0.521 11 54
                                    22  1.000  19.866    9  0.427 0.510 23 60
                                    21  1.068  22.413   10  0.483 0.492 33 60
                                    20  1.079  23.998   11  0.509 0.513 29 60
                                    19  1.071  24.844   14  1.013 1.181 23 38
                                    18  1.060  25.099   15  0.988 1.188 35 40
                                    17  1.040  25.000   16  1.031 1.155 29 52
                                    16  1.023  23.255   17  0.889 1.181 13 44
                                    15  1.030  23.149   18  0.992 1.166 21 40
                                    14  1.106  22.680   19  1.168 1.296 15 32
                                    13  1.139  23.199   20  1.124 1.278 21 52
                                    12  1.171  23.876   21  1.123 1.265 11 44
                                    11  1.194  24.526
                                    10  1.205  25.041
                                     9  1.212  25.235
                                     8  1.225  25.813
                                     7  1.235* 26.511
                                     6  1.231  27.061*
                                     5  1.200  27.030
                                     4  1.123  25.640
                                     3  0.966  21.775
                                     2  0.700  15.075
                                Bottom  1  0.192   4.151
                                % AXIAL TILT  -6.053  -5.417
                                AVG BOT 8ft/12ft  1.0257  1.0226
Active Channel Flow: Mlb/hr        89.20
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.296	19	15	32	1.576	0.914	19	43	34	8.40	0.686	17.5	21	19	52	5	7.85	0.817	33.8	14	49	24	19
1.289	19	33	40	1.581	0.911	19	15	30	8.40	0.683	16.9	21	13	48	5	6.75	0.796	44.7	18	11	46	5
1.287	19	23	40	1.583	0.910	19	35	42	8.24	0.669	16.9	19	47	46	5	6.97	0.787	41.1	18	17	10	5
1.284	19	35	38	1.586	0.908	21	49	18	8.23	0.669	17.1	20	21	52	5	7.23	0.785	37.6	16	9	30	20
1.278	20	21	52	1.593	0.904	19	29	24	8.14	0.664	17.4	21	49	44	5	7.14	0.783	38.5	15	15	16	5
1.277	19	35	42	1.600	0.900	21	33	36	7.24	0.662	37.8	14	11	38	19	6.76	0.781	42.9	18	15	50	5
1.275	19	17	34	1.600	0.900	19	37	22	6.59	0.645	44.0	18	49	46	5	6.72	0.777	43.0	18	41	50	5
1.270	19	23	52	1.601	0.900	19	23	52	6.71	0.638	41.4	17	47	44	5	7.33	0.775	35.4	18	41	8	5
1.268	19	13	34	1.603	0.898	21	41	10	7.77	0.634	17.4	21	17	50	5	6.49	0.763	44.4	18	9	18	5
1.265	21	11	44	1.614	0.892	20	21	52	6.69	0.632	40.8	18	17	52	5	7.04	0.761	37.3	17	47	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.55 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,000.2 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       10200.0 (1389.10 )
Delta E: MWd/MTU, (GWd)         199.8 (  27.21 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -26.33
Flow: Mlb/hr                   104.70 (102.14 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 10 --  8 --  8 -- 10 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- 10 --  8 --  8 -- 10 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- 28 -- 28 -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            9.46

k-effective:                   0.99901
Void Fraction:                   0.440
Core Delta-P: psia              25.179
Core Plate Delta-P: psia        20.638
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          88.65
Total Bypass Flow (%):           15.3
Total Water Rod Flow (%):        -0.0
Source Convergence             0.00008
```

Core Average Exposure: MWd/MTU 21834.7

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.212	3.974	4	0.918	0.947	27	42
24	0.644	11.698	5	0.507	0.557	1	36
23	0.877	16.434	6	0.486	0.519	11	54
22	0.999	20.082	9	0.426	0.508	23	60
21	1.065	22.643	10	0.481	0.490	33	60
20	1.075	24.231	11	0.506	0.510	29	60
19	1.067	25.075	14	1.012	1.179	23	38
18	1.055	25.327	15	0.986	1.186	35	40
17	1.035	25.224	16	1.029	1.152	29	52
16	1.018	23.467	17	0.887	1.180	13	44
15	1.024	23.362	18	0.991	1.164	21	40
14	1.101	22.888	19	1.170	1.298	15	32
13	1.133	23.414	20	1.126	1.281	21	52
12	1.166	24.097	21	1.125	1.268	11	44
11	1.190	24.751					
10	1.201	25.268					
9	1.211	25.464					
8	1.226	26.045					
7	1.238*	26.744					
6	1.237	27.293*					
5	1.210	27.257					
4	1.134	25.852					
3	0.977	21.957					
2	0.708	15.207					
Bottom 1	0.194	4.188					
% AXIAL TILT	-6.361	-5.369					
AVG BOT 8ft/12ft	1.0268	1.0223					

Active Channel Flow: Mlb/hr 88.65

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.298	19	15	32	1.573	0.915	19	43	34	8.49	0.695	17.9	21	19	52	5	7.82	0.816	34.2	14	49	24	19
1.290	19	33	40	1.578	0.912	19	15	30	8.51	0.694	17.3	21	13	48	5	6.80	0.805	45.0	18	11	46	5
1.288	19	23	40	1.580	0.911	19	35	42	8.33	0.679	17.3	19	47	46	5	7.01	0.795	41.4	18	17	10	5
1.286	19	35	38	1.582	0.910	21	49	18	8.32	0.679	17.4	20	21	52	5	7.19	0.791	38.8	15	15	16	5
1.281	20	21	52	1.590	0.906	19	29	24	8.23	0.673	17.8	21	49	44	5	6.82	0.790	43.2	18	15	50	5
1.278	19	35	42	1.595	0.903	19	23	52	7.20	0.661	38.1	14	11	38	19	6.76	0.785	43.3	18	41	50	5
1.277	19	17	34	1.597	0.902	21	33	36	6.64	0.652	44.3	18	49	46	5	7.19	0.783	38.0	16	9	30	20
1.273	19	23	52	1.597	0.902	19	37	22	6.75	0.644	41.7	17	47	44	5	7.38	0.783	35.7	18	41	8	5
1.269	19	13	34	1.597	0.902	21	41	10	7.86	0.643	17.8	21	17	50	5	6.53	0.770	44.7	18	9	18	5
1.268	21	11	44	1.608	0.895	20	21	52	6.73	0.638	41.1	18	17	52	5	7.08	0.768	37.6	17	47	18	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.56 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,200.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       10392.5 (1415.40 )
Delta E: MWd/MTU, (GWd)         192.5 (  26.22 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.49
Flow: Mlb/hr                   104.09 (101.55 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- 28 -- 28 -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 10 --  8 --  8 -- 10 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 12 -- -- --  8 --  8 -- -- -- 12 -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- 14 --  8 -- -- -- -- --  8 -- 14 -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- 10 --  8 --  8 -- 10 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- 28 -- 28 -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            9.46

k-effective:                   0.99900
Void Fraction:                   0.442
Core Delta-P: psia              24.971
Core Plate Delta-P: psia        20.430
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          88.12
Total Bypass Flow (%):           15.3
Total Water Rod Flow (%):        -0.0
Source Convergence             0.00008
```

Core Average Exposure: MWd/MTU 22027.2

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.212	4.022	4	0.918	0.947	27	42
24	0.645	11.831	5	0.506	0.555	1	36
23	0.877	16.616	6	0.485	0.518	11	54
22	0.998	20.290	9	0.425	0.506	23	60
21	1.063	22.864	10	0.479	0.487	33	60
20	1.072	24.454	11	0.503	0.507	29	60
19	1.064	25.297	14	1.010	1.178	23	38
18	1.051	25.546	15	0.985	1.185	35	40
17	1.031	25.439	16	1.028	1.150	15	42
16	1.013	23.670	17	0.885	1.179	13	44
15	1.019	23.567	18	0.990	1.162	21	40
14	1.096	23.088	19	1.172	1.299	15	32
13	1.129	23.620	20	1.127	1.284	21	52
12	1.161	24.309	21	1.126	1.270	11	44
11	1.186	24.967					
10	1.199	25.486					
9	1.210	25.685					
8	1.227	26.268					
7	1.242	26.970					
6	1.244*	27.519*					
5	1.218	27.477					
4	1.144	26.058					
3	0.987	22.135					
2	0.716	15.336					
Bottom 1	0.197	4.224					
% AXIAL TILT	-6.654	-5.325					
AVG BOT 8ft/12ft	1.0279	1.0220					

```
Active Channel Flow: Mlb/hr        88.12
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	Power FT	Power IR	Power JR	MCPR Value	MCPR Margin	MCPR FT	MCPR IR	MCPR JR	APLHGR Value	APLHGR Margin	APLHGR Exp.	APLHGR FT	APLHGR IR	APLHGR JR	APLHGR K	LHGR Value	LHGR Margin	LHGR Exp.	LHGR FT	LHGR IR	LHGR JR	LHGR K
1.299	19	15	32	1.571	0.917	19	43	34	8.57	0.704	18.2	21	19	52	5	7.78	0.815	34.5	14	49	24	19
1.292	19	33	40	1.575	0.914	19	15	30	8.61	0.704	17.7	21	13	48	5	6.84	0.813	45.3	18	11	46	5
1.290	19	23	40	1.577	0.913	19	35	42	8.41	0.687	17.7	19	47	46	5	7.04	0.801	41.7	18	17	10	5
1.287	19	35	38	1.577	0.913	21	49	18	8.40	0.687	17.8	20	21	52	5	6.86	0.798	43.5	18	15	50	5
1.284	20	21	52	1.586	0.908	19	29	24	8.30	0.681	18.1	21	49	44	5	7.22	0.797	39.1	15	15	16	5
1.280	19	35	42	1.590	0.906	19	23	52	7.16	0.660	38.4	14	11	38	19	6.80	0.792	43.6	18	41	50	5
1.278	19	17	34	1.591	0.905	21	41	10	6.68	0.658	44.6	18	49	46	5	7.41	0.790	36.0	18	41	8	5
1.276	19	23	52	1.593	0.904	19	37	22	7.93	0.651	18.1	21	17	50	5	7.15	0.782	38.3	16	9	30	20
1.270	21	11	44	1.594	0.904	21	33	36	6.78	0.649	42.0	17	47	44	5	6.56	0.777	44.9	18	9	18	5
1.270	19	13	34	1.602	0.899	20	21	52	7.92	0.647	17.5	19	15	48	5	7.12	0.775	37.9	17	47	18	5

```
  * LHGR calculated with pin-power reconstruction
  * CPR calculated with pin-power reconstruction & CPR limit type 3
  * Thermal limit file:
```

Figure A.57 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,392.5 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       10392.7 (1415.40 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.02 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.87
Flow: Mlb/hr                   106.39 (103.80 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 14 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- 18 --  0 -- -- --  0 -- 18 -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- 32 -- 14 -- 32 -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %           10.36

k-effective:                  0.99902
Void Fraction:                  0.441
Core Delta-P: psia             26.028
Core Plate Delta-P: psia       21.484
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          89.99   Active Channel Flow: Mlb/hr        89.99
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00006
```

Core Average Exposure: MWd/MTU 22027.3

	N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top	25	0.171	4.022	4	0.853	0.946	27	42
	24	0.517	11.831	5	0.490	0.534	1	36
	23	0.711	16.616	6	0.466	0.496	11	54
	22	0.828	20.290	9	0.412	0.486	15	58
	21	0.915	22.864	10	0.455	0.461	33	60
	20	0.977	24.455	11	0.462	0.465	29	60
	19	1.018	25.297	14	1.067	1.277	29	48
	18	1.050	25.547	15	1.037	1.227	27	16
	17	1.064	25.439	16	0.948	1.162	25	52
	16	1.068	23.670	17	0.865	1.116	17	48
	15	1.082	23.567	18	0.998	1.266	21	40
	14	1.171	23.088	19	1.181	1.359	29	46
	13	1.215	23.620	20	1.217	1.366	29	50
	12	1.260	24.309	21	1.080	1.250	35	28
	11	1.298	24.967					
	10	1.322*	25.486					
	9	1.321	25.685					
	8	1.299	26.268					
	7	1.278	26.970					
	6	1.252	27.519*					
	5	1.206	27.477					
	4	1.122	26.058					
	3	0.964	22.136					
	2	0.699	15.336					
Bottom	1	0.192	4.224					
% AXIAL TILT		-11.099	-5.325					
AVG BOT 8ft/12ft		1.0722	1.0220					

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.366	20	29	50	1.581	0.911	20	29	50	8.42	0.674	14.9	20	49	32	5	7.65	0.826	37.3	14	47	32	5
1.359	20	11	32	1.582	0.910	19	33	44	7.38	0.671	37.1	14	47	32	6	7.70	0.825	36.5	14	31	48	6
1.359	19	29	46	1.590	0.906	19	35	42	7.41	0.671	36.7	14	29	48	6	7.66	0.823	36.7	15	33	16	6
1.352	19	27	48	1.591	0.905	19	29	46	8.35	0.668	14.2	20	29	50	5	7.63	0.820	36.7	15	15	34	6
1.349	19	15	32	1.592	0.905	19	43	34	7.23	0.664	38.2	18	27	12	6	7.65	0.817	36.2	16	23	8	10
1.337	19	13	34	1.593	0.904	19	27	48	7.22	0.663	38.1	18	49	28	6	7.47	0.814	38.0	18	33	50	6
1.335	19	21	38	1.595	0.903	20	11	30	7.31	0.656	35.8	16	37	8	10	7.42	0.809	38.0	18	49	34	6
1.335	19	23	40	1.596	0.902	19	37	22	8.15	0.652	13.6	19	27	48	6	7.62	0.806	35.3	16	7	24	10
1.328	19	19	40	1.599	0.901	19	19	36	8.10	0.648	13.6	19	47	28	6	7.27	0.800	38.9	16	9	32	6
1.326	19	21	42	1.599	0.901	19	39	24	7.30	0.648	34.7	16	53	38	10	7.45	0.795	36.1	15	23	42	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.58 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,392.7 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    22134.8
Exposure: MWd/MTU (GWd)       10500.0 (1430.00 )
Delta E: MWd/MTU, (GWd)         107.3 (  14.61 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.170   4.044     4  0.853 0.947  27 42
Inlet Subcooling: Btu/lbm       -25.98                       24  0.515  11.891     5  0.489 0.533   1 36
Flow: Mlb/hr                   105.97 (103.39 %)            23  0.707  16.698     6  0.465 0.495  11 54
                                                            22  0.824  20.386     9  0.411 0.486  15 58
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.910  22.970    10  0.454 0.460  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.972  24.568    11  0.460 0.464  29 60
 3           -- -- 32 -- 14 -- 32 -- --           55        19  1.013  25.415    14  1.067 1.276  29 48
 5        -- -- -- -- -- -- -- -- -- -- --        51        18  1.045  25.668    15  1.036 1.227  27 16
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47        17  1.060  25.562    16  0.947 1.161  25 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43        16  1.064  23.789    17  0.864 1.116  17 48
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39        15  1.079  23.687    18  0.997 1.265  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35        14  1.168  23.207    19  1.182 1.360  29 46
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31        13  1.213  23.743    20  1.218 1.366  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27        12  1.259  24.437    21  1.081 1.251  35 28
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23        11  1.297  25.099
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19        10  1.323  25.620
23     -- -- 18 --  0 -- -- --  0 -- 18 -- --     15         9  1.323* 25.819
25        -- -- -- -- -- -- -- -- -- -- --        11         8  1.302  26.400
27           -- -- 32 -- 14 -- 32 -- --           7         7  1.282  27.100
29              -- -- -- -- -- -- --              3         6  1.258  27.646*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58               5  1.214  27.599
                                                              4  1.130  26.172
Control Rod Density: %          10.36                         3  0.972  22.233
                                                              2  0.705  15.407
k-effective:                 0.99897                   Bottom  1  0.194   4.243
Void Fraction:                 0.442
Core Delta-P: psia            25.859              % AXIAL TILT -11.483  -5.324
Core Plate Delta-P: psia      21.315          AVG BOT 8ft/12ft  1.0744  1.0220
Coolant Temp: Deg-F           548.1
In Channel Flow: Mlb/hr        89.63   Active Channel Flow: Mlb/hr        89.63
Total Bypass Flow (%):          15.4   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.366	20	29	50	1.580	0.912	20	29	50	8.48	0.679	15.1	20	49	32	5	7.68	0.832	37.4	14	47	32	5
1.360	19	29	46	1.580	0.911	19	33	44	7.41	0.675	37.3	14	47	32	6	7.70	0.829	37.0	14	31	48	5
1.360	20	11	32	1.589	0.906	19	35	42	7.43	0.674	36.9	14	29	48	6	7.69	0.827	36.9	15	33	16	6
1.353	19	27	48	1.590	0.906	19	29	46	8.41	0.672	14.4	20	29	50	5	7.65	0.824	36.9	15	15	34	6
1.350	19	15	32	1.591	0.905	19	43	34	7.25	0.667	38.4	18	27	12	6	7.65	0.818	36.4	16	23	8	10
1.338	19	13	34	1.592	0.905	19	27	48	7.24	0.666	38.3	18	49	28	6	7.49	0.817	38.2	18	33	50	6
1.336	19	21	38	1.594	0.904	20	11	30	7.31	0.657	35.9	16	37	8	10	7.44	0.813	38.2	18	49	34	6
1.336	19	23	40	1.595	0.903	19	37	22	8.21	0.656	13.4	19	27	14	5	7.63	0.808	35.5	16	7	24	10
1.329	19	19	40	1.598	0.901	19	21	38	8.15	0.652	13.4	19	47	28	5	7.29	0.804	39.0	16	9	32	6
1.327	19	21	42	1.598	0.901	19	19	36	7.31	0.650	34.9	16	53	38	10	7.47	0.799	36.3	15	23	42	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.59 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,500.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    22384.7
Exposure: MWd/MTU (GWd)       10750.0 (1464.10 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                   Top 25  0.171   4.094     4  0.853 0.946  27 42
Inlet Subcooling: Btu/lbm       -26.12                     24  0.516  12.029     5  0.487 0.531   1 36
Flow: Mlb/hr                   105.45 (102.88 %)          23  0.708  16.888     6  0.464 0.494  11 54
                                                          22  0.823  20.608     9  0.410 0.484  15 58
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29          21  0.909  23.216    10  0.452 0.458  33 60
 1              -- -- -- -- -- -- --              59  :JR 20  0.970  24.830    11  0.458 0.462  29 60
 3           -- -- 32 -- 14 -- 32 -- --           55      19  1.009  25.688    14  1.064 1.272  29 48
 5        -- -- -- -- -- -- -- -- -- -- --        51      18  1.041  25.950    15  1.034 1.223  27 16
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47      17  1.055  25.848    16  0.946 1.159  25 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43      16  1.059  24.065    17  0.862 1.115  17 48
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39      15  1.074  23.966    18  0.996 1.262  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35      14  1.163  23.483    19  1.184 1.361  29 46
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31      13  1.208  24.029    20  1.220 1.367  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27      12  1.254  24.734    21  1.084 1.253  35 28
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23      11  1.293  25.405
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19      10  1.320  25.932
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --    15       9  1.323* 26.132
25       -- -- -- -- -- -- -- -- -- -- --       11       8  1.304  26.708
27          -- -- 32 -- 14 -- 32 -- --           7       7  1.287  27.403
29             -- -- -- -- -- -- --              3       6  1.264  27.943*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58          5  1.222  27.887
                                                         4  1.139  26.440
Control Rod Density: %          10.36                    3  0.980  22.463
                                                         2  0.711  15.574
k-effective:                 0.99897                Bottom  1  0.196   4.289
Void Fraction:                 0.444
Core Delta-P: psia            25.681            % AXIAL TILT -11.753  -5.327
Core Plate Delta-P: psia      21.137         AVG BOT 8ft/12ft  1.0752  1.0222
Coolant Temp: Deg-F           548.1
In Channel Flow: Mlb/hr        89.17   Active Channel Flow: Mlb/hr        89.17
Total Bypass Flow (%):          15.4   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.367	20	29	50	1.577	0.913	20	29	50	8.51	0.684	15.6	20	49	32	5	7.67	0.835	37.9	14	47	32	5
1.361	19	29	46	1.577	0.913	19	33	44	7.40	0.677	37.7	14	47	32	6	7.68	0.832	37.5	14	31	48	5
1.360	20	11	32	1.585	0.908	19	35	42	7.43	0.677	37.3	14	29	48	6	7.67	0.830	37.3	15	33	16	6
1.354	19	27	48	1.587	0.908	19	29	46	8.44	0.675	14.8	20	29	50	5	7.65	0.828	37.3	15	15	34	6
1.351	19	15	32	1.588	0.907	19	43	34	7.24	0.669	38.7	18	27	12	6	7.47	0.820	38.6	18	33	50	6
1.339	19	13	34	1.589	0.906	19	27	48	7.23	0.668	38.7	18	49	28	6	7.62	0.820	36.8	16	23	8	10
1.338	19	23	40	1.591	0.905	19	37	22	8.25	0.660	13.9	19	27	14	5	7.43	0.816	38.6	18	49	34	6
1.338	19	21	38	1.591	0.905	20	11	30	7.29	0.658	36.3	16	37	8	10	7.58	0.808	36.0	16	7	24	10
1.330	19	19	40	1.594	0.903	19	21	38	8.22	0.658	13.9	19	47	28	5	7.27	0.805	39.4	16	9	32	6
1.329	19	21	42	1.595	0.903	19	19	36	7.13	0.652	37.5	18	21	40	6	7.48	0.804	36.7	15	23	42	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.60 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 10,750.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    22634.8
Exposure: MWd/MTU (GWd)       11000.0 (1498.10 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.171   4.144     4  0.853 0.946  27 42
Inlet Subcooling: Btu/lbm       -26.30                       24  0.517  12.168     5  0.486 0.528   1 36
Flow: Mlb/hr                   104.78 (102.22 %)            23  0.708  17.078     6  0.462 0.492  11 54
                                                            22  0.821  20.830     9  0.408 0.483  15 58
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.906  23.461    10  0.450 0.456  33 60
 1              -- -- -- -- -- --              59  :JR     20  0.965  25.092    11  0.455 0.459  29 60
 3           -- -- 32 -- 14 -- 32 -- --        55          19  1.004  25.961    14  1.063 1.269  29 48
 5        -- -- -- -- -- -- -- -- -- -- --     51          18  1.036  26.231    15  1.033 1.221  27 16
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --  47          17  1.049  26.133    16  0.945 1.158  25 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43          16  1.053  24.339    17  0.860 1.113  17 48
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39       15  1.068  24.245    18  0.994 1.260  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35       14  1.157  23.757    19  1.187 1.363  29 46
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31       13  1.203  24.314    20  1.221 1.368  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27       12  1.249  25.029    21  1.086 1.255  33 26
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23       11  1.290  25.710
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19       10  1.319  26.244
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --  15          9  1.324* 26.445
25       -- -- -- -- -- -- -- -- -- -- -- --  11          8  1.308  27.016
27          -- -- 32 -- 14 -- 32 -- --         7          7  1.293  27.707
29             -- -- -- -- -- -- --            3          6  1.272  28.242*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58          5  1.232  28.175
                                                         4  1.150  26.709
Control Rod Density: %          10.36                    3  0.990  22.695
                                                         2  0.718  15.742
k-effective:                 0.99901                Bottom  1  0.198   4.336
Void Fraction:                 0.445
Core Delta-P: psia            25.478              % AXIAL TILT -12.134  -5.332
Core Plate Delta-P: psia      20.934          AVG BOT 8ft/12ft  1.0768  1.0223
Coolant Temp: Deg-F           548.1
In Channel Flow: Mlb/hr        88.55   Active Channel Flow: Mlb/hr        88.55
Total Bypass Flow (%):         15.5    (of total core flow)
Total Water Rod Flow (%):      -0.0    (of total core flow)
Source Convergence           0.00010
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.368	20	29	50	1.573	0.915	20	29	50	8.57	0.691	16.1	20	49	32	5	7.69	0.841	38.3	14	47	32	5
1.363	19	29	46	1.574	0.915	19	33	44	8.50	0.682	15.3	20	29	50	5	7.69	0.838	37.9	14	31	48	5
1.360	20	11	32	1.581	0.911	19	35	42	7.42	0.681	38.1	14	47	32	6	7.69	0.835	37.7	15	33	16	6
1.356	19	27	48	1.582	0.910	19	29	46	7.44	0.681	37.7	14	29	48	6	7.67	0.834	37.8	15	15	34	6
1.353	19	15	32	1.584	0.909	19	43	34	7.25	0.673	39.1	18	27	12	6	7.48	0.825	39.0	18	33	50	6
1.341	19	13	34	1.585	0.909	19	27	48	7.24	0.672	39.0	18	49	28	6	7.60	0.822	37.3	16	23	8	10
1.340	19	23	40	1.587	0.908	19	37	22	8.33	0.667	14.3	19	27	14	5	7.44	0.821	39.1	18	49	34	6
1.340	19	21	38	1.588	0.907	20	11	30	8.31	0.664	14.4	19	47	28	5	7.51	0.810	37.2	15	23	42	6
1.332	19	19	40	1.590	0.906	19	21	38	7.28	0.659	36.7	16	37	8	10	7.26	0.809	39.9	16	9	32	6
1.331	19	21	42	1.591	0.905	19	19	36	7.16	0.657	37.9	18	21	40	6	7.55	0.808	36.4	16	7	24	10

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.61 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 11,000.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       11250.0 (1532.10 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.27
Flow: Mlb/hr                   104.90 (102.34 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 14 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- 32 -- 14 -- 32 -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          10.36

k-effective:                  0.99919
Void Fraction:                  0.446
Core Delta-P: psia             25.543
Core Plate Delta-P: psia       21.000
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          88.65
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00010
```

```
Core Average Exposure: MWd/MTU    22884.8

                    Axial Profile     Edit   Radial Power
          N(PRA)  Power  Exposure    Zone   Avg.   Max.   IR JR
Top 25    0.171    4.195      4     0.852  0.946  27 42
    24    0.517   12.307      5     0.484  0.525   1 36
    23    0.707   17.269      6     0.460  0.490  11 54
    22    0.819   21.052      9     0.407  0.481  15 58
    21    0.902   23.706     10     0.448  0.453  33 60
    20    0.961   25.352     11     0.452  0.456  29 60
    19    0.999   26.232     14     1.061  1.267  29 48
    18    1.030   26.510     15     1.031  1.219  27 16
    17    1.043   26.416     16     0.943  1.156  25 52
    16    1.048   24.612     17     0.858  1.111  17 48
    15    1.063   24.521     18     0.993  1.258  21 40
    14    1.153   24.030     19     1.189  1.366  29 46
    13    1.199   24.598     20     1.223  1.369  29 50
    12    1.246   25.324     21     1.088  1.257  33 26
    11    1.288   26.014
    10    1.319   26.555
     9   1.326*   26.758
     8    1.312   27.325
     7    1.298   28.013
     6    1.279   28.543*
     5    1.240   28.467
     4    1.159   26.981
     3    0.998   22.929
     2    0.724   15.912
Bottom 1  0.199    4.383

% AXIAL TILT -12.502  -5.342
AVG BOT 8ft/12ft  1.0784  1.0224

Active Channel Flow: Mlb/hr        88.65
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.369	20	29	50	1.575	0.914	20	29	50	8.63	0.699	16.5	20	49	32	5	7.71	0.847	38.8	14	47	32	5
1.366	19	29	46	1.576	0.914	19	33	44	8.57	0.690	15.8	20	29	50	5	7.71	0.844	38.4	14	31	48	5
1.361	20	11	32	1.583	0.910	19	29	46	7.44	0.686	38.5	14	47	32	6	7.71	0.842	38.2	15	33	16	6
1.358	19	27	48	1.584	0.909	19	35	42	7.47	0.686	38.1	14	29	48	6	7.70	0.841	38.2	15	15	34	6
1.356	19	15	32	1.587	0.908	19	27	48	7.26	0.677	39.5	18	27	12	6	7.48	0.830	39.5	18	33	50	6
1.344	19	13	34	1.587	0.907	19	43	34	7.25	0.676	39.4	18	49	28	6	7.45	0.826	39.5	18	49	34	6
1.343	19	23	40	1.589	0.906	19	37	22	8.42	0.674	14.8	19	27	14	5	7.60	0.825	37.7	16	23	8	10
1.342	19	21	38	1.590	0.906	20	11	30	8.40	0.672	14.8	19	47	28	5	7.54	0.818	37.6	15	23	42	6
1.335	19	19	40	1.592	0.904	19	21	38	7.20	0.663	38.3	18	21	40	6	7.50	0.815	37.7	15	41	24	6
1.334	19	21	42	1.594	0.903	19	19	36	8.27	0.662	14.3	19	45	30	6	7.26	0.812	40.3	16	9	32	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.62 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 11,250.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       11500.0 (1566.20 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.24
Flow: Mlb/hr                   105.02 (102.46 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 14 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --    15
25       -- -- -- -- -- -- -- -- -- -- --       11
27          -- -- 32 -- 14 -- 32 -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          10.36

k-effective:                  0.99934
Void Fraction:                  0.446
Core Delta-P: psia             25.599
Core Plate Delta-P: psia       21.056
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          88.75
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00009
```

Core Average Exposure: MWd/MTU 23134.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.171	4.245	4	0.852	0.945	27	42
24	0.516	12.446	5	0.481	0.523	1	36
23	0.705	17.459	6	0.458	0.489	11	54
22	0.816	21.273	9	0.405	0.479	15	58
21	0.898	23.949	10	0.445	0.451	33	60
20	0.956	25.611	11	0.449	0.453	29	60
19	0.993	26.501	14	1.059	1.265	29	48
18	1.024	26.788	15	1.029	1.217	27	16
17	1.038	26.698	16	0.942	1.154	25	52
16	1.043	24.883	17	0.855	1.110	17	48
15	1.058	24.796	18	0.991	1.257	21	40
14	1.148	24.302	19	1.191	1.368	29	46
13	1.195	24.881	20	1.225	1.371	29	50
12	1.244	25.618	21	1.090	1.259	33	26
11	1.287	26.318					
10	1.319	26.866					
9	1.329*	27.072					
8	1.316	27.636					
7	1.304	28.320					
6	1.286	28.845*					
5	1.248	28.760					
4	1.167	27.255					
3	1.006	23.165					
2	0.730	16.083					
Bottom 1	0.201	4.431					
% AXIAL TILT	-12.916	-5.355					
AVG BOT 8ft/12ft	1.0804	1.0226					

Active Channel Flow: Mlb/hr 88.75
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.371	20	29	50	1.577	0.913	20	29	50	8.69	0.706	17.0	20	49	32	5	7.73	0.854	39.2	14	47	32	5
1.368	19	29	46	1.580	0.912	19	33	44	8.63	0.698	16.2	20	29	50	5	7.74	0.851	38.8	14	31	48	5
1.362	20	11	32	1.584	0.909	19	29	46	7.47	0.692	38.9	14	47	32	6	7.74	0.849	38.6	15	33	16	6
1.360	19	27	48	1.587	0.907	19	35	42	7.49	0.691	38.5	14	29	48	6	7.72	0.848	38.7	15	15	34	6
1.359	19	15	32	1.589	0.906	19	27	48	8.51	0.683	15.3	19	27	14	5	7.49	0.834	39.9	18	33	50	6
1.346	19	13	34	1.591	0.905	19	43	34	8.49	0.681	15.3	19	47	28	5	7.42	0.831	40.3	18	49	34	5
1.345	19	23	40	1.591	0.905	19	37	22	7.27	0.681	39.9	18	27	12	6	7.59	0.829	38.1	16	23	8	10
1.345	19	21	38	1.593	0.904	20	11	30	7.27	0.680	39.8	18	49	28	6	7.58	0.826	38.0	15	23	42	6
1.337	19	19	40	1.595	0.903	19	21	38	8.38	0.670	14.3	19	45	30	5	7.54	0.823	38.1	15	41	24	6
1.337	19	21	42	1.597	0.901	19	19	36	7.25	0.670	38.7	18	21	40	6	7.43	0.818	38.9	18	39	40	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.63 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 11,500.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       11750.0 (1600.20 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.10
Flow: Mlb/hr                   105.54 (102.97 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 14 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15  -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19  -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23     -- -- 18 --  0 -- -- --  0 -- 18 -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- 32 -- 14 -- 32 -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          10.36

k-effective:                  0.99955
Void Fraction:                  0.446
Core Delta-P: psia             25.811
Core Plate Delta-P: psia       21.268
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          89.18
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00007
```

```
Core Average Exposure: MWd/MTU    23384.8

                    Axial Profile     Edit   Radial Power
          N(PRA)  Power  Exposure    Zone   Avg.   Max.   IR JR
Top 25    0.171    4.296      4     0.851  0.945  27 42
    24    0.516   12.585      5     0.479  0.520   1 36
    23    0.704   17.648      6     0.456  0.487  11 54
    22    0.813   21.493      9     0.403  0.477  15 58
    21    0.894   24.191     10     0.443  0.448  33 60
    20    0.951   25.869     11     0.446  0.450  29 60
    19    0.989   26.769     14     1.058  1.263  29 48
    18    1.019   27.065     15     1.027  1.216  27 16
    17    1.033   26.977     16     0.941  1.153  25 52
    16    1.038   25.153     17     0.853  1.108  17 48
    15    1.054   25.070     18     0.990  1.255  21 40
    14    1.146   24.573     19     1.194  1.371  29 46
    13    1.193   25.163     20     1.227  1.372  29 50
    12    1.243   25.912     21     1.092  1.260  33 26
    11    1.287   26.622
    10    1.321   27.178
     9   1.332*   27.386
     8    1.320   27.947
     7    1.309   28.628
     6    1.291   29.150*
     5    1.253   29.055
     4    1.173   27.531
     3    1.012   23.403
     2    0.735   16.256
Bottom 1  0.202    4.479

% AXIAL TILT -13.228  -5.373
AVG BOT 8ft/12ft  1.0820  1.0228

Active Channel Flow: Mlb/hr       89.18
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.372	20	29	50	1.582	0.910	20	29	50	8.73	0.712	17.5	20	49	30	5	7.74	0.860	39.7	14	47	32	5
1.371	19	29	46	1.586	0.908	19	33	44	8.68	0.704	16.7	20	29	50	5	7.75	0.857	39.3	14	31	48	5
1.364	20	11	32	1.588	0.907	19	29	46	7.49	0.696	39.3	14	47	32	6	7.75	0.856	39.1	15	33	16	6
1.363	19	27	48	1.593	0.904	19	35	42	7.51	0.696	38.9	14	29	48	6	7.74	0.855	39.1	15	15	34	6
1.361	19	15	32	1.594	0.903	19	27	48	8.59	0.692	15.7	19	27	14	5	7.49	0.838	40.3	18	33	50	6
1.349	19	13	34	1.597	0.902	19	43	34	8.58	0.690	15.7	19	47	28	5	7.42	0.836	40.8	18	49	34	5
1.348	19	23	40	1.597	0.902	19	37	22	7.28	0.684	40.3	18	27	12	6	7.61	0.833	38.5	15	23	42	6
1.347	19	21	38	1.598	0.901	20	11	30	7.27	0.683	40.2	18	49	28	6	7.59	0.833	38.6	16	23	8	10
1.340	19	19	40	1.601	0.900	19	21	38	8.48	0.679	14.7	19	45	30	5	7.57	0.830	38.5	15	41	24	6
1.340	19	21	42	1.604	0.898	19	19	36	7.28	0.676	39.1	18	21	40	6	7.46	0.825	39.3	18	39	40	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.64 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 11,750.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       12000.0 (1634.30 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.05
Flow: Mlb/hr                   105.70 (103.12 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 14 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- 32 -- 14 -- 32 -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          10.36

k-effective:                  0.99967
Void Fraction:                  0.447
Core Delta-P: psia             25.871
Core Plate Delta-P: psia       21.327
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          89.33   Active Channel Flow: Mlb/hr        89.33
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00009

                                        Core Average Exposure: MWd/MTU    23634.8

                                                 Axial Profile    Edit   Radial Power
                                       N(PRA)  Power  Exposure   Zone   Avg.   Max.   IR JR
                                    Top 25  0.170    4.346      4  0.851  0.945  27 42
                                        24  0.515   12.723      5  0.478  0.518   1 36
                                        23  0.701   17.837      6  0.455  0.485  11 54
                                        22  0.810   21.712      9  0.402  0.475  15 58
                                        21  0.889   24.432     10  0.441  0.446  33 60
                                        20  0.946   26.126     11  0.444  0.448  29 60
                                        19  0.983   27.036     14  1.056  1.260  29 48
                                        18  1.013   27.340     15  1.026  1.214  27 16
                                        17  1.027   27.256     16  0.939  1.151  25 52
                                        16  1.034   25.422     17  0.851  1.106  17 48
                                        15  1.050   25.343     18  0.988  1.253  21 40
                                        14  1.143   24.844     19  1.196  1.373  29 46
                                        13  1.192   25.445     20  1.228  1.373  29 50
                                        12  1.242   26.205     21  1.094  1.262  33 26
                                        11  1.288   26.926
                                        10  1.324   27.489
                                         9  1.337*  27.701
                                         8  1.325   28.259
                                         7  1.314   28.938
                                         6  1.297   29.455*
                                         5  1.259   29.351
                                         4  1.180   27.808
                                         3  1.019   23.642
                                         2  0.740   16.429
                                    Bottom  1  0.204    4.527

                                % AXIAL TILT -13.649  -5.394
                              AVG BOT 8ft/12ft  1.0842  1.0230
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.373	19	29	46	1.585	0.909	20	29	50	8.77	0.719	18.0	20	49	30	5	7.75	0.866	40.2	14	47	32	5
1.373	20	29	50	1.589	0.906	19	29	46	8.74	0.712	17.2	20	29	50	5	7.77	0.864	39.7	14	31	48	5
1.365	19	27	48	1.590	0.906	19	33	44	7.48	0.701	40.0	14	47	32	5	7.78	0.863	39.5	15	33	16	6
1.364	20	11	32	1.598	0.901	19	35	42	8.68	0.701	16.2	19	27	14	5	7.77	0.862	39.6	15	15	34	6
1.364	19	15	32	1.598	0.901	19	27	48	7.54	0.701	39.3	14	29	48	6	7.49	0.843	40.8	18	33	50	6
1.351	19	13	34	1.601	0.899	19	23	40	8.67	0.700	16.2	19	47	28	5	7.65	0.842	38.9	15	23	42	6
1.351	19	23	40	1.601	0.899	20	11	30	8.60	0.689	15.2	19	45	30	5	7.43	0.840	41.2	18	49	34	5
1.350	19	21	38	1.602	0.899	19	43	34	7.28	0.687	40.7	18	27	12	6	7.61	0.839	39.0	15	41	24	6
1.343	19	19	40	1.604	0.898	19	21	38	7.28	0.686	40.6	18	49	28	6	7.59	0.837	39.0	16	23	8	10
1.342	19	21	42	1.604	0.897	19	15	30	8.55	0.684	14.7	19	29	16	5	7.50	0.834	39.8	18	39	40	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.65 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 12,000.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       12250.0 (1668.30 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.95
Flow: Mlb/hr                   106.09 (103.51 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 14 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- 14 -- -- -- 10 -- -- -- 10 -- -- -- 14 -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- 32 -- 14 -- 32 -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          10.36

k-effective:                  0.99980
Void Fraction:                  0.446
Core Delta-P: psia             26.026
Core Plate Delta-P: psia       21.482
Coolant Temp: Deg-F            548.2
In Channel Flow: Mlb/hr         89.67
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00010
```

Core Average Exposure: MWd/MTU 23884.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.170	4.396	4	0.850	0.944	27	42
24	0.514	12.862	5	0.476	0.516	1	36
23	0.699	18.026	6	0.453	0.483	11	54
22	0.807	21.931	9	0.400	0.474	15	58
21	0.885	24.672	10	0.439	0.444	33	60
20	0.941	26.381	11	0.441	0.445	29	60
19	0.978	27.301	14	1.054	1.258	29	48
18	1.008	27.613	15	1.024	1.212	27	16
17	1.022	27.533	16	0.938	1.149	25	52
16	1.030	25.690	17	0.849	1.104	17	48
15	1.048	25.615	18	0.987	1.251	21	40
14	1.141	25.113	19	1.198	1.376	29	46
13	1.191	25.726	20	1.230	1.374	29	50
12	1.243	26.498	21	1.097	1.264	33	26
11	1.290	27.230					
10	1.326	27.802					
9	1.341*	28.017					
8	1.330	28.572					
7	1.318	29.248					
6	1.300	29.761*					
5	1.263	29.649					
4	1.185	28.087					
3	1.024	23.883					
2	0.744	16.604					
Bottom 1	0.205	4.576					
% AXIAL TILT	-13.955	-5.418					
AVG BOT 8ft/12ft	1.0859	1.0232					

Active Channel Flow: Mlb/hr 89.67
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.376	19	29	46	1.590	0.906	20	29	50	8.79	0.723	18.4	20	49	30	5	7.75	0.870	40.6	14	47	32	5
1.374	20	29	50	1.591	0.905	19	29	46	8.77	0.717	17.7	20	29	50	5	7.80	0.869	40.0	15	33	16	6
1.367	19	27	48	1.596	0.902	19	33	44	8.75	0.710	16.7	19	27	14	5	7.78	0.869	40.2	15	15	34	5
1.366	19	15	32	1.603	0.898	19	27	48	8.74	0.709	16.7	19	47	28	5	7.77	0.869	40.2	14	31	48	5
1.365	20	11	32	1.603	0.898	19	35	42	7.50	0.706	40.4	14	47	32	5	7.68	0.850	39.3	15	23	42	6
1.353	19	13	34	1.606	0.896	20	11	30	7.55	0.705	39.7	14	29	48	6	7.65	0.847	39.4	15	41	24	6
1.353	19	23	40	1.607	0.896	19	23	40	8.70	0.700	15.7	19	45	30	5	7.47	0.845	41.2	18	33	50	6
1.353	19	21	38	1.607	0.896	19	21	38	8.62	0.694	15.7	19	29	46	6	7.42	0.843	41.6	18	49	34	5
1.345	19	21	42	1.607	0.896	19	15	30	7.38	0.690	39.9	18	21	40	6	7.54	0.843	40.2	18	39	40	6
1.345	19	19	40	1.608	0.895	19	43	34	7.27	0.689	41.1	18	27	12	6	7.60	0.842	39.5	16	23	8	10

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.66 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 12,250.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    24134.8
Exposure: MWd/MTU (GWd)       12500.0 (1702.40 )
Delta E: MWd/MTU, (GWd)         250.0 (  34.05 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.170   4.447     4   0.849 0.944  27 42
Inlet Subcooling: Btu/lbm       -25.78                       24  0.514  13.000     5   0.474 0.514   1 36
Flow: Mlb/hr                   106.74 (104.13 %)            23  0.699  18.214     6   0.452 0.482  11 54
                                                            22  0.805  22.148     9   0.399 0.472  15 58
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.883  24.911    10   0.437 0.442  33 60
 1              --  --  --  --  --  --  --                59  :JR  20  0.937  26.635    11   0.439 0.443  29 60
 3           --  --  32  --  14  --  32  --  --           55          19  0.974  27.565    14   1.053 1.255  29 48
 5        --  --  --  --  --  --  --  --  --  --  --     51          18  1.004  27.885    15   1.022 1.210  27 16
 7     --  --  18  --   0  --  --  --   0  --  18  --  --  47          17  1.019  27.809    16   0.937 1.147  25 52
 9  --  --  --  --  --  --  --  --  --  --  --  --  --  --  43          16  1.028  25.957    17   0.848 1.102  17 48
11  --  32  --   0  --  --  --  10  --  --  --   0  --  32  --  39          15  1.046  25.887    18   0.985 1.249  21 40
13  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  35          14  1.140  25.382    19   1.199 1.378  29 46
15  --  14  --  --  --  10  --  --  --  10  --  --  --  14  --  31          13  1.191  26.007    20   1.231 1.374  29 50
17  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  27          12  1.244  26.792    21   1.099 1.265  33 26
19  --  32  --   0  --  --  --  10  --  --  --   0  --  32  --  23          11  1.292  27.534
21  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  19          10  1.329  28.114
23     --  --  18  --   0  --  --  --   0  --  18  --  --     15           9  1.345* 28.334
25        --  --  --  --  --  --  --  --  --  --  --        11           8  1.333  28.887
27           --  --  32  --  14  --  32  --  --              7           7  1.320  29.560
29              --  --  --  --  --  --  --                  3           6  1.301  30.069*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.263  29.948
                                                             4  1.186  28.368
Control Rod Density: %          10.36                        3  1.026  24.125
                                                             2  0.745  16.780
k-effective:                 0.99996                  Bottom  1  0.205   4.625
Void Fraction:                 0.446
Core Delta-P: psia            26.271                % AXIAL TILT -14.160  -5.446
Core Plate Delta-P: psia      21.728          AVG BOT 8ft/12ft  1.0871  1.0234
Coolant Temp: Deg-F           548.2
In Channel Flow: Mlb/hr        90.23   Active Channel Flow: Mlb/hr        90.23
Total Bypass Flow (%):         15.5   (of total core flow)
Total Water Rod Flow (%):      -0.0   (of total core flow)
Source Convergence          0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.378	19	29	46	1.595	0.903	19	29	46	8.78	0.725	18.9	20	49	30	5	7.79	0.875	40.6	15	15	34	5
1.374	20	29	50	1.596	0.902	20	29	50	8.78	0.721	18.2	20	29	50	5	7.80	0.874	40.4	15	33	16	6
1.368	19	27	48	1.604	0.898	19	33	44	8.80	0.717	17.2	19	27	14	5	7.72	0.872	41.1	14	47	32	5
1.368	19	15	32	1.610	0.894	19	27	48	8.79	0.715	17.2	19	47	28	5	7.76	0.872	40.6	14	31	48	5
1.365	20	11	32	1.611	0.894	19	15	30	8.79	0.710	16.2	19	45	30	5	7.71	0.858	39.8	15	23	42	6
1.356	19	23	40	1.611	0.894	19	35	42	7.49	0.708	40.8	14	47	32	5	7.67	0.854	39.9	15	41	24	6
1.355	19	21	38	1.611	0.894	19	21	38	7.53	0.708	40.3	14	29	48	5	7.57	0.850	40.7	18	39	40	6
1.355	19	13	34	1.612	0.893	19	37	22	8.75	0.704	15.6	19	29	16	5	7.60	0.847	39.9	16	23	8	10
1.348	19	21	42	1.613	0.892	20	11	30	7.41	0.696	40.2	18	21	40	6	7.45	0.847	41.6	18	33	50	6
1.348	19	19	40	1.617	0.891	19	43	34	8.59	0.694	16.2	19	19	40	5	7.39	0.844	42.1	18	49	34	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.67 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 12,500.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    24135.0
Exposure: MWd/MTU (GWd)       12500.2 (1702.40 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.169   4.447     4  0.844 0.939  27 42
Inlet Subcooling: Btu/lbm       -26.50                        24  0.509  13.000     5  0.474 0.521   1 36
Flow: Mlb/hr                   104.07 (101.53 %)             23  0.692  18.214     6  0.453 0.480  11 54
                                                             22  0.799  22.148     9  0.399 0.474  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.879  24.911    10  0.445 0.451  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  0.937  26.635    11  0.451 0.456  29 60
 3           -- -- 32 -- 18 -- 32 -- --           55         19  0.979  27.565    14  1.054 1.256  29 48
 5        -- -- -- -- -- -- -- -- -- -- --        51         18  1.017  27.885    15  1.017 1.207  27 16
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47         17  1.043  27.809    16  0.945 1.152  25 52
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43         16  1.053  25.957    17  0.855 1.097  17 48
11 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39         15  1.062  25.887    18  0.983 1.241  21 40
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.150  25.383    19  1.195 1.375  29 46
15 -- 18 -- -- -- 10 -- -- -- 10 -- -- -- 18 -- 31         13  1.194  26.007    20  1.234 1.381  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.243  26.792    21  1.103 1.261  19 52
19 -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23         11  1.287  27.534
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.322  28.115
23    -- -- 18 --  0 -- -- --  0 -- 18 -- --     15          9  1.336* 28.334
25       -- -- -- -- -- -- -- -- -- -- --        11          8  1.323  28.887
27          -- -- 32 -- 18 -- 32 -- --            7          7  1.310  29.560
29             -- -- -- -- -- -- --               3          6  1.292  30.069*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.256  29.948
                                                             4  1.180  28.368
Control Rod Density: %           10.18                       3  1.022  24.125
                                                             2  0.743  16.780
k-effective:                  0.99996                Bottom  1  0.205   4.625
Void Fraction:                  0.449
Core Delta-P: psia             25.314            % AXIAL TILT -13.564  -5.446
Core Plate Delta-P: psia       20.771        AVG BOT 8ft/12ft  1.0859  1.0234
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          87.91  Active Channel Flow: Mlb/hr        87.91
Total Bypass Flow (%):           15.5  (of total core flow)
Total Water Rod Flow (%):        -0.0  (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.381	20	29	50	1.565	0.920	20	29	50	8.70	0.719	18.9	20	49	30	5	7.73	0.868	40.6	15	15	34	5
1.375	19	29	46	1.574	0.915	19	29	46	8.71	0.715	18.2	20	29	50	5	7.74	0.867	40.4	15	33	16	6
1.371	20	11	32	1.582	0.911	20	11	30	8.73	0.711	17.2	19	27	14	5	7.66	0.865	41.1	14	47	32	5
1.368	19	27	48	1.587	0.907	19	27	48	8.71	0.710	17.2	19	47	28	5	7.70	0.865	40.6	14	31	48	5
1.365	19	15	32	1.590	0.906	19	33	44	8.72	0.704	16.2	19	45	30	5	7.65	0.851	39.8	15	23	42	6
1.355	19	13	34	1.590	0.906	19	15	30	7.43	0.703	40.8	14	47	32	5	7.61	0.847	39.9	15	41	24	6
1.347	19	23	40	1.601	0.900	19	21	38	7.47	0.703	40.3	14	29	48	5	7.57	0.843	39.9	16	23	8	10
1.346	19	21	38	1.601	0.900	19	35	42	8.68	0.698	15.6	19	29	16	5	7.50	0.843	40.7	18	39	40	6
1.339	19	21	42	1.601	0.899	19	37	22	7.35	0.690	40.2	18	21	40	6	7.35	0.839	42.1	18	33	50	5
1.339	19	19	40	1.603	0.899	19	43	34	8.52	0.689	16.2	19	19	40	5	7.33	0.838	42.1	18	49	34	5

```
  * LHGR calculated with pin-power reconstruction
  * CPR calculated with pin-power reconstruction & CPR limit type 3
  * Thermal limit file:
```

Figure A.68 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 12,500.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       12874.8 (1753.40 )
Delta E: MWd/MTU, (GWd)         374.6 (  51.01 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -26.13
Flow: Mlb/hr                   105.40 (102.83 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- 32 -- 18 -- 32 -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- 18 --  0 -- -- --  0 -- 18 -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15  -- 18 -- -- -- 10 -- -- -- 10 -- -- -- 18 -- 31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19  -- 32 --  0 -- -- -- 10 -- -- --  0 -- 32 -- 23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23     -- -- 18 --  0 -- -- --  0 -- 18 -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- 32 -- 18 -- 32 -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          10.18

k-effective:                 1.00022
Void Fraction:                 0.447
Core Delta-P: psia            25.776
Core Plate Delta-P: psia      21.233
Coolant Temp: Deg-F           548.1
In Channel Flow: Mlb/hr       89.06   Active Channel Flow: Mlb/hr        89.06
Total Bypass Flow (%):         15.5   (of total core flow)
Total Water Rod Flow (%):      -0.0   (of total core flow)
Source Convergence          0.00009

                                    Core Average Exposure: MWd/MTU    24509.5

                                    Axial Profile     Edit   Radial Power
                                N(PRA) Power Exposure Zone  Avg.  Max.  IR JR
                               Top 25  0.169   4.521    4  0.843 0.938  27 42
                                   24  0.511  13.205    5  0.471 0.518   1 36
                                   23  0.692  18.493    6  0.451 0.478  11 54
                                   22  0.798  22.471    9  0.397 0.472  23 60
                                   21  0.876  25.267   10  0.442 0.448  33 60
                                   20  0.934  27.014   11  0.447 0.452  29 60
                                   19  0.975  27.961   14  1.051 1.251  29 48
                                   18  1.013  28.296   15  1.015 1.204  27 16
                                   17  1.040  28.231   16  0.943 1.149  25 52
                                   16  1.052  26.365   17  0.853 1.094  17 48
                                   15  1.063  26.299   18  0.982 1.238  21 40
                                   14  1.152  25.789   19  1.197 1.378  29 46
                                   13  1.198  26.429   20  1.236 1.381  29 50
                                   12  1.248  27.231   21  1.107 1.264  19 52
                                   11  1.292  27.989
                                   10  1.327  28.582
                                    9  1.341* 28.807
                                    8  1.327  29.356
                                    7  1.311  30.025
                                    6  1.289  30.527*
                                    5  1.251  30.393
                                    4  1.176  28.786
                                    3  1.019  24.487
                                    2  0.741  17.043
                                Bottom  1  0.204   4.698

                          % AXIAL TILT -13.663  -5.479
                      AVG BOT 8ft/12ft  1.0868  1.0238
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.381	20	29	50	1.577	0.913	20	29	50	8.64	0.718	19.6	20	49	30	5	7.71	0.873	41.3	15	15	34	5
1.378	19	29	46	1.583	0.910	19	29	46	8.76	0.717	17.9	19	27	14	5	7.71	0.873	41.3	15	33	16	5
1.371	20	11	32	1.594	0.903	20	11	30	8.68	0.717	18.9	20	29	50	5	7.78	0.869	40.2	14	31	48	5
1.370	19	27	48	1.599	0.900	19	15	30	8.82	0.716	16.9	19	45	30	5	7.72	0.868	40.7	14	47	32	5
1.367	19	15	32	1.601	0.900	19	27	48	8.74	0.716	17.9	19	47	28	5	7.67	0.860	40.4	15	23	42	6
1.357	19	13	34	1.604	0.898	19	33	44	8.79	0.711	16.4	19	29	16	5	7.63	0.856	40.5	15	41	24	6
1.350	19	23	40	1.610	0.894	19	21	38	7.45	0.705	40.9	14	29	14	5	7.53	0.853	41.3	18	39	40	6
1.350	19	21	38	1.611	0.894	19	37	22	7.40	0.704	41.4	14	47	32	5	7.58	0.851	40.6	16	23	8	10
1.343	19	21	42	1.614	0.892	19	25	42	8.62	0.701	16.9	19	19	40	5	7.54	0.845	40.4	15	31	18	6
1.342	19	19	40	1.617	0.890	19	43	34	8.62	0.700	16.8	19	21	42	5	7.48	0.844	41.0	15	17	32	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.69 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 12,874.8 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      12875.0 (1753.40 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -26.97
Flow: Mlb/hr                  102.38 ( 99.88 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 --  0 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- --  8 --  0 -- -- --  0 --  8 -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- --  8 --  0 -- -- --  0 --  8 -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- 28 --  0 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.23

k-effective:                 1.00029
Void Fraction:                 0.457
Core Delta-P: psia            24.777
Core Plate Delta-P: psia      20.237
Coolant Temp: Deg-F           548.2
In Channel Flow: Mlb/hr        86.72   Active Channel Flow: Mlb/hr        86.72
Total Bypass Flow (%):          15.3   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00008
```

```
Core Average Exposure: MWd/MTU    24509.7

                 Axial Profile    Edit   Radial Power
          N(PRA) Power Exposure   Zone   Avg.   Max.   IR JR
Top 25    0.176   4.521            4  0.922  0.957  39 30
    24    0.532  13.205            5  0.488  0.529   1 36
    23    0.718  18.493            6  0.468  0.503  11 54
    22    0.820  22.471            9  0.410  0.483  15 58
    21    0.890  25.267           10  0.456  0.460  33 60
    20    0.932  27.014           11  0.470  0.472   1 32
    19    0.963  27.961           14  1.003  1.153  25 48
    18    0.985  28.296           15  0.966  1.173  21 36
    17    1.001  28.231           16  1.009  1.155  21 48
    16    1.019  26.366           17  0.860  1.177  17 48
    15    1.053  26.299           18  0.973  1.153  19 50
    14    1.155  25.789           19  1.192  1.316  39 28
    13    1.204  26.429           20  1.144  1.299   9 40
    12    1.247  27.231           21  1.154  1.318  17 50
    11    1.271  27.990
    10    1.272  28.582
     9    1.281  28.808
     8    1.295  29.356
     7    1.308  30.025
     6    1.309* 30.527*
     5    1.289  30.393
     4    1.224  28.786
     3    1.066  24.488
     2    0.776  17.043
Bottom 1  0.214   4.698

% AXIAL TILT -13.903  -5.479
AVG BOT 8ft/12ft  1.0866  1.0238
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.318	21	17	50	1.578	0.912	19	19	36	8.84	0.739	20.4	21	13	48	5	6.94	0.840	46.7	18	15	50	5
1.316	19	39	28	1.587	0.907	21	25	34	8.49	0.718	21.8	21	51	42	5	7.25	0.828	42.0	15	15	16	5
1.308	19	19	48	1.595	0.903	20	9	22	8.58	0.716	20.2	19	15	48	5	6.71	0.804	46.0	18	17	10	5
1.307	19	37	26	1.598	0.901	19	9	38	8.40	0.714	22.3	21	17	50	5	7.15	0.803	40.6	17	17	48	5
1.303	19	19	36	1.601	0.899	21	17	50	8.49	0.708	20.1	20	51	40	5	6.51	0.803	48.2	18	49	16	5
1.300	21	35	28	1.603	0.898	19	37	30	7.44	0.687	38.5	14	37	12	12	8.34	0.802	41.8	14	23	50	12
1.299	20	9	40	1.612	0.893	19	39	34	8.28	0.679	18.0	19	39	12	12	7.16	0.802	40.4	15	31	18	6
1.296	19	21	38	1.617	0.891	21	9	42	6.74	0.677	46.3	18	15	50	5	7.09	0.801	41.1	15	33	16	6
1.295	19	9	38	1.626	0.885	21	41	10	8.05	0.676	20.9	21	15	52	5	6.60	0.797	46.6	18	49	42	5
1.293	19	41	30	1.630	0.883	20	9	28	8.14	0.676	19.6	19	13	50	5	7.25	0.794	38.5	18	7	42	5

```
* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:
```

Figure A.70 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 12,875.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       13000.0 (1770.50 )
Delta E: MWd/MTU, (GWd)         125.0 (  17.03 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.86
Flow: Mlb/hr                   102.79 (100.28 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 --  0 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- --  8 --  0 -- -- --  0 --  8 -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- --  8 --  0 -- -- --  0 --  8 -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- 28 --  0 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.23

k-effective:                 1.00031
Void Fraction:                 0.456
Core Delta-P: psia            24.889
Core Plate Delta-P: psia      20.350
Coolant Temp: Deg-F           548.2
In Channel Flow: Mlb/hr       87.10   Active Channel Flow: Mlb/hr       87.10
Total Bypass Flow (%):         15.3   (of total core flow)
Total Water Rod Flow (%):      -0.0   (of total core flow)
Source Convergence          0.00006
```

```
Core Average Exposure: MWd/MTU    24634.8

                 Axial Profile     Edit   Radial Power
          N(PRA) Power Exposure    Zone  Avg.  Max.   IR JR
      Top 25  0.177   4.547        4  0.921 0.956  39 30
          24  0.533  13.277        5  0.488 0.528   1 36
          23  0.718  18.589        6  0.468 0.502  11 54
          22  0.820  22.582        9  0.409 0.482  15 58
          21  0.890  25.387       10  0.455 0.459  33 60
          20  0.931  27.140       11  0.469 0.471   1 32
          19  0.962  28.091       14  1.003 1.151  25 48
          18  0.983  28.429       15  0.965 1.172  21 36
          17  1.000  28.366       16  1.009 1.155  21 48
          16  1.018  26.498       17  0.859 1.176  17 48
          15  1.052  26.436       18  0.972 1.152  19 50
          14  1.155  25.925       19  1.192 1.317  39 28
          13  1.205  26.572       20  1.145 1.301   9 40
          12  1.248  27.378       21  1.155 1.319  17 50
          11  1.272  28.140
          10  1.273  28.732
           9  1.281  28.959
           8  1.295  29.509
           7  1.306  30.179
           6  1.308* 30.682*
           5  1.289  30.545
           4  1.225  28.931
           3  1.068  24.614
           2  0.778  17.135
      Bottom  1  0.214   4.723
% AXIAL TILT -13.940  -5.492
AVG BOT 8ft/12ft  1.0869  1.0239
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.319	21	17	50	1.581	0.911	19	19	36	8.81	0.738	20.6	21	13	48	5	6.90	0.836	46.9	18	15	50	5
1.317	19	39	28	1.593	0.904	21	25	34	8.44	0.716	22.1	21	51	42	5	7.20	0.825	42.2	15	15	16	5
1.309	19	19	48	1.595	0.903	20	9	22	8.54	0.714	20.4	19	15	48	5	8.34	0.804	42.0	14	23	50	12
1.308	19	23	36	1.599	0.900	19	9	38	8.35	0.711	22.6	21	17	50	5	7.16	0.804	40.6	15	31	18	6
1.304	19	19	36	1.605	0.897	21	17	50	8.46	0.707	20.3	20	51	40	5	7.08	0.801	41.3	15	33	16	6
1.301	21	35	28	1.608	0.895	19	37	30	7.44	0.688	38.7	14	37	12	12	6.67	0.801	46.2	18	17	10	5
1.301	20	9	40	1.615	0.892	19	39	34	8.30	0.682	18.2	19	39	12	12	7.11	0.801	40.8	17	17	48	5
1.296	19	9	38	1.619	0.890	21	9	42	6.70	0.675	46.5	18	15	50	5	6.48	0.800	48.4	18	49	16	5
1.296	19	21	38	1.630	0.884	21	41	10	8.10	0.674	19.8	19	47	50	5	6.56	0.794	46.8	18	49	42	5
1.294	19	41	30	1.631	0.883	20	9	28	8.01	0.674	21.1	21	15	52	5	7.22	0.792	38.7	18	7	42	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.71 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 13,000.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       13200.0 (1797.70 )
Delta E: MWd/MTU, (GWd)         200.0 (  27.24 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.45
Flow: Mlb/hr                   104.26 (101.72 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 --  0 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- --  8 --  0 -- -- --  0 --  8 -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- --  8 --  0 -- -- --  0 --  8 -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- --        15
25       -- -- -- 28 --  0 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.23

k-effective:                 1.00049
Void Fraction:                0.454
Core Delta-P: psia           25.352
Core Plate Delta-P: psia     20.809
Coolant Temp: Deg-F          548.3
In Channel Flow: Mlb/hr       88.05
Total Bypass Flow (%):         15.5
Total Water Rod Flow (%):      -0.0
Source Convergence          0.00006
```

Core Average Exposure: MWd/MTU 24834.7

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.177	4.589	4	0.919	0.953	39	30
24	0.534	13.391	5	0.486	0.527	1	36
23	0.719	18.744	6	0.467	0.501	11	54
22	0.821	22.759	9	0.408	0.481	23	60
21	0.890	25.579	10	0.453	0.458	33	60
20	0.930	27.341	11	0.467	0.469	1	32
19	0.961	28.299	14	1.002	1.150	25	48
18	0.982	28.641	15	0.963	1.171	21	36
17	1.000	28.582	16	1.008	1.154	21	48
16	1.020	26.709	17	0.858	1.175	17	48
15	1.055	26.654	18	0.971	1.151	19	50
14	1.159	26.143	19	1.194	1.317	39	28
13	1.211	26.799	20	1.146	1.303	9	40
12	1.253	27.614	21	1.157	1.320	17	50
11	1.277	28.380					
10	1.278	28.973					
9	1.285	29.201					
8	1.296	29.754					
7	1.305*	30.427					
6	1.303	30.929*					
5	1.281	30.789					
4	1.217	29.163					
3	1.061	24.816					
2	0.773	17.282					
Bottom 1	0.213	4.764					
% AXIAL TILT	-13.832	-5.513					
AVG BOT 8ft/12ft	1.0868	1.0240					

Active Channel Flow: Mlb/hr 88.05
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.320	21	17	50	1.590	0.905	19	19	36	8.68	0.729	21.0	21	13	48	5	6.77	0.824	47.2	18	15	50	5
1.317	19	39	28	1.601	0.900	20	9	22	8.34	0.709	22.4	21	9	20	5	7.07	0.813	42.5	15	15	16	5
1.309	19	19	48	1.606	0.897	19	9	38	8.39	0.704	20.8	19	15	48	5	8.36	0.809	42.4	14	23	50	12
1.308	19	23	36	1.607	0.896	21	25	34	8.21	0.701	22.9	21	17	50	5	7.16	0.808	41.0	15	31	18	6
1.306	19	19	36	1.611	0.894	21	17	50	8.36	0.701	20.7	20	51	40	5	7.06	0.803	41.6	15	33	16	6
1.303	20	9	40	1.623	0.887	19	37	30	7.46	0.692	39.0	14	37	12	12	7.30	0.794	37.8	15	39	26	6
1.301	21	35	28	1.624	0.886	21	9	42	8.35	0.688	18.6	19	39	12	12	7.01	0.791	41.0	15	41	24	6
1.298	19	9	38	1.626	0.886	19	39	34	8.20	0.676	18.6	20	39	10	12	6.99	0.791	41.2	17	17	48	5
1.298	19	21	38	1.634	0.881	21	41	10	8.18	0.675	18.8	19	37	10	12	6.55	0.790	46.5	18	17	10	5
1.293	19	41	30	1.639	0.879	20	9	28	8.06	0.668	19.4	19	53	40	5	6.36	0.789	48.7	18	49	16	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.72 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 13,200.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       13400.0 (1825.00 )
Delta E: MWd/MTU, (GWd)         200.0 (  27.24 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.11
Flow: Mlb/hr                    105.47 (102.90 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 --  0 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- --  8 --  0 -- -- --  0 --  8 -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- --  8 --  0 -- -- --  0 --  8 -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- 28 --  0 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %           9.23

k-effective:                  1.00062
Void Fraction:                  0.451
Core Delta-P: psia             25.791
Core Plate Delta-P: psia       21.248
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          89.11
Total Bypass Flow (%):           15.5
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00009
```

Core Average Exposure: MWd/MTU 25034.8

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.177	4.631	4	0.917	0.951	39	30
24	0.536	13.506	5	0.485	0.525	1	36
23	0.721	18.898	6	0.466	0.500	11	54
22	0.823	22.936	9	0.408	0.481	23	60
21	0.890	25.771	10	0.452	0.457	33	60
20	0.930	27.542	11	0.465	0.467	1	32
19	0.960	28.506	14	1.001	1.149	25	48
18	0.982	28.853	15	0.962	1.168	21	36
17	1.000	28.798	16	1.007	1.153	21	48
16	1.022	26.920	17	0.858	1.174	17	48
15	1.059	26.872	18	0.971	1.151	19	50
14	1.164	26.362	19	1.194	1.317	21	34
13	1.216	27.028	20	1.148	1.305	9	40
12	1.259	27.851	21	1.160	1.321	17	50
11	1.283	28.621					
10	1.282	29.214					
9	1.288	29.444					
8	1.297	29.999					
7	1.302*	30.673					
6	1.296	31.175*					
5	1.272	31.031					
4	1.208	29.393					
3	1.053	25.016					
2	0.767	17.429					
Bottom 1	0.211	4.805					
% AXIAL TILT	-13.674	-5.532					
AVG BOT 8ft/12ft	1.0864	1.0242					

Active Channel Flow: Mlb/hr 89.11
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	Power FT	Power IR	Power JR	MCPR Value	MCPR Margin	MCPR FT	MCPR IR	MCPR JR	APLHGR Value	APLHGR Margin	APLHGR Exp.	APLHGR FT	APLHGR IR	APLHGR JR	APLHGR K	LHGR Value	LHGR Margin	LHGR Exp.	LHGR FT	LHGR IR	LHGR JR	LHGR K
1.321	21	17	50	1.602	0.899	19	19	36	8.55	0.720	21.4	21	47	48	5	8.37	0.814	42.7	14	23	50	12
1.317	19	21	34	1.607	0.896	20	9	22	8.22	0.701	22.7	21	9	20	5	6.65	0.813	47.5	18	15	50	5
1.310	19	19	48	1.614	0.892	19	9	38	7.47	0.696	39.3	14	37	12	12	7.16	0.810	41.3	15	31	18	6
1.308	19	23	36	1.619	0.890	21	17	50	8.25	0.695	21.2	19	15	48	5	7.04	0.803	42.0	15	33	16	6
1.306	19	19	36	1.623	0.887	21	25	34	8.40	0.694	19.0	19	39	12	12	6.95	0.801	42.9	15	15	16	5
1.305	20	9	40	1.631	0.883	21	9	42	8.25	0.694	21.1	20	51	40	5	7.32	0.799	38.2	15	39	26	6
1.300	21	35	28	1.638	0.879	19	39	34	8.08	0.692	23.2	21	17	12	5	7.00	0.793	41.4	15	41	24	6
1.300	19	9	38	1.639	0.879	19	37	30	8.27	0.683	18.9	20	39	10	12	6.88	0.781	41.5	17	17	48	5
1.298	19	21	38	1.639	0.878	21	41	10	8.23	0.681	19.1	19	23	52	12	6.46	0.780	46.6	18	49	42	6
1.293	19	41	30	1.647	0.874	20	9	28	8.11	0.664	17.8	19	29	16	6	6.43	0.779	46.8	18	17	10	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.73 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 13,400.0 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       13400.2 (1825.00 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.57
Flow: Mlb/hr                   103.80 (101.27 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --                59  :JR
 3           -- -- -- -- -- -- -- -- -- --          55
 5        -- -- -- 28 --  6 -- 28 -- -- --          51
 7     -- -- -- -- -- -- -- -- -- -- -- --          47
 9 -- -- --  8 --  0 -- -- --  0 --  8 -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- --  8 --  0 -- -- --  0 --  8 -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- 28 --  6 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.10

k-effective:                 1.00062
Void Fraction:                 0.453
Core Delta-P: psia            25.157
Core Plate Delta-P: psia      20.615
Coolant Temp: Deg-F           548.2
In Channel Flow: Mlb/hr        87.67
Total Bypass Flow (%):          15.5
Total Water Rod Flow (%):       -0.0
Source Convergence          0.00006
```

Core Average Exposure: MWd/MTU 25035.0

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.182	4.631	4	0.915	0.947	39	30
24	0.551	13.506	5	0.484	0.523	1	36
23	0.740	18.899	6	0.466	0.499	11	54
22	0.840	22.937	9	0.407	0.485	23	60
21	0.903	25.771	10	0.454	0.463	33	60
20	0.939	27.542	11	0.468	0.472	29	60
19	0.966	28.506	14	1.003	1.158	25	48
18	0.985	28.854	15	0.960	1.164	21	36
17	1.001	28.798	16	1.010	1.155	21	48
16	1.020	26.920	17	0.858	1.172	17	48
15	1.055	26.873	18	0.970	1.152	19	50
14	1.159	26.363	19	1.193	1.311	21	34
13	1.210	27.028	20	1.154	1.298	9	40
12	1.252	27.851	21	1.159	1.319	17	50
11	1.275	28.621					
10	1.274	29.214					
9	1.280	29.445					
8	1.289	29.999					
7	1.295*	30.674					
6	1.290	31.176*					
5	1.267	31.032					
4	1.203	29.393					
3	1.050	25.016					
2	0.765	17.429					
Bottom 1	0.211	4.805					
% AXIAL TILT	-13.064	-5.532					
AVG BOT 8ft/12ft	1.0815	1.0242					

Active Channel Flow: Mlb/hr 87.67

(of total core flow)

(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	Power FT	Power IR	Power JR	MCPR Value	MCPR Margin	MCPR FT	MCPR IR	MCPR JR	APLHGR Value	APLHGR Margin	APLHGR Exp.	APLHGR FT	APLHGR IR	APLHGR JR	APLHGR K	LHGR Value	LHGR Margin	LHGR Exp.	LHGR FT	LHGR IR	LHGR JR	LHGR K
1.319	21	17	50	1.595	0.903	19	19	36	8.50	0.717	21.4	21	47	48	5	8.33	0.810	42.7	14	23	50	12
1.311	19	21	34	1.600	0.900	21	17	50	8.18	0.698	22.7	21	9	20	5	6.62	0.809	47.5	18	15	50	5
1.310	19	19	48	1.602	0.899	20	9	22	7.44	0.692	39.3	14	37	12	12	7.11	0.805	41.3	15	31	18	6
1.304	19	23	36	1.611	0.894	19	9	38	8.21	0.691	21.2	19	15	48	5	6.99	0.798	42.0	15	33	16	6
1.300	19	19	36	1.613	0.892	21	41	10	8.21	0.691	21.1	20	51	40	5	6.91	0.798	42.9	15	15	16	5
1.298	19	29	46	1.615	0.891	21	25	34	8.36	0.691	19.0	19	39	12	12	7.28	0.795	38.2	15	39	26	6
1.298	20	9	40	1.627	0.885	21	9	42	8.04	0.689	23.2	21	17	12	5	6.96	0.789	41.4	15	41	24	6
1.295	21	35	28	1.632	0.882	19	39	34	8.22	0.679	18.9	20	39	10	12	6.85	0.777	41.5	17	17	48	5
1.293	19	21	38	1.633	0.882	19	37	30	8.19	0.677	19.1	19	23	52	12	6.42	0.776	46.6	18	49	42	6
1.293	19	9	38	1.639	0.878	19	19	48	7.93	0.660	19.7	19	53	40	5	6.40	0.775	46.8	18	17	10	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.74 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 13,400.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    25354.8
Exposure: MWd/MTU (GWd)       13720.0 (1868.50 )
Delta E: MWd/MTU, (GWd)         319.8 (  43.55 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.184   4.700     4   0.912 0.944  39 30
Inlet Subcooling: Btu/lbm       -25.99                       24  0.556  13.696     5   0.483 0.521   1 36
Flow: Mlb/hr                   105.96 (103.37 %)            23  0.746  19.153     6   0.465 0.498  11 54
                                                            22  0.846  23.227     9   0.406 0.484  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.907  26.083    10   0.452 0.461  33 60
 1              -- -- -- -- -- -- --              59  :JR  20  0.941  27.866    11   0.465 0.470  29 60
 3           -- -- -- -- -- -- -- -- -- --        55       19  0.967  28.839    14   1.001 1.156  25 48
 5        -- -- -- 28 --  6 -- 28 -- -- --        51       18  0.987  29.193    15   0.957 1.160  21 36
 7     -- -- -- -- -- -- -- -- -- -- -- --        47       17  1.004  29.143    16   1.010 1.153  21 48
 9 -- -- --  8 --  0 -- -- --  0 --  8 -- -- -- 43       16  1.026  27.258    17   0.858 1.170  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39       15  1.063  27.222    18   0.969 1.151  19 50
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 35       14  1.169  26.712    19   1.194 1.311  21 34
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31       13  1.220  27.393    20   1.156 1.301   9 40
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 27       12  1.262  28.229    21   1.163 1.321  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23       11  1.284  29.006
21 -- -- --  8 --  0 -- -- --  0 --  8 -- -- -- 19       10  1.280  29.599
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15        9  1.282  29.832
25       -- -- -- 28 --  6 -- 28 -- -- --        11        8  1.287* 30.389
27          -- -- -- -- -- -- -- -- --           7        7  1.286  31.065
29             -- -- -- -- -- -- --              3        6  1.275  31.566*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.248  31.415
                                                            4  1.184  29.757
Control Rod Density: %           9.10                       3  1.034  25.334
                                                            2  0.754  17.660
k-effective:                  1.00081                Bottom  1  0.208   4.869
Void Fraction:                  0.448
Core Delta-P: psia             25.912          % AXIAL TILT -12.572  -5.552
Core Plate Delta-P: psia       21.369       AVG BOT 8ft/12ft  1.0797  1.0244
Coolant Temp: Deg-F            548.3
In Channel Flow: Mlb/hr         89.58   Active Channel Flow: Mlb/hr        89.58
Total Bypass Flow (%):          15.5   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.321	21	17	50	1.612	0.893	21	17	50	8.28	0.701	21.9	21	13	14	5	8.37	0.818	43.3	14	23	50	12
1.311	19	21	34	1.613	0.893	20	9	22	8.45	0.701	19.5	19	21	50	12	7.07	0.806	41.8	15	31	18	6
1.311	19	19	48	1.615	0.892	19	19	36	7.47	0.699	39.9	14	37	12	12	7.28	0.800	38.7	15	39	26	6
1.303	19	23	36	1.623	0.887	21	41	10	8.33	0.691	19.5	20	21	52	12	6.92	0.794	42.5	15	33	16	6
1.301	20	9	40	1.624	0.887	19	9	38	8.27	0.687	19.7	19	23	52	12	6.41	0.789	48.0	18	15	50	5
1.301	19	19	36	1.638	0.879	21	9	42	7.98	0.684	23.3	21	9	20	5	6.91	0.788	41.9	15	41	24	6
1.298	19	29	46	1.642	0.877	21	25	34	8.01	0.677	21.7	20	51	40	5	7.24	0.781	37.2	16	39	48	12
1.295	19	9	38	1.652	0.872	19	19	48	7.98	0.674	21.7	19	15	14	5	6.72	0.779	43.3	15	15	16	6
1.294	19	23	48	1.652	0.872	19	39	34	7.81	0.672	23.8	21	17	12	5	6.93	0.777	40.5	14	23	38	6
1.294	21	25	34	1.658	0.869	20	9	28	8.03	0.661	18.4	19	29	16	6	7.19	0.777	37.2	15	23	34	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.75 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 13,720.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    25355.0
Exposure: MWd/MTU (GWd)       13720.2 (1868.60 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.   IR JR
Core Pressure: psia            1050.0                   Top 25  0.186   4.700     4  0.910 0.941  39 30
Inlet Subcooling: Btu/lbm       -26.57                      24  0.562  13.696     5  0.484 0.522   1 36
Flow: Mlb/hr                   103.82 (101.29 %)            23  0.754  19.153     6  0.465 0.499  11 54
                                                            22  0.857  23.227     9  0.407 0.483  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.922  26.083    10  0.452 0.459  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.962  27.866    11  0.464 0.468  29 60
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.982  28.840    14  1.000 1.151  25 48
 5        -- -- -- 28 --  6 -- 28 -- -- --        51         18  0.996  29.194    15  0.956 1.157  21 36
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  1.009  29.144    16  1.011 1.151  21 48
 9 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- -- 43         16  1.027  27.258    17  0.859 1.172  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39         15  1.061  27.223    18  0.970 1.149  19 50
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 35         14  1.164  26.713    19  1.194 1.310  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.213  27.393    20  1.155 1.304   9 40
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 -- 27         12  1.253  28.229    21  1.162 1.320  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23         11  1.274  29.006
21 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- -- 19         10  1.270  29.599
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15          9  1.272  29.832
25       -- -- -- 28 --  6 -- 28 -- -- --       11          8  1.277  30.390
27          -- -- -- -- -- -- -- -- --           7          7  1.277* 31.065
29             -- -- -- -- -- -- --              3          6  1.268  31.566*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.242  31.415
                                                            4  1.181  29.757
Control Rod Density: %            9.01                      3  1.032  25.334
                                                            2  0.753  17.660
k-effective:                   1.00076                Bottom  1  0.207   4.869
Void Fraction:                   0.450
Core Delta-P: psia              25.074          % AXIAL TILT -11.878  -5.552
Core Plate Delta-P: psia        20.532       AVG BOT 8ft/12ft  1.0743  1.0244
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          87.74  Active Channel Flow: Mlb/hr        87.74
Total Bypass Flow (%):           15.5  (of total core flow)
Total Water Rod Flow (%):        -0.0  (of total core flow)
Source Convergence            0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.320	21	17	50	1.583	0.910	20	9	22	8.23	0.697	21.9	21	13	14	5	8.31	0.812	43.3	14	23	50	12
1.310	19	19	48	1.591	0.905	21	17	50	8.38	0.696	19.5	19	21	50	12	7.03	0.801	41.8	15	31	18	6
1.307	19	21	34	1.594	0.903	19	19	36	7.41	0.694	39.9	14	37	12	12	7.23	0.794	38.7	15	39	26	6
1.304	20	9	40	1.599	0.901	19	9	38	8.27	0.686	19.5	20	21	52	12	6.87	0.789	42.5	15	33	16	6
1.299	19	19	36	1.605	0.897	21	9	42	8.20	0.682	19.7	19	23	52	12	6.38	0.784	48.0	18	15	50	5
1.299	19	23	36	1.607	0.896	21	41	10	7.93	0.680	23.3	21	9	20	5	6.87	0.783	41.9	15	41	24	6
1.297	19	9	38	1.625	0.886	19	19	48	7.96	0.673	21.7	20	51	40	5	7.18	0.775	37.2	16	39	48	12
1.292	19	29	46	1.632	0.882	21	25	34	7.93	0.670	21.7	19	15	14	5	6.67	0.774	43.3	15	15	16	6
1.291	19	21	38	1.632	0.882	19	15	48	7.76	0.668	23.8	21	17	12	5	7.15	0.772	37.2	15	23	34	6
1.290	19	23	48	1.636	0.880	20	9	28	7.98	0.656	18.4	19	29	16	6	6.88	0.772	40.5	14	23	38	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.76 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 13,720.2 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    25634.8
Exposure: MWd/MTU (GWd)       14000.0 (1906.70 )
Delta E: MWd/MTU, (GWd)         279.8 (  38.11 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.188   4.761     4  0.906 0.938  39 30
Inlet Subcooling: Btu/lbm       -25.90                       24  0.568  13.865     5  0.482 0.520   1 36
Flow: Mlb/hr                   106.28 (103.69 %)            23  0.761  19.380     6  0.464 0.497  11 54
                                                            22  0.864  23.486     9  0.406 0.482  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.929  26.361    10  0.450 0.458  33 60
 1              -- -- -- -- -- -- --              59  :JR  20  0.967  28.157    11  0.462 0.466  29 60
 3           -- -- -- -- -- -- -- -- -- --        55       19  0.986  29.136    14  0.999 1.148  25 48
 5        -- -- -- 28 --  6 -- 28 -- -- --        51       18  1.000  29.494    15  0.953 1.153  21 36
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47       17  1.014  29.448    16  1.010 1.150  21 48
 9 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- --  43       16  1.035  27.556    17  0.859 1.172  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39       15  1.070  27.530    18  0.970 1.150  19 50
13 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  35       14  1.176  27.020    19  1.195 1.311  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31       13  1.225  27.714    20  1.156 1.308   9 40
17 -- 28 -- 12 -- -- -- 14 -- -- -- 12 -- 28 --  27       12  1.265  28.560    21  1.166 1.323  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23       11  1.283* 29.343
21 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- --  19       10  1.276  29.934
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15        9  1.274  30.168
25       -- -- -- 28 --  6 -- 28 -- -- --        11        8  1.273  30.727
27          -- -- -- -- -- -- -- -- --            7        7  1.267  31.403
29             -- -- -- -- -- -- --               3        6  1.250  31.902*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.220  31.744
                                                            4  1.157  30.070
Control Rod Density: %            9.01                      3  1.012  25.607
                                                            2  0.738  17.859
k-effective:                   1.00104                Bottom  1  0.203   4.925
Void Fraction:                   0.444
Core Delta-P: psia              25.983          % AXIAL TILT -11.183  -5.557
Core Plate Delta-P: psia        21.440       AVG BOT 8ft/12ft  1.0714  1.0245
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          89.89   Active Channel Flow: Mlb/hr        89.89
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00005
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.323	21	17	50	1.594	0.903	20	9	22	8.47	0.706	20.0	19	21	50	12	8.35	0.821	43.8	14	23	50	12
1.311	19	19	48	1.603	0.898	21	17	50	7.45	0.701	40.3	14	37	12	12	6.96	0.797	42.3	15	31	18	6
1.308	20	9	40	1.612	0.894	19	9	38	8.37	0.698	20.0	20	21	52	12	7.20	0.795	39.2	15	39	26	6
1.306	19	21	34	1.615	0.891	19	19	36	8.28	0.691	20.2	19	23	52	12	7.22	0.784	37.6	16	39	48	12
1.300	19	9	38	1.616	0.891	21	9	42	8.00	0.681	22.4	21	13	14	5	6.78	0.782	42.9	15	33	16	6
1.298	19	19	36	1.618	0.890	21	41	10	7.72	0.665	23.8	21	9	20	5	7.01	0.781	40.0	18	41	50	12
1.297	19	23	36	1.639	0.878	19	19	48	7.77	0.659	22.1	20	9	22	5	6.80	0.779	42.3	15	41	24	6
1.294	21	19	52	1.645	0.875	19	15	48	7.98	0.658	18.6	21	7	26	12	7.15	0.776	37.7	15	23	34	6
1.291	19	23	48	1.650	0.873	20	9	28	7.93	0.654	18.9	19	29	16	6	6.85	0.773	41.0	14	23	24	6
1.291	19	29	46	1.650	0.873	19	11	40	7.70	0.653	22.2	19	15	14	5	6.94	0.768	39.3	16	25	10	12

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.77 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,000.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    25635.0
Exposure: MWd/MTU (GWd)       14000.2 (1906.70 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.188   4.761     4  0.907 0.942  39 30
Inlet Subcooling: Btu/lbm       -26.47                      24  0.567  13.865     5  0.482 0.523   1 36
Flow: Mlb/hr                   104.17 (101.63 %)            23  0.760  19.380     6  0.464 0.496  11 54
                                                            22  0.864  23.486     9  0.405 0.479  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.932  26.361    10  0.450 0.455  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.974  28.157    11  0.462 0.463  29 60
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.998  29.136    14  1.001 1.142  25 48
 5        -- -- -- 28 --  6 -- 28 -- -- --        51         18  1.019  29.494    15  0.954 1.156  21 36
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  1.027  29.448    16  1.010 1.144  21 48
 9 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- -- 43         16  1.042  27.556    17  0.858 1.166  17 48
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39         15  1.074  27.530    18  0.968 1.143  19 50
13 -- 28 -- 14 -- -- -- 14 -- -- -- 14 -- 28 -- 35         14  1.176  27.020    19  1.196 1.311  21 34
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.223  27.714    20  1.158 1.311   9 40
17 -- 28 -- 14 -- -- -- 14 -- -- -- 14 -- 28 -- 27         12  1.260  28.560    21  1.163 1.316  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23         11  1.277* 29.343
21 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- -- 19         10  1.268  29.934
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15          9  1.266  30.169
25       -- -- -- 28 --  6 -- 28 -- -- --       11          8  1.265  30.728
27          -- -- -- -- -- -- -- -- --            7          7  1.259  31.404
29             -- -- -- -- -- -- --               3          6  1.244  31.902*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.215  31.744
                                                             4  1.154  30.070
Control Rod Density: %            8.92                       3  1.010  25.608
                                                             2  0.736  17.860
k-effective:                   1.00101                Bottom  1  0.203   4.925
Void Fraction:                   0.446
Core Delta-P: psia              25.198              % AXIAL TILT -10.676  -5.557
Core Plate Delta-P: psia        20.656          AVG BOT 8ft/12ft  1.0683  1.0245
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          88.06   Active Channel Flow: Mlb/hr        88.06
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.316	21	17	50	1.568	0.918	20	9	22	8.41	0.701	20.0	19	21	50	12	8.29	0.815	43.8	14	23	50	12
1.311	19	21	34	1.581	0.911	19	19	36	7.40	0.696	40.3	14	37	12	12	7.25	0.813	40.5	15	15	34	19
1.311	20	9	40	1.583	0.909	19	9	38	8.30	0.692	20.0	20	21	52	12	7.30	0.806	39.1	14	47	26	19
1.306	19	19	36	1.596	0.902	21	9	42	8.22	0.686	20.2	19	23	52	12	6.92	0.793	42.3	15	31	18	6
1.306	19	9	38	1.597	0.902	21	17	50	7.97	0.677	22.4	21	13	14	5	7.16	0.791	39.2	15	39	26	6
1.304	19	19	48	1.612	0.894	20	9	28	7.68	0.661	23.8	21	9	20	5	7.50	0.779	33.7	14	7	34	15
1.298	19	23	36	1.612	0.893	21	41	10	7.98	0.657	18.6	21	7	26	12	7.17	0.778	37.6	16	39	48	12
1.292	19	21	38	1.623	0.887	19	11	40	7.73	0.655	22.1	20	9	22	5	6.74	0.778	42.9	15	33	16	6
1.292	19	11	40	1.629	0.884	19	19	48	7.88	0.651	18.9	19	29	16	6	6.95	0.775	40.0	18	41	50	12
1.291	19	41	30	1.630	0.884	19	39	34	7.66	0.650	22.2	19	15	14	5	6.76	0.775	42.3	15	41	24	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.78 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,000.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       14250.0 (1940.70 )
Delta E: MWd/MTU, (GWd)         249.8 (  34.02 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.84
Flow: Mlb/hr                   106.51 (103.91 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 --  6 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9  -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- --  43
11  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13  -- 28 -- 14 -- -- -- 14 -- -- -- 14 -- 28 --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- 28 -- 14 -- -- -- 14 -- -- -- 14 -- 28 --  27
19  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21  -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- --  19
23     -- -- -- -- -- -- -- -- -- -- -- --        15
25        -- -- -- 28 --  6 -- 28 -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %           8.92

k-effective:                  1.00115
Void Fraction:                  0.440
Core Delta-P: psia             26.026
Core Plate Delta-P: psia       21.483
Coolant Temp: Deg-F            548.2
In Channel Flow: Mlb/hr         90.13
Total Bypass Flow (%):          15.4
Total Water Rod Flow (%):       -0.0
Source Convergence           0.00009
```

Core Average Exposure: MWd/MTU 25884.7

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.189	4.817	4	0.904	0.939	19	34
24	0.574	14.017	5	0.481	0.522	1	36
23	0.767	19.584	6	0.463	0.495	11	54
22	0.871	23.719	9	0.404	0.479	23	60
21	0.937	26.613	10	0.449	0.454	33	60
20	0.979	28.419	11	0.461	0.462	29	60
19	1.002	29.405	14	1.000	1.139	25	48
18	1.023	29.769	15	0.952	1.152	21	36
17	1.032	29.725	16	1.010	1.143	21	48
16	1.049	27.826	17	0.858	1.166	17	48
15	1.083	27.808	18	0.968	1.144	19	50
14	1.187	27.297	19	1.196	1.309	21	34
13	1.234	28.002	20	1.159	1.314	9	40
12	1.270	28.857	21	1.167	1.318	17	50
11	1.285*	29.644					
10	1.274	30.233					
9	1.267	30.468					
8	1.261	31.027					
7	1.249	31.701					
6	1.228	32.196*					
5	1.195	32.031					
4	1.132	30.343					
3	0.991	25.846					
2	0.723	18.034					
Bottom 1	0.199	4.973					
% AXIAL TILT	-10.022	-5.549					
AVG BOT 8ft/12ft	1.0657	1.0246					

Active Channel Flow: Mlb/hr 90.13
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.318	21	17	50	1.580	0.912	20	9	22	8.48	0.710	20.5	19	21	50	12	8.33	0.824	44.2	14	23	50	12
1.314	20	9	40	1.596	0.902	19	9	38	8.39	0.702	20.5	20	21	52	12	7.21	0.813	40.9	15	15	34	19
1.309	19	21	34	1.602	0.899	19	19	36	7.44	0.702	40.7	14	37	12	12	7.29	0.809	39.5	14	47	26	19
1.308	19	9	38	1.607	0.896	21	9	42	8.29	0.694	20.6	19	23	52	12	7.13	0.791	39.6	15	39	26	6
1.305	19	19	48	1.608	0.895	21	17	50	8.10	0.670	19.1	21	53	36	12	6.86	0.789	42.7	15	31	18	6
1.305	19	19	36	1.622	0.888	21	41	10	7.76	0.663	22.9	21	13	14	5	7.56	0.789	34.2	14	7	34	15
1.296	19	23	36	1.626	0.886	20	9	28	7.26	0.656	36.6	14	53	28	12	7.21	0.786	38.1	16	39	48	12
1.293	19	11	40	1.637	0.880	19	11	40	6.72	0.649	42.8	14	13	36	19	7.02	0.786	40.4	18	41	50	12
1.292	21	9	42	1.643	0.877	19	19	48	6.94	0.648	39.8	18	19	50	12	7.10	0.775	38.1	15	23	34	6
1.290	19	21	38	1.648	0.874	19	15	48	7.50	0.648	24.2	21	9	20	5	6.65	0.771	43.3	15	33	16	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.79 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,250.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      14250.2 (1940.70 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm     -26.99
Flow: Mlb/hr                  102.33 ( 99.83 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              .  --  --  --  --  --  --  --              .          59  :JR
 3           --  --  --  --  --  --  --  --  --  --  --                55
 5        --  --  --  28  --  14  --  28  --  --  --                   51
 7     --  --  --  --  --  --  --  --  --  --  --  --  --             47
 9  --  --  --  10  --   0  --  --  --   0  --  10  --  --  --  43
11  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  39
13  --  28  --  14  --  --  --  16  --  --  --  14  --  28  --  35
15  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  31
17  --  28  --  14  --  --  --  16  --  --  --  14  --  28  --  27
19  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  23
21  --  --  --  10  --   0  --  --  --   0  --  10  --  --  --  19
23     --  --  --  --  --  --  --  --  --  --  --  --  --     15
25        --  --  --  28  --  14  --  28  --  --  --           11
27           --  --  --  --  --  --  --  --  --              7
29              --  --  --  --  --  --  --                  3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              8.69

k-effective:                     1.00127
Void Fraction:                     0.444
Core Delta-P: psia                24.467
Core Plate Delta-P: psia          19.926
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr           86.51
Total Bypass Flow (%):             15.5
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00007
```

Core Average Exposure: MWd/MTU 25884.9

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.192	4.817	4	0.905	0.933	39	30
24	0.579	14.017	5	0.477	0.514	1	36
23	0.776	19.585	6	0.461	0.492	11	54
22	0.886	23.719	9	0.403	0.487	23	60
21	0.960	26.613	10	0.451	0.467	33	60
20	1.006	28.420	11	0.465	0.477	29	60
19	1.031	29.406	14	1.003	1.159	25	48
18	1.050	29.769	15	0.951	1.147	27	16
17	1.054	29.725	16	1.015	1.147	21	48
16	1.062	27.826	17	0.857	1.159	17	48
15	1.087	27.808	18	0.965	1.144	19	50
14	1.184	27.298	19	1.195	1.311	29	46
13	1.226	28.003	20	1.172	1.294	25	50
12	1.258	28.857	21	1.164	1.312	17	50
11	1.269*	29.644					
10	1.256	30.234					
9	1.249	30.468					
8	1.243	31.027					
7	1.231	31.701					
6	1.211	32.196*					
5	1.180	32.031					
4	1.119	30.343					
3	0.980	25.846					
2	0.716	18.034					
Bottom 1	0.197	4.973					
% AXIAL TILT	-8.601	-5.549					
AVG BOT 8ft/12ft	1.0561	1.0246					

Active Channel Flow: Mlb/hr 86.51
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.312	21	17	50	1.572	0.916	20	9	22	8.41	0.704	20.5	19	21	50	12	7.70	0.837	37.8	14	23	50	15
1.311	19	29	46	1.575	0.915	21	17	50	7.39	0.698	40.7	14	37	12	12	7.14	0.805	40.9	15	15	34	19
1.303	19	19	48	1.576	0.914	21	41	10	8.33	0.696	20.5	20	21	52	12	7.20	0.798	39.5	14	47	26	19
1.301	19	27	48	1.583	0.910	19	19	36	8.23	0.690	20.6	19	23	52	12	7.15	0.780	38.1	16	39	48	12
1.301	19	21	34	1.592	0.905	19	29	46	7.97	0.659	19.1	21	53	36	12	7.02	0.780	39.6	15	39	26	6
1.298	19	23	48	1.593	0.904	19	9	38	7.66	0.654	22.9	21	13	14	5	6.95	0.779	40.4	18	41	50	12
1.294	20	25	50	1.601	0.899	21	9	42	7.15	0.646	36.6	14	53	28	12	6.75	0.777	42.7	15	31	18	6
1.294	20	9	40	1.608	0.896	19	19	48	6.87	0.642	39.8	18	19	50	12	7.43	0.776	34.2	14	7	34	15
1.293	19	19	36	1.617	0.890	20	35	12	6.64	0.641	42.8	14	13	36	19	6.89	0.766	39.7	16	25	10	12
1.292	19	23	36	1.620	0.889	20	9	28	7.40	0.640	24.2	21	9	20	5	6.86	0.765	39.9	15	31	26	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.80 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,250.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      14600.0 (1988.40 )
Delta E: MWd/MTU, (GWd)        349.8 (  47.64 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -25.99
Flow: Mlb/hr                  105.95 (103.37 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 -- 14 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- 28 -- 14 -- -- -- 16 -- -- -- 14 -- 28 -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- 28 -- 14 -- -- -- 16 -- -- -- 14 -- 28 -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- -- 10 --  0 -- -- --  0 -- 10 -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- 28 -- 14 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              8.69

k-effective:                     1.00139
Void Fraction:                     0.435
Core Delta-P: psia                25.728
Core Plate Delta-P: psia          21.186
Coolant Temp: Deg-F               548.1
In Channel Flow: Mlb/hr            89.71
Total Bypass Flow (%):             15.3
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00007
```

Core Average Exposure: MWd/MTU 26234.9

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.195	4.896	4	0.900	0.928	39	30
24	0.590	14.235	5	0.476	0.513	1	36
23	0.788	19.877	6	0.461	0.492	11	54
22	0.898	24.053	9	0.403	0.487	23	60
21	0.970	26.975	10	0.450	0.465	33	60
20	1.014	28.799	11	0.463	0.475	29	60
19	1.037	29.795	14	1.002	1.156	25	48
18	1.056	30.166	15	0.948	1.142	27	16
17	1.061	30.123	16	1.015	1.146	21	48
16	1.073	28.211	17	0.858	1.159	17	48
15	1.100	28.202	18	0.965	1.145	19	50
14	1.201	27.689	19	1.194	1.308	29	46
13	1.243	28.407	20	1.174	1.298	9	40
12	1.273	29.272	21	1.169	1.316	17	50
11	1.281*	30.063					
10	1.263	30.648					
9	1.250	30.881					
8	1.235	31.438					
7	1.214	32.109					
6	1.186	32.597*					
5	1.148	32.422					
4	1.086	30.713					
3	0.952	26.171					
2	0.695	18.270					
Bottom 1	0.192	5.039					
% AXIAL TILT	-7.541	-5.511					
AVG BOT 8ft/12ft	1.0516	1.0244					

Active Channel Flow: Mlb/hr 89.71

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.316	21	17	50	1.590	0.906	20	9	22	8.50	0.715	21.1	19	21	50	12	7.78	0.851	38.4	14	23	50	15
1.308	19	29	46	1.591	0.905	21	41	10	8.44	0.710	21.1	20	21	52	12	7.09	0.804	41.5	15	15	34	19
1.304	19	19	48	1.592	0.905	21	17	50	7.43	0.705	41.1	14	23	50	12	7.19	0.803	40.1	14	47	26	19
1.299	19	27	48	1.613	0.893	19	9	38	8.31	0.700	21.3	19	23	52	12	7.04	0.794	40.9	18	41	50	12
1.299	19	23	48	1.617	0.891	19	19	36	8.14	0.677	19.7	21	53	36	12	7.21	0.791	38.6	16	39	48	12
1.298	20	9	40	1.618	0.890	21	9	42	7.25	0.659	37.1	14	53	34	12	7.52	0.790	34.8	14	7	34	15
1.297	19	21	34	1.622	0.888	19	29	46	6.96	0.655	40.3	18	19	50	12	6.95	0.776	40.2	15	39	26	6
1.296	21	19	52	1.629	0.884	19	19	48	7.75	0.648	20.5	21	19	52	12	6.93	0.776	40.3	16	25	10	12
1.294	20	25	50	1.640	0.878	20	35	12	6.63	0.643	43.3	14	13	36	19	6.71	0.769	42.4	15	31	18	7
1.291	19	9	38	1.643	0.877	20	9	28	7.77	0.639	18.4	19	23	36	6	6.97	0.766	38.7	15	23	34	6

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.81 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,600.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    26235.0
Exposure: MWd/MTU (GWd)       14600.2 (1988.40 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.207   4.896     4  0.906 0.931  39 30
Inlet Subcooling: Btu/lbm       -26.57                      24  0.627  14.235     5  0.475 0.512   1 36
Flow: Mlb/hr                   103.79 (101.26 %)            23  0.833  19.877     6  0.459 0.491  11 54
                                                            22  0.939  24.053     9  0.401 0.481  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.996  26.975    10  0.446 0.457  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  1.026  28.799    11  0.458 0.466  29 60
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.036  29.795    14  0.998 1.151  25 48
 5        -- -- -- 28 -- 10 -- 28 -- -- --        51         18  1.047  30.166    15  0.956 1.145  21 36
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  1.052  30.123    16  1.010 1.151  21 48
 9 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- --  43         16  1.063  28.211    17  0.853 1.162  17 14
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  1.090  28.202    18  0.964 1.144  19 50
13 -- 28 -- 14 -- -- -- 16 -- -- -- 14 -- 28 --  35         14  1.188  27.689    19  1.201 1.308  19 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.230  28.407    20  1.161 1.294   9 40
17 -- 28 -- 14 -- -- -- 16 -- -- -- 14 -- 28 --  27         12  1.260  29.273    21  1.163 1.314  17 50
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.268* 30.063
21 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- --  19         10  1.250  30.649
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.237  30.882
25       -- -- -- 28 -- 10 -- 28 -- -- --        11          8  1.223  31.438
27          -- -- -- -- -- -- -- -- --            7          7  1.203  32.109
29             -- -- -- -- -- -- --               3          6  1.176  32.597*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.140  32.422
                                                             4  1.080  30.713
Control Rod Density: %          8.51                         3  0.947  26.171
                                                             2  0.692  18.271
k-effective:                 1.00141                  Bottom  1  0.191   5.039
Void Fraction:                 0.436
Core Delta-P: psia            24.911              % AXIAL TILT  -6.571  -5.511
Core Plate Delta-P: psia      20.369          AVG BOT 8ft/12ft  1.0428  1.0244
Coolant Temp: Deg-F           548.0
In Channel Flow: Mlb/hr        87.84   Active Channel Flow: Mlb/hr        87.84
Total Bypass Flow (%):         15.4    (of total core flow)
Total Water Rod Flow (%):      -0.0    (of total core flow)
Source Convergence          0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.314	21	17	50	1.558	0.924	21	17	50	8.39	0.706	21.1	19	21	50	12	7.62	0.835	38.4	14	23	50	15
1.308	19	19	48	1.567	0.919	21	41	10	8.33	0.700	21.1	20	21	52	12	7.17	0.814	41.5	15	15	34	19
1.302	19	21	34	1.570	0.917	20	9	22	7.35	0.697	41.1	14	23	50	12	7.26	0.811	40.1	14	47	26	19
1.300	19	23	48	1.584	0.909	19	19	48	8.20	0.690	21.3	19	23	52	12	7.48	0.787	34.8	14	7	34	15
1.299	19	29	46	1.593	0.904	19	19	36	8.08	0.671	19.7	21	53	36	12	6.95	0.783	40.9	18	41	50	12
1.297	19	19	36	1.596	0.902	19	9	38	7.20	0.654	37.1	14	53	34	12	7.11	0.780	38.6	16	39	48	12
1.296	19	23	36	1.599	0.901	21	9	42	6.69	0.650	43.3	14	13	36	19	6.88	0.769	40.2	15	39	26	6
1.294	20	9	40	1.599	0.901	19	37	14	6.88	0.646	40.3	18	19	50	12	6.83	0.766	40.5	15	31	26	18
1.292	19	21	38	1.613	0.893	19	15	48	7.64	0.640	20.5	21	19	52	12	6.83	0.764	40.3	16	25	10	12
1.290	21	19	52	1.618	0.890	19	29	46	6.59	0.638	43.0	15	15	34	19	6.64	0.762	42.4	15	31	18	7

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.82 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,600.2 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       14800.0 (2015.60 )
Delta E: MWd/MTU, (GWd)         199.8 (  27.21 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.89
Flow: Mlb/hr                   106.33 (103.74 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- 28 -- 10 -- 28 -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- 28 -- 14 -- -- -- 16 -- -- -- 14 -- 28 -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- 28 -- 14 -- -- -- 16 -- -- -- 14 -- 28 -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- 28 -- 10 -- 28 -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            8.51

k-effective:                   1.00155
Void Fraction:                   0.430
Core Delta-P: psia              25.804
Core Plate Delta-P: psia        21.261
Coolant Temp: Deg-F             548.1
In Channel Flow: Mlb/hr          90.09
Total Bypass Flow (%):           15.3
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00007
```

Core Average Exposure: MWd/MTU 26434.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.209	4.945	4	0.902	0.928	39	30
24	0.635	14.370	5	0.475	0.512	1	36
23	0.843	20.056	6	0.459	0.491	11	54
22	0.949	24.256	9	0.401	0.480	23	60
21	1.005	27.190	10	0.445	0.456	33	60
20	1.033	29.021	11	0.457	0.465	29	60
19	1.042	30.018	14	0.997	1.149	25	48
18	1.053	30.392	15	0.953	1.141	21	36
17	1.058	30.350	16	1.010	1.150	21	48
16	1.070	28.431	17	0.854	1.162	17	14
15	1.099	28.428	18	0.965	1.145	19	50
14	1.199	27.913	19	1.200	1.309	19	48
13	1.241	28.639	20	1.162	1.297	9	40
12	1.269	29.510	21	1.166	1.317	17	50
11	1.274*	30.303					
10	1.253	30.884					
9	1.236	31.115					
8	1.217	31.669					
7	1.191	32.336					
6	1.158	32.819*					
5	1.118	32.637					
4	1.057	30.917					
3	0.927	26.350					
2	0.677	18.401					
Bottom 1	0.187	5.076					
% AXIAL TILT	-5.765	-5.474					
AVG BOT 8ft/12ft	1.0391	1.0243					

Active Channel Flow: Mlb/hr 90.09

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.317	21	17	50	1.570	0.917	21	17	50	8.44	0.712	21.5	19	21	50	12	7.68	0.844	38.8	14	23	50	15
1.309	19	19	48	1.577	0.913	21	41	10	8.39	0.708	21.5	20	21	52	12	7.16	0.815	41.8	15	15	34	19
1.301	19	23	48	1.582	0.910	20	9	22	7.36	0.701	41.4	14	23	50	12	7.27	0.815	40.5	14	47	26	19
1.298	19	21	34	1.598	0.901	19	19	48	8.24	0.696	21.6	19	23	52	12	7.55	0.796	35.1	14	7	34	15
1.297	20	9	40	1.609	0.895	19	9	38	8.18	0.682	20.0	21	53	36	12	7.00	0.792	41.2	18	41	50	12
1.296	19	29	46	1.609	0.895	21	9	42	7.26	0.662	37.4	14	53	34	12	7.14	0.787	39.0	16	39	48	12
1.294	21	19	52	1.615	0.892	19	37	14	6.94	0.654	40.6	18	19	50	12	6.86	0.771	40.6	16	25	10	12
1.294	19	19	36	1.616	0.891	19	19	36	6.70	0.652	43.6	14	13	36	19	6.82	0.764	40.5	15	39	26	6
1.292	19	23	36	1.625	0.886	19	15	48	7.73	0.649	20.8	21	19	52	12	6.75	0.762	41.1	16	23	8	12
1.289	19	9	38	1.639	0.879	20	9	28	7.80	0.643	18.6	21	55	34	12	6.77	0.762	40.8	15	31	26	18

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.83 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,800.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    26435.0
Exposure: MWd/MTU (GWd)       14800.2 (2015.70 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.192   4.945     4  0.885 0.907  39 30
Inlet Subcooling: Btu/lbm       -26.83                       24  0.580  14.370     5  0.469 0.531   1 36
Flow: Mlb/hr                   102.87 (100.36 %)            23  0.768  20.056     6  0.456 0.482  11 54
                                                            22  0.864  24.256     9  0.396 0.482  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.915  27.190    10  0.455 0.459  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.941  29.021    11  0.468 0.470   1 32
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.950  30.019    14  1.011 1.177  23 50
 5        -- -- -- -- -- 14 -- -- -- -- --        51         18  0.957  30.392    15  0.937 1.139  27 16
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  0.955  30.350    16  1.021 1.183  21 48
 9 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- --  43         16  0.961  28.431    17  0.860 1.154  17 14
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  0.983  28.428    18  0.958 1.173  19 12
13 -- -- -- 14 -- -- -- 16 -- -- -- 14 -- -- --  35         14  1.073  27.913    19  1.194 1.358  21 50
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.115  28.640    20  1.188 1.348  21 52
17 -- -- -- 14 -- -- -- 16 -- -- -- 14 -- -- --  27         12  1.156  29.510    21  1.176 1.335  19 52
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.193  30.303
21 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- --  19         10  1.228  30.885
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.260  31.115
25       -- -- -- -- -- -- 14 -- -- -- -- --     11          8  1.285  31.670
27          -- -- -- -- -- -- -- -- -- --        7          7  1.304  32.337
29             -- -- -- -- -- -- -- --           3          6  1.318  32.819*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.329* 32.638
                                                            4  1.315  30.917
Control Rod Density: %            6.62                      3  1.202  26.350
                                                            2  0.902  18.401
k-effective:                   1.00150                Bottom  1  0.252   5.076
Void Fraction:                   0.463
Core Delta-P: psia              24.890            % AXIAL TILT -15.084  -5.473
Core Plate Delta-P: psia        20.349          AVG BOT 8ft/12ft  1.0809  1.0243
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          86.81   Active Channel Flow: Mlb/hr        86.81
Total Bypass Flow (%):           15.6   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.358	19	21	50	1.553	0.927	20	21	52	9.07	0.774	22.8	20	21	10	4	7.57	0.887	44.1	16	23	8	4
1.348	20	21	52	1.576	0.914	21	41	10	8.75	0.759	24.7	21	19	10	4	6.92	0.855	48.4	18	41	50	4
1.342	19	23	48	1.578	0.912	19	21	50	8.93	0.753	21.4	19	23	10	4	7.19	0.854	45.2	14	23	50	4
1.339	19	23	52	1.583	0.909	19	37	14	8.89	0.747	21.0	19	21	8	4	7.23	0.853	44.7	16	25	10	4
1.335	21	19	52	1.588	0.907	19	23	52	8.80	0.745	21.8	19	21	12	4	7.33	0.848	43.1	16	39	48	4
1.330	20	25	50	1.596	0.902	21	17	50	8.79	0.739	21.0	21	25	8	4	7.06	0.840	45.4	16	7	24	5
1.322	19	19	48	1.598	0.901	19	19	48	8.61	0.725	21.3	21	53	36	4	7.52	0.823	38.4	18	41	8	4
1.318	21	17	50	1.624	0.887	20	35	12	8.47	0.714	21.3	20	25	12	4	7.52	0.814	37.4	14	25	48	4
1.299	19	27	14	1.630	0.884	20	9	22	8.16	0.708	24.7	21	17	12	4	9.97	0.814	28.9	21	41	10	4
1.297	19	29	46	1.641	0.877	19	9	38	8.57	0.707	18.8	19	23	14	4	6.82	0.810	45.3	16	9	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.84 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 14,800.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       15000.0 (2042.90 )
Delta E: MWd/MTU, (GWd)         199.8 (  27.21 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -25.97
Flow: Mlb/hr                   106.02 (103.43 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 14 -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- -- 14 -- -- -- 16 -- -- -- 14 -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- 14 -- -- -- 16 -- -- -- 14 -- -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- 10 --  6 -- -- --  6 -- 10 -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- --        15
25       -- -- -- -- -- 14 -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              6.62

k-effective:                     1.00165
Void Fraction:                     0.455
Core Delta-P: psia                25.997
Core Plate Delta-P: psia          21.455
Coolant Temp: Deg-F               548.5
In Channel Flow: Mlb/hr            89.59   Active Channel Flow: Mlb/hr        89.59
Total Bypass Flow (%):             15.5   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence               0.00010
```

Core Average Exposure: MWd/MTU 26634.8

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.195	4.990	4	0.882	0.904	39	30
24	0.589	14.494	5	0.468	0.530	1	36
23	0.780	20.221	6	0.456	0.481	11	54
22	0.877	24.443	9	0.395	0.481	23	60
21	0.926	27.388	10	0.454	0.457	33	60
20	0.951	29.224	11	0.466	0.468	1	32
19	0.959	30.223	14	1.010	1.176	23	50
18	0.966	30.598	15	0.935	1.137	27	16
17	0.963	30.556	16	1.020	1.182	21	48
16	0.971	28.630	17	0.860	1.155	17	14
15	0.994	28.632	18	0.959	1.173	19	12
14	1.084	28.115	19	1.194	1.359	21	50
13	1.126	28.850	20	1.189	1.349	21	52
12	1.166	29.729	21	1.179	1.337	19	52
11	1.200	30.528					
10	1.231	31.116					
9	1.259	31.354					
8	1.278	31.913					
7	1.290	32.583					
6	1.298	33.068*					
5	1.303*	32.889					
4	1.287	31.166					
3	1.177	26.577					
2	0.883	18.572					
Bottom 1	0.246	5.124					
% AXIAL TILT	-14.088	-5.501					
AVG BOT 8ft/12ft	1.0760	1.0244					

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.359	19	21	50	1.574	0.915	20	21	52	8.86	0.759	23.2	20	21	10	4	7.39	0.870	44.5	16	23	8	4
1.349	20	21	52	1.593	0.904	21	41	10	8.53	0.742	25.0	21	19	10	4	6.73	0.835	48.7	18	41	50	4
1.342	19	23	48	1.599	0.901	19	21	50	8.72	0.738	21.8	19	23	10	4	7.05	0.835	45.0	16	25	10	4
1.339	19	23	52	1.606	0.897	19	37	14	8.69	0.733	21.4	19	21	8	4	7.00	0.834	45.5	14	23	50	4
1.337	21	19	52	1.609	0.895	19	23	52	8.58	0.729	22.2	19	21	12	4	6.99	0.831	45.3	16	39	48	5
1.329	20	25	50	1.613	0.893	21	17	50	8.62	0.727	21.4	21	25	8	4	6.91	0.826	45.8	16	7	24	5
1.323	19	19	48	1.619	0.889	19	19	48	8.45	0.714	21.7	21	53	36	4	7.34	0.807	38.7	18	41	8	4
1.321	21	17	50	1.647	0.875	20	35	12	8.28	0.699	21.7	20	25	12	4	7.34	0.798	37.7	14	25	48	4
1.298	19	27	14	1.649	0.873	20	9	22	8.40	0.695	19.1	19	23	14	4	9.73	0.797	29.4	21	41	10	4
1.295	19	29	46	1.661	0.867	19	9	38	7.93	0.690	25.1	21	17	12	4	6.67	0.796	45.6	16	9	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.85 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,000.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    26635.0
Exposure: MWd/MTU (GWd)       15000.2 (2042.90 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.195   4.990     4  0.881 0.910  19 34
Inlet Subcooling: Btu/lbm       -26.82                      24  0.588  14.495     5  0.469 0.533   1 36
Flow: Mlb/hr                   102.91 (100.40 %)            23  0.780  20.221     6  0.456 0.481  11 54
                                                            22  0.879  24.443     9  0.395 0.475  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.932  27.388    10  0.452 0.460  59 34
 1              -- -- -- -- -- -- --              59  :JR   20  0.963  29.224    11  0.464 0.471   1 32
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.979  30.224    14  1.011 1.162  23 50
 5        -- -- -- -- -- 12 -- -- -- -- --        51         18  0.982  30.599    15  0.936 1.122  27 16
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  0.984  30.556    16  1.020 1.172  21 48
 9 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  43         16  0.984  28.630    17  0.859 1.153  17 14
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  1.001  28.632    18  0.959 1.165  19 12
13 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  35         14  1.086  28.116    19  1.197 1.345  21 50
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.124  28.850    20  1.184 1.334  21 52
17 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  27         12  1.160  29.729    21  1.176 1.325  19 52
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.192  30.528
21 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  19         10  1.221  31.116
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.247  31.354
25       -- -- -- -- -- 12 -- -- -- -- --        11          8  1.267  31.913
27          -- -- -- -- -- -- -- -- -- --         7          7  1.279  32.583
29             -- -- -- -- -- -- -- --           3          6  1.288  33.069*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.295* 32.889
                                                            4  1.280  31.166
Control Rod Density: %            6.49                      3  1.171  26.577
                                                            2  0.879  18.572
k-effective:                   1.00167                Bottom  1  0.245   5.124
Void Fraction:                   0.458
Core Delta-P: psia              24.933            % AXIAL TILT -13.286  -5.501
Core Plate Delta-P: psia        20.395          AVG BOT 8ft/12ft  1.0715  1.0244
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          87.22   Active Channel Flow: Mlb/hr        87.22
Total Bypass Flow (%):           15.2   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.345	19	21	50	1.571	0.917	20	21	52	8.80	0.754	23.2	20	21	10	4	7.35	0.865	44.5	16	23	8	4
1.334	20	21	52	1.587	0.907	21	41	10	8.47	0.737	25.0	21	19	10	4	7.00	0.830	45.0	16	25	10	4
1.328	19	23	48	1.596	0.902	19	21	50	8.66	0.733	21.8	19	23	10	4	6.69	0.830	48.7	18	41	50	4
1.325	21	19	52	1.598	0.901	21	17	50	8.63	0.728	21.4	19	21	8	4	6.96	0.829	45.5	14	23	50	4
1.322	19	23	52	1.599	0.901	19	19	48	8.53	0.724	22.2	19	21	12	4	6.94	0.825	45.3	16	39	48	5
1.316	19	19	48	1.600	0.900	19	37	14	8.57	0.722	21.4	21	25	8	4	6.86	0.820	45.8	16	7	24	5
1.314	21	17	50	1.602	0.899	20	9	22	8.39	0.709	21.7	21	53	36	4	7.30	0.802	38.7	18	41	8	4
1.309	20	25	50	1.613	0.893	19	23	52	8.23	0.695	21.7	20	25	12	4	7.03	0.796	41.2	15	15	34	18
1.298	19	9	38	1.613	0.893	19	9	38	8.34	0.690	19.1	19	23	14	4	7.30	0.793	37.7	14	25	48	4
1.291	20	9	40	1.624	0.887	20	9	28	7.88	0.686	25.1	21	17	12	4	9.67	0.792	29.4	21	41	10	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.86 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,000.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    26864.8
Exposure: MWd/MTU (GWd)       15230.0 (2074.20 )
Delta E: MWd/MTU, (GWd)         229.8 (  31.30 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.198   5.043    4  0.877 0.907  19 34
Inlet Subcooling: Btu/lbm       -25.87                        24  0.601  14.640    5  0.469 0.532   1 36
Flow: Mlb/hr                   106.40 (103.80 %)             23  0.795  20.414    6  0.456 0.481  11 54
                                                             22  0.895  24.661    9  0.395 0.475  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.948  27.619   10  0.451 0.459  59 34
 1              -- -- -- -- -- -- --              59  :JR    20  0.978  29.463   11  0.463 0.470   1 32
 3           -- -- -- -- -- -- -- -- -- --        55          19  0.992  30.466   14  1.010 1.160  23 50
 5        -- -- -- -- -- 12 -- -- -- -- --        51          18  0.995  30.842   15  0.934 1.118  27 16
 7     -- -- -- -- -- -- -- -- -- -- -- --        47          17  0.998  30.800   16  1.020 1.171  21 48
 9 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  43          16  1.000  28.865   17  0.860 1.154  17 14
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39          15  1.018  28.870   18  0.960 1.166  19 12
13 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  35          14  1.105  28.351   19  1.196 1.345  21 50
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31          13  1.142  29.094   20  1.185 1.335  21 52
17 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  27          12  1.176  29.980   21  1.179 1.328  19 52
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23          11  1.204  30.786
21 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  19          10  1.227  31.381
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15           9  1.247  31.625
25       -- -- -- -- -- 12 -- -- -- -- --        11           8  1.259  32.188
27          -- -- -- -- -- -- -- -- --           7           7  1.261* 32.861
29             -- -- -- -- -- -- --              3           6  1.260  33.349*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.256  33.170
                                                             4  1.235  31.444
Control Rod Density: %            6.49                       3  1.128  26.832
                                                             2  0.846  18.763
k-effective:                   1.00183                Bottom  1  0.236   5.178
Void Fraction:                   0.449
Core Delta-P: psia              26.066          % AXIAL TILT -11.797  -5.518
Core Plate Delta-P: psia        21.524       AVG BOT 8ft/12ft  1.0645  1.0245
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          89.98   Active Channel Flow: Mlb/hr        89.98
Total Bypass Flow (%):           15.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.345	19	21	50	1.588	0.907	20	21	52	8.45	0.726	23.7	20	21	10	4	6.94	0.839	46.7	16	23	8	5
1.335	20	21	52	1.601	0.900	21	41	10	8.13	0.710	25.5	21	19	10	4	7.06	0.802	41.6	15	15	34	18
1.328	21	19	52	1.611	0.894	21	17	50	8.32	0.706	22.3	19	23	10	4	6.32	0.802	50.4	18	41	50	5
1.327	19	23	48	1.614	0.892	19	21	50	8.30	0.703	21.9	19	21	8	4	6.76	0.801	45.0	16	25	10	5
1.322	19	23	52	1.616	0.891	20	9	22	8.27	0.700	21.8	21	25	8	4	6.53	0.800	47.8	14	23	50	5
1.317	21	17	50	1.616	0.891	19	19	48	8.18	0.696	22.6	19	21	12	4	6.70	0.800	45.6	16	39	48	5
1.317	19	19	48	1.620	0.889	19	37	14	8.07	0.685	22.1	21	53	36	4	6.65	0.798	46.1	16	7	24	5
1.308	20	25	50	1.628	0.885	19	9	38	7.90	0.670	22.1	20	25	12	4	7.09	0.794	40.4	14	47	26	18
1.301	19	9	38	1.630	0.883	19	23	52	8.04	0.668	19.6	19	23	14	4	7.01	0.773	39.1	18	41	8	4
1.295	20	9	40	1.642	0.877	20	9	28	7.72	0.660	23.0	20	9	22	4	7.02	0.771	38.7	16	15	42	20

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.87 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,230.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    26865.0
Exposure: MWd/MTU (GWd)       15230.2 (2074.20 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.198   5.043     4  0.876 0.903  19 34
Inlet Subcooling: Btu/lbm       -26.36                       24  0.598  14.640     5  0.468 0.530   1 36
Flow: Mlb/hr                   104.58 (102.03 %)            23  0.792  20.414     6  0.455 0.480  11 54
                                                            22  0.893  24.661     9  0.395 0.479  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.948  27.619    10  0.453 0.457  59 34
 1              -- -- -- -- -- -- --              59  :JR  20  0.981  29.463    11  0.465 0.467   1 32
 3           -- -- -- -- -- -- -- -- -- --        55       19  1.000  30.467    14  1.011 1.167  23 50
 5        -- -- -- -- -- 16 -- -- -- -- --        51       18  1.008  30.842    15  0.932 1.128  27 16
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47       17  1.012  30.801    16  1.023 1.174  21 48
 9 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  43       16  1.009  28.865    17  0.861 1.152  17 14
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39       15  1.023  28.870    18  0.959 1.166  19 12
13 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  35       14  1.107  28.351    19  1.195 1.349  21 50
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31       13  1.142  29.094    20  1.192 1.339  21 52
17 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  27       12  1.173  29.981    21  1.178 1.329  19 52
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23       11  1.199  30.787
21 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  19       10  1.222  31.381
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15        9  1.241  31.625
25       -- -- -- -- -- 16 -- -- -- -- --        11        8  1.252  32.188
27          -- -- -- -- -- -- -- -- --            7        7  1.255* 32.862
29             -- -- -- -- -- -- --               3        6  1.254  33.349*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.252  33.171
                                                            4  1.232  31.445
Control Rod Density: %            6.40                      3  1.126  26.832
                                                            2  0.845  18.763
k-effective:                   1.00180                Bottom  1  0.236   5.178
Void Fraction:                   0.451
Core Delta-P: psia              25.380            % AXIAL TILT -11.393  -5.518
Core Plate Delta-P: psia        20.839         AVG BOT 8ft/12ft  1.0626  1.0245
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          88.40   Active Channel Flow: Mlb/hr        88.40
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.349	19	21	50	1.563	0.922	20	21	52	8.42	0.724	23.7	20	21	10	4	6.91	0.836	46.7	16	23	8	5
1.339	20	21	52	1.582	0.910	21	41	10	8.10	0.707	25.5	21	19	10	4	6.29	0.799	50.4	18	41	50	5
1.333	19	23	48	1.591	0.905	19	21	50	8.28	0.703	22.3	19	23	10	4	7.02	0.798	41.6	15	15	34	18
1.330	19	23	52	1.593	0.904	19	37	14	8.27	0.700	21.9	19	21	8	4	6.73	0.797	45.0	16	25	10	5
1.329	21	19	52	1.597	0.902	21	17	50	8.23	0.697	21.8	21	25	8	4	6.50	0.796	47.8	14	23	50	5
1.322	20	25	50	1.599	0.901	19	23	52	8.14	0.694	22.6	19	21	12	4	6.67	0.796	45.6	16	39	48	5
1.317	19	19	48	1.600	0.900	19	19	48	8.05	0.683	22.1	21	53	36	4	6.62	0.795	46.1	16	7	24	5
1.316	21	17	50	1.611	0.894	20	9	22	7.87	0.667	22.1	20	25	12	4	7.05	0.789	40.4	14	47	26	18
1.293	19	9	38	1.624	0.887	19	9	38	8.01	0.665	19.6	19	23	14	4	6.99	0.771	39.1	18	41	8	4
1.292	19	27	14	1.633	0.882	20	35	12	7.70	0.658	23.0	20	9	22	4	6.99	0.768	38.7	16	15	42	20

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.88 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,230.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    26991.8
Exposure: MWd/MTU (GWd)       15357.0 (2091.50 )
Delta E: MWd/MTU, (GWd)         126.8 (  17.26 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.200   5.073    4  0.873 0.900  19 34
Inlet Subcooling: Btu/lbm       -25.76                        24  0.606  14.722    5  0.468 0.529   1 36
Flow: Mlb/hr                   106.81 (104.21 %)             23  0.801  20.522    6  0.455 0.480  11 54
                                                             22  0.903  24.783    9  0.395 0.479  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.958  27.749   10  0.452 0.456  59 34
 1              -- -- -- -- -- -- --              59  :JR   20  0.989  29.597   11  0.464 0.466   1 32
 3           -- -- -- -- -- -- -- -- -- --        55         19  1.008  30.603   14  1.011 1.167  23 50
 5        -- -- -- -- -- 16 -- -- -- -- --        51         18  1.016  30.980   15  0.931 1.126  27 16
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  1.019  30.939   16  1.023 1.173  21 48
 9 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  43         16  1.017  28.997   17  0.862 1.153  17 14
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39         15  1.032  29.004   18  0.960 1.167  19 12
13 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  35         14  1.117  28.484   19  1.194 1.349  21 50
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31         13  1.151  29.231   20  1.193 1.341  21 52
17 -- -- -- 16 -- -- -- 16 -- -- -- 16 -- -- --  27         12  1.181  30.121   21  1.180 1.331  19 52
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23         11  1.205  30.930
21 -- -- -- 12 --  6 -- -- --  6 -- 12 -- -- --  19         10  1.224  31.528
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.240  31.774
25       -- -- -- -- -- 16 -- -- -- -- --        11          8  1.247* 32.339
27          -- -- -- -- -- -- -- -- --           7          7  1.245  33.012
29             -- -- -- -- -- -- --              3          6  1.238  33.499*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.231  33.321
                                                            4  1.208  31.592
Control Rod Density: %          6.40                        3  1.104  26.967
                                                            2  0.828  18.865
k-effective:                 1.00192                Bottom  1  0.231   5.206
Void Fraction:                 0.445
Core Delta-P: psia            26.166              % AXIAL TILT -10.555  -5.517
Core Plate Delta-P: psia      21.625          AVG BOT 8ft/12ft  1.0585  1.0245
Coolant Temp: Deg-F           548.4
In Channel Flow: Mlb/hr        90.37   Active Channel Flow: Mlb/hr        90.37
Total Bypass Flow (%):         15.4   (of total core flow)
Total Water Rod Flow (%):      -0.0   (of total core flow)
Source Convergence          0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.349	19	21	50	1.575	0.914	20	21	52	8.24	0.710	23.9	20	21	10	4	6.79	0.824	46.9	16	23	8	5
1.341	20	21	52	1.592	0.904	21	41	10	7.93	0.694	25.7	21	19	10	4	7.03	0.801	41.8	15	15	34	18
1.333	19	23	48	1.603	0.898	19	21	50	8.11	0.690	22.5	19	23	10	4	7.08	0.794	40.6	14	47	26	18
1.331	21	19	52	1.607	0.896	21	17	50	8.10	0.687	22.1	19	21	8	4	6.18	0.786	50.6	18	41	50	5
1.331	19	23	52	1.607	0.896	19	37	14	8.08	0.685	22.0	21	25	8	4	6.61	0.785	45.2	16	25	10	5
1.322	20	25	50	1.612	0.893	19	23	52	7.97	0.680	22.8	19	21	12	4	6.51	0.784	46.3	16	7	24	5
1.318	21	17	50	1.613	0.893	19	19	48	7.90	0.671	22.2	21	7	26	4	6.38	0.784	48.0	14	23	50	5
1.317	19	19	48	1.623	0.887	20	9	22	7.71	0.655	22.3	20	25	12	4	6.55	0.784	45.8	16	39	48	5
1.294	19	9	38	1.637	0.880	19	9	38	7.85	0.653	19.8	19	23	14	4	7.04	0.775	38.9	16	15	42	20
1.291	19	27	14	1.647	0.874	20	35	12	7.65	0.646	21.6	19	7	22	4	6.84	0.757	39.3	18	41	8	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.89 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,357.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    26992.0
Exposure: MWd/MTU (GWd)       15357.1 (2091.50 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.02 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.187   5.073     4  0.805 0.876  19 34
Inlet Subcooling: Btu/lbm      -26.75                         24  0.566  14.722     5  0.478 0.519   1 36
Flow: Mlb/hr                   103.17 (100.65 %)              23  0.748  20.522     6  0.460 0.492  53 50
                                                              22  0.843  24.783     9  0.400 0.475  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29               21  0.896  27.749    10  0.447 0.456  33 60
 1              -- -- -- -- -- -- --              59  :JR     20  0.915  29.597    11  0.457 0.465  29 60
 3           -- -- -- -- -- -- -- -- -- --        55          19  0.921  30.604    14  0.993 1.175  11 38
 5        -- -- -- -- -- -- -- -- -- -- --        51          18  0.930  30.981    15  0.904 1.201  15 46
 7     -- -- -- -- -- 10 -- 10 -- -- -- --        47          17  0.947  30.939    16  1.047 1.196  19 46
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43          16  0.973  28.998    17  0.891 1.206  17 14
11 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  39          15  1.009  29.005    18  0.985 1.188  11 42
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35          14  1.110  28.484    19  1.189 1.366  17 46
15 -- -- 16 -- -- -- -- -- -- -- -- 16 -- --     31          13  1.156  29.231    20  1.183 1.349   9 40
17 -- -- -- -- -- -- -- -- -- -- -- -- -- --     27          12  1.196  30.121    21  1.194 1.351  11 44
19 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  23          11  1.227  30.930
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19          10  1.253  31.528
23    -- -- -- -- -- 10 -- 10 -- -- -- -- --     15           9  1.274  31.774
25       -- -- -- -- -- -- -- -- -- -- --        11           8  1.286  32.339
27          -- -- -- -- -- -- -- -- --            7           7  1.291  33.012
29             -- -- -- -- -- -- --               3           6  1.295  33.500*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.302* 33.321
                                                             4  1.297  31.592
Control Rod Density: %            5.86                       3  1.205  26.967
                                                             2  0.915  18.865
k-effective:                   1.00196                Bottom  1  0.256   5.206
Void Fraction:                   0.461
Core Delta-P: psia              25.022          % AXIAL TILT -15.724  -5.517
Core Plate Delta-P: psia        20.481       AVG BOT 8ft/12ft  1.0909  1.0245
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          87.06  Active Channel Flow: Mlb/hr        87.06
Total Bypass Flow (%):           15.6  (of total core flow)
Total Water Rod Flow (%):        -0.0  (of total core flow)
Source Convergence            0.00010
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.366	19	17	46	1.557	0.925	20	9	22	8.71	0.746	23.2	20	9	22	4	7.02	0.846	46.3	16	7	24	5
1.364	19	11	40	1.559	0.924	19	17	46	8.46	0.735	25.0	21	9	20	4	6.90	0.837	46.9	16	23	8	5
1.360	19	15	44	1.561	0.922	21	17	50	8.41	0.724	23.8	20	39	10	4	7.19	0.835	43.5	15	15	16	4
1.358	19	13	42	1.564	0.921	19	13	42	8.53	0.724	22.1	19	49	22	4	6.73	0.833	48.5	18	49	42	4
1.356	19	19	48	1.566	0.920	19	19	48	8.40	0.722	23.6	21	47	14	4	7.17	0.830	43.2	16	47	40	4
1.351	21	11	44	1.570	0.917	21	49	18	8.24	0.721	25.6	21	41	10	4	7.00	0.829	45.0	14	49	24	4
1.349	20	9	40	1.575	0.914	19	15	44	8.48	0.718	22.0	19	9	24	4	7.40	0.813	38.7	16	41	16	4
1.347	21	17	50	1.578	0.913	21	9	42	8.46	0.717	22.0	21	25	8	4	6.75	0.811	46.1	16	9	26	5
1.345	19	15	48	1.578	0.912	20	21	52	8.47	0.715	21.6	19	7	22	4	6.49	0.810	49.2	18	41	50	4
1.344	19	13	46	1.581	0.911	19	15	48	8.12	0.706	25.0	21	49	18	4	7.22	0.800	39.5	16	15	42	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.90 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,357.1 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       15500.0 (2111.00 )
Delta E: MWd/MTU, (GWd)         142.9 (  19.46 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.95
Flow: Mlb/hr                   106.09 (103.51 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- -- 10 -- 10 -- -- -- --       47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43
11  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15  -- -- 16 -- -- -- -- -- -- -- -- -- 16 -- -- 31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23     -- -- -- -- -- 10 -- 10 -- -- -- -- --    15
25        -- -- -- -- -- -- -- -- -- -- --       11
27           -- -- -- -- -- -- -- -- --          7
29              -- -- -- -- -- -- --             3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              5.86

k-effective:                     1.00200
Void Fraction:                     0.455
Core Delta-P: psia                26.059
Core Plate Delta-P: psia          21.518
Coolant Temp: Deg-F               548.5
In Channel Flow: Mlb/hr            89.64
Total Bypass Flow (%):              15.5
Total Water Rod Flow (%):           -0.0
Source Convergence              0.00008
```

Core Average Exposure: MWd/MTU 27134.8

	Axial Profile N(PRA)	Power	Exposure	Edit Zone	Radial Power Avg.	Max.	IR	JR
Top	25	0.189	5.104	4	0.803	0.874	19	34
	24	0.573	14.809	5	0.477	0.518	1	36
	23	0.757	20.637	6	0.460	0.492	53	50
	22	0.853	24.913	9	0.399	0.474	23	60
	21	0.905	27.887	10	0.446	0.455	33	60
	20	0.923	29.739	11	0.456	0.465	29	60
	19	0.928	30.746	14	0.993	1.174	11	38
	18	0.937	31.124	15	0.903	1.202	15	46
	17	0.955	31.085	16	1.047	1.196	19	46
	16	0.982	29.142	17	0.891	1.206	17	14
	15	1.019	29.154	18	0.985	1.188	11	42
	14	1.120	28.634	19	1.189	1.366	17	46
	13	1.166	29.387	20	1.184	1.350	9	40
	12	1.205	30.283	21	1.196	1.353	11	44
	11	1.233	31.096					
	10	1.255	31.697					
	9	1.272	31.946					
	8	1.280	32.512					
	7	1.280	33.187					
	6	1.279	33.674*					
	5	1.282*	33.497					
	4	1.274	31.768					
	3	1.183	27.130					
	2	0.899	18.988					
Bottom	1	0.252	5.241					

% AXIAL TILT -14.903 -5.540
AVG BOT 8ft/12ft 1.0870 1.0246

Active Channel Flow: Mlb/hr 89.64
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.366	19	17	46	1.577	0.913	20	9	22	8.56	0.734	23.5	20	9	22	4	6.91	0.834	46.6	16	7	24	5
1.365	19	11	40	1.578	0.913	21	17	50	8.30	0.723	25.3	21	9	20	4	6.78	0.825	47.1	16	23	8	5
1.361	19	15	44	1.579	0.912	19	17	46	8.38	0.712	22.4	19	49	22	4	7.09	0.820	43.0	15	15	16	4
1.359	19	13	42	1.584	0.909	19	13	42	8.24	0.711	24.1	20	39	10	4	6.59	0.818	48.8	18	49	42	4
1.357	19	19	48	1.586	0.908	19	19	48	8.23	0.709	23.9	21	47	14	4	7.03	0.817	43.4	16	47	40	4
1.353	21	11	44	1.588	0.907	21	49	18	8.07	0.707	25.9	21	41	10	4	6.87	0.816	45.2	14	49	24	4
1.350	20	9	40	1.595	0.903	19	15	44	8.32	0.707	22.2	19	9	24	4	6.64	0.799	46.3	16	9	26	5
1.349	21	17	50	1.596	0.902	21	9	42	8.31	0.706	22.3	21	25	8	4	7.17	0.798	39.9	16	41	16	4
1.346	19	15	48	1.597	0.901	20	21	52	8.31	0.704	21.9	19	7	22	4	6.24	0.797	50.8	18	41	50	5
1.346	19	13	46	1.599	0.901	21	41	10	7.96	0.694	25.3	21	49	18	4	7.03	0.788	40.4	14	47	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.91 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,500.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    27135.1
Exposure: MWd/MTU (GWd)       15500.2 (2111.00 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.190   5.104     4  0.804 0.871  19 34
Inlet Subcooling: Btu/lbm       -26.59                      24  0.575  14.809     5  0.476 0.516   1 36
Flow: Mlb/hr                   103.75 (101.22 %)            23  0.760  20.637     6  0.459 0.491  11 54
                                                            22  0.858  24.913     9  0.399 0.476  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.913  27.888    10  0.446 0.457  33 60
 1              -- -- -- -- -- -- --           59  :JR     20  0.936  29.739    11  0.456 0.467  29 60
 3           -- -- -- -- -- -- -- -- -- --     55          19  0.947  30.746    14  0.995 1.168  11 38
 5        -- -- -- -- -- -- -- -- -- -- -- --  51          18  0.950  31.124    15  0.904 1.198  15 46
 7     -- -- -- -- -- 12 -- 12 -- -- -- --     47          17  0.962  31.085    16  1.047 1.196  19 46
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43          16  0.986  29.142    17  0.890 1.205  17 14
11 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 39          15  1.020  29.154    18  0.984 1.185  17 44
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.118  28.634    19  1.190 1.364  17 46
15 -- -- 16 -- -- -- -- -- -- -- -- -- 16 -- -- 31          13  1.162  29.387    20  1.185 1.342   9 40
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.199  30.283    21  1.193 1.348  17 50
19 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 23          11  1.226  31.096
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.248  31.697
23    -- -- -- -- -- 12 -- 12 -- -- -- -- --    15           9  1.264  31.947
25       -- -- -- -- -- -- -- -- -- -- --       11           8  1.272  32.513
27          -- -- -- -- -- -- -- -- -- --        7           7  1.272  33.187
29             -- -- -- -- -- -- --              3           6  1.272  33.675*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.275* 33.497
                                                            4  1.268  31.768
Control Rod Density: %            5.77                      3  1.178  27.130
                                                            2  0.895  18.988
k-effective:                   1.00205                Bottom  1  0.251   5.242
Void Fraction:                   0.457
Core Delta-P: psia              25.179          % AXIAL TILT -14.282  -5.540
Core Plate Delta-P: psia        20.638       AVG BOT 8ft/12ft  1.0826  1.0246
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          87.61   Active Channel Flow: Mlb/hr        87.61
Total Bypass Flow (%):           15.6   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00009
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.364	19	17	46	1.556	0.925	19	17	46	8.52	0.731	23.5	20	9	22	4	6.88	0.830	46.6	16	7	24	5
1.358	19	19	48	1.557	0.925	21	17	50	8.26	0.720	25.3	21	9	20	4	6.75	0.820	47.1	16	23	8	5
1.358	19	11	40	1.561	0.922	19	19	48	8.34	0.709	22.4	19	49	22	4	7.06	0.816	43.0	15	15	16	4
1.357	19	15	44	1.566	0.919	20	21	52	8.20	0.707	24.1	20	39	10	4	6.56	0.815	48.8	18	49	42	4
1.353	19	13	42	1.566	0.919	20	9	22	8.20	0.706	23.9	21	47	14	4	7.00	0.813	43.4	16	47	40	4
1.348	21	17	50	1.570	0.917	19	13	42	8.03	0.704	25.9	21	41	10	4	6.84	0.812	45.2	14	49	24	4
1.347	21	11	44	1.574	0.915	21	41	10	8.28	0.704	22.2	19	9	24	4	6.60	0.795	46.3	16	9	26	5
1.343	19	15	48	1.577	0.913	21	49	18	8.27	0.702	22.3	21	25	8	4	7.13	0.795	39.9	16	41	16	4
1.342	20	9	40	1.580	0.911	19	15	44	8.28	0.701	21.9	19	7	22	4	6.21	0.792	50.8	18	41	50	5
1.340	19	13	46	1.583	0.910	19	15	48	7.93	0.691	25.3	21	49	18	4	7.00	0.784	40.4	14	47	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.92 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,500.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      15650.0 (2131.40 )
Delta E: MWd/MTU, (GWd)        149.8 (  20.40 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -25.81
Flow: Mlb/hr                  106.64 (104.04 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- 12 -- 12 -- -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- 16 -- -- -- -- -- -- -- -- 16 -- --     31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- --     27
19 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- -- 12 -- 12 -- -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          5.77

k-effective:                 1.00205
Void Fraction:                0.450
Core Delta-P: psia           26.192
Core Plate Delta-P: psia     21.650
Coolant Temp: Deg-F          548.4
In Channel Flow: Mlb/hr      90.16
Total Bypass Flow (%):        15.5
Total Water Rod Flow (%):     -0.0
Source Convergence         0.00006
```

```
Core Average Exposure: MWd/MTU    27284.8

                    Axial Profile     Edit   Radial Power
          N(PRA)  Power  Exposure    Zone   Avg.   Max.   IR JR
Top 25    0.193    5.138      4    0.802  0.869  19 34
    24    0.585   14.901      5    0.476  0.516   1 36
    23    0.773   20.760      6    0.459  0.491  11 54
    22    0.872   25.052      9    0.399  0.476  23 60
    21    0.926   28.035     10    0.446  0.457  33 60
    20    0.948   29.890     11    0.455  0.467  29 60
    19    0.958   30.899     14    0.995  1.167  11 38
    18    0.960   31.278     15    0.903  1.198  15 46
    17    0.973   31.241     16    1.047  1.195  19 46
    16    0.997   29.295     17    0.891  1.205  17 14
    15    1.031   29.312     18    0.984  1.184  17 44
    14    1.130   28.792     19    1.190  1.364  17 46
    13    1.173   29.551     20    1.186  1.343   9 40
    12    1.208   30.452     21    1.195  1.349  17 50
    11    1.232   31.270
    10    1.249   31.873
     9    1.262   32.126
     8    1.264*  32.693
     7    1.259   33.367
     6    1.252   33.855*
     5    1.250   33.678
     4    1.239   31.948
     3    1.149   27.297
     2    0.873   19.115
Bottom    0.245    5.277

% AXIAL TILT -13.160  -5.556
AVG BOT 8ft/12ft  1.0771  1.0247

Active Channel Flow: Mlb/hr        90.16
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.364	19	17	46	1.572	0.916	21	17	50	8.30	0.714	23.7	20	9	22	4	6.73	0.816	46.8	16	7	24	5
1.358	19	19	48	1.575	0.914	19	17	46	8.04	0.703	25.5	21	9	20	4	6.62	0.807	47.3	16	23	8	5
1.358	19	11	40	1.579	0.912	19	19	48	8.00	0.692	24.4	20	39	10	4	6.26	0.796	50.5	18	49	42	5
1.355	19	15	44	1.583	0.910	20	21	52	8.12	0.692	22.7	19	49	22	4	6.66	0.795	45.6	16	47	40	5
1.352	19	13	42	1.584	0.909	20	9	22	8.09	0.689	22.6	21	25	8	4	6.88	0.794	42.8	15	15	16	9
1.349	21	17	50	1.589	0.906	21	41	10	7.97	0.688	24.1	21	47	14	4	6.49	0.793	47.6	14	49	24	5
1.348	21	11	44	1.589	0.906	19	13	42	7.83	0.688	26.1	21	41	10	4	6.46	0.780	46.6	16	9	26	5
1.344	19	15	48	1.593	0.904	21	49	18	8.08	0.687	22.5	19	9	24	4	6.29	0.780	48.6	18	41	50	7
1.343	20	9	40	1.599	0.901	19	15	48	8.07	0.685	22.1	19	7	22	4	7.02	0.775	39.1	16	41	16	4
1.341	19	13	46	1.600	0.900	19	15	44	7.92	0.674	22.6	19	39	8	4	6.84	0.768	40.6	14	47	26	5

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.93 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,650.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      15650.2 (2131.40 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -27.06
Flow: Mlb/hr                  102.09 ( 99.60 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- 12 -- 12 -- -- -- --        47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- 12 -- 12 -- -- -- -- --        15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              5.05

k-effective:                     1.00216
Void Fraction:                     0.464
Core Delta-P: psia                24.720
Core Plate Delta-P: psia          20.179
Coolant Temp: Deg-F               548.4
In Channel Flow: Mlb/hr            86.13
Total Bypass Flow (%):             15.6
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00007
```

Core Average Exposure: MWd/MTU 27285.0

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.182	5.138	4	0.795	0.875	19	34
24	0.549	14.901	5	0.471	0.529	1	36
23	0.724	20.760	6	0.456	0.483	53	50
22	0.819	25.052	9	0.394	0.468	23	60
21	0.872	28.035	10	0.449	0.456	59	34
20	0.897	29.890	11	0.462	0.466	1	32
19	0.912	30.899	14	1.006	1.197	13	36
18	0.921	31.278	15	0.896	1.178	15	46
17	0.942	31.241	16	1.065	1.183	47	40
16	0.979	29.295	17	0.889	1.185	13	44
15	1.023	29.313	18	0.978	1.201	11	28
14	1.129	28.792	19	1.182	1.363	13	34
13	1.177	29.552	20	1.229	1.368	11	36
12	1.216	30.452	21	1.191	1.332	9	42
11	1.243	31.270					
10	1.264	31.874					
9	1.279	32.126					
8	1.285	32.693					
7	1.285	33.367					
6	1.287	33.855*					
5	1.296	33.678					
4	1.299*	31.948					
3	1.220	27.298					
2	0.936	19.115					
Bottom 1	0.264	5.277					
% AXIAL TILT	-16.476	-5.556					
AVG BOT 8ft/12ft	1.0989	1.0247					

Active Channel Flow: Mlb/hr 86.13
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.368	20	11	36	1.568	0.918	20	9	22	8.93	0.762	22.7	21	7	26	4	7.56	0.887	44.3	18	49	34	4
1.365	20	11	32	1.575	0.914	19	13	38	8.92	0.760	22.5	20	49	30	4	7.47	0.886	45.1	16	9	26	4
1.363	19	13	34	1.577	0.913	19	13	34	9.09	0.755	19.5	19	13	34	4	7.76	0.885	41.9	15	15	34	4
1.361	19	11	40	1.578	0.912	19	17	46	8.77	0.754	23.7	20	9	22	4	7.45	0.884	45.2	16	9	32	4
1.350	19	9	24	1.579	0.912	19	13	42	8.88	0.754	22.2	20	49	26	4	8.10	0.879	37.6	14	47	26	4
1.349	19	13	38	1.581	0.911	19	9	38	8.82	0.750	22.5	19	9	24	4	7.55	0.876	43.4	14	47	32	4
1.348	20	9	40	1.582	0.910	21	17	50	8.75	0.748	23.1	20	51	28	4	7.40	0.874	44.9	16	7	24	4
1.342	20	9	34	1.589	0.906	19	19	48	8.66	0.737	22.5	21	53	30	4	7.33	0.872	45.4	14	49	24	4
1.341	19	13	42	1.589	0.906	20	21	52	8.83	0.732	19.5	19	15	32	4	7.77	0.859	39.2	14	7	34	4
1.340	19	17	46	1.597	0.902	20	51	28	8.58	0.731	22.7	19	49	22	4	7.26	0.846	43.7	16	47	40	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.94 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,650.2 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    27484.9
Exposure: MWd/MTU (GWd)       15850.0 (2158.60 )
Delta E: MWd/MTU, (GWd)         199.8 (  27.21 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.185   5.181     4  0.792 0.872  19 34
Inlet Subcooling: Btu/lbm       -26.08                        24  0.561  15.019     5  0.471 0.528   1 36
Flow: Mlb/hr                   105.59 (103.02 %)             23  0.739  20.916     6  0.455 0.483  53 50
                                                             22  0.835  25.229     9  0.393 0.468  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.888  28.223    10  0.448 0.455  59 34
 1              -- -- -- -- -- -- --              59  :JR    20  0.911  30.084    11  0.461 0.465   1 32
 3           -- -- -- -- -- -- -- -- -- --        55          19  0.925  31.096    14  1.005 1.194  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  0.934  31.476    15  0.894 1.178  15 46
 7     -- -- -- -- -- 12 -- 12 -- -- -- -- --     47          17  0.955  31.444    16  1.065 1.182  47 40
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43          16  0.994  29.498    17  0.889 1.185  13 44
11  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 39          15  1.038  29.524    18  0.979 1.199  11 28
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.145  29.005    19  1.182 1.361  11 40
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.193  29.774    20  1.230 1.366  11 36
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.229  30.682    21  1.194 1.335   9 42
19  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 23          11  1.252  31.504
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.268  32.112
23     -- -- -- -- -- 12 -- 12 -- -- -- -- --     15           9  1.277* 32.368
25        -- -- -- -- -- -- -- -- -- -- --        11           8  1.277  32.936
27           -- -- -- -- -- -- -- -- --           7           7  1.269  33.610
29              -- -- -- -- -- -- --              3           6  1.262  34.098*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58               5  1.263  33.923
                                                              4  1.260  32.193
Control Rod Density: %            5.05                        3  1.181  27.528
                                                              2  0.905  19.292
k-effective:                   1.00225                Bottom  1  0.255   5.328
Void Fraction:                   0.454
Core Delta-P: psia              25.903          % AXIAL TILT -15.061  -5.592
Core Plate Delta-P: psia        21.361       AVG BOT 8ft/12ft  1.0921  1.0249
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          89.19  Active Channel Flow: Mlb/hr        89.19
Total Bypass Flow (%):           15.5  (of total core flow)
Total Water Rod Flow (%):        -0.0  (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.366	20	11	36	1.590	0.906	20	9	22	8.69	0.744	23.1	21	7	26	4	7.32	0.864	44.6	18	49	34	4
1.364	20	11	32	1.599	0.901	21	17	50	8.68	0.742	22.9	20	49	30	4	7.54	0.863	42.2	15	15	34	4
1.361	19	11	40	1.600	0.900	19	17	46	8.85	0.737	19.9	19	13	34	4	7.24	0.863	45.4	16	9	26	4
1.361	19	13	34	1.600	0.900	19	13	38	8.62	0.735	22.6	20	49	26	4	7.39	0.862	43.8	16	9	32	4
1.350	19	9	24	1.601	0.899	19	13	42	8.51	0.734	24.1	20	51	22	4	7.86	0.857	38.0	14	47	26	4
1.350	20	9	40	1.604	0.898	19	9	38	8.55	0.730	22.9	19	9	24	4	7.33	0.855	43.7	14	47	32	4
1.348	19	13	38	1.606	0.897	19	13	34	8.51	0.730	23.4	20	51	28	4	7.17	0.851	45.2	16	7	24	4
1.341	20	9	34	1.608	0.895	20	21	52	8.43	0.720	22.9	21	53	30	4	7.10	0.849	45.8	14	49	24	4
1.340	19	13	42	1.610	0.895	19	19	48	8.61	0.716	19.9	19	15	32	4	7.55	0.837	39.6	14	7	34	4
1.340	19	17	46	1.614	0.892	21	41	10	8.31	0.710	23.0	19	49	22	4	7.02	0.821	44.0	16	47	40	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.95 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,850.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    27485.0
Exposure: MWd/MTU (GWd)       15850.2 (2158.70 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.186   5.181     4  0.793 0.869  19 34
Inlet Subcooling: Btu/lbm       -26.53                      24  0.561  15.019     5  0.470 0.526   1 36
Flow: Mlb/hr                   103.94 (101.40 %)            23  0.740  20.916     6  0.455 0.482  11 54
                                                            22  0.837  25.229     9  0.393 0.470  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.893  28.224    10  0.448 0.453  59 34
 1              -- -- -- -- -- -- --              59  :JR  20  0.919  30.084    11  0.461 0.463   1 32
 3           -- -- -- -- -- -- -- -- -- --        55       19  0.938  31.096    14  1.007 1.188  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51       18  0.953  31.477    15  0.895 1.175  15 46
 7     -- -- -- -- -- 14 -- 14 -- -- -- -- --     47       17  0.968  31.445    16  1.065 1.176  47 40
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43       16  1.002  29.498    17  0.888 1.183  17 14
11 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 39       15  1.042  29.525    18  0.977 1.192  11 28
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35       14  1.146  29.005    19  1.183 1.354  11 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31       13  1.191  29.774    20  1.231 1.359  11 36
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27       12  1.225  30.682    21  1.192 1.328   9 42
19 -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- -- 23       11  1.247  31.505
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19       10  1.261  32.112
23    -- -- -- -- -- 14 -- 14 -- -- -- -- --    15        9  1.270* 32.368
25       -- -- -- -- -- -- -- -- -- -- -- --     11        8  1.269  32.936
27          -- -- -- -- -- -- -- -- -- --        7        7  1.261  33.610
29             -- -- -- -- -- -- -- --           3        6  1.254  34.099*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58          5  1.256  33.923
                                                         4  1.253  32.194
Control Rod Density: %          4.95                     3  1.175  27.528
                                                         2  0.901  19.292
k-effective:                 1.00232                Bottom  1  0.254   5.328
Void Fraction:                 0.456
Core Delta-P: psia            25.358            % AXIAL TILT -14.447  -5.592
Core Plate Delta-P: psia      20.818          AVG BOT 8ft/12ft  1.0884  1.0249
Coolant Temp: Deg-F           548.4
In Channel Flow: Mlb/hr        87.85   Active Channel Flow: Mlb/hr        87.85
Total Bypass Flow (%):          15.5   (of total core flow)
Total Water Rod Flow (%):       -0.0   (of total core flow)
Source Convergence           0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.359	20	11	36	1.585	0.908	21	17	50	8.64	0.739	23.1	21	7	26	4	7.28	0.859	44.6	18	49	34	4
1.356	20	11	32	1.586	0.908	19	17	46	8.63	0.737	22.9	20	49	30	4	7.50	0.858	42.2	15	15	34	4
1.354	19	11	40	1.586	0.908	20	9	22	8.80	0.733	19.9	19	47	28	4	7.20	0.858	45.4	16	9	26	4
1.353	19	13	34	1.587	0.908	20	21	52	8.57	0.730	22.6	20	49	26	4	7.35	0.857	43.8	16	9	32	4
1.343	19	9	24	1.592	0.905	19	19	48	8.46	0.730	24.1	20	51	22	4	7.82	0.852	38.0	14	47	26	4
1.342	20	9	40	1.594	0.903	19	13	42	8.51	0.726	22.9	19	51	24	4	7.29	0.850	43.7	14	47	32	4
1.341	19	13	38	1.595	0.903	19	13	38	8.46	0.726	23.4	20	51	28	4	7.13	0.847	45.2	16	7	24	4
1.338	19	17	46	1.598	0.901	21	41	10	8.38	0.716	22.9	21	53	30	4	7.06	0.844	45.8	14	49	24	4
1.335	19	19	48	1.600	0.900	19	9	38	8.56	0.712	19.9	19	15	32	4	7.50	0.833	39.6	14	7	34	4
1.335	19	13	42	1.601	0.899	19	13	34	8.26	0.706	23.0	19	49	22	4	6.98	0.817	44.0	16	47	40	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.96 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 15,850.2 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       16000.0 (2179.10 )
Delta E: MWd/MTU, (GWd)         149.8 (  20.40 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.80
Flow: Mlb/hr                   106.67 (104.07 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- 14 -- 14 -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- --  8 -- 12 -- 12 --  8 -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- -- 14 -- 14 -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              4.95

k-effective:                     1.00236
Void Fraction:                     0.449
Core Delta-P: psia                26.245
Core Plate Delta-P: psia          21.703
Coolant Temp: Deg-F               548.4
In Channel Flow: Mlb/hr            90.17   Active Channel Flow: Mlb/hr        90.17
Total Bypass Flow (%):              15.5   (of total core flow)
Total Water Rod Flow (%):           -0.0   (of total core flow)
Source Convergence              0.00008

Core Average Exposure: MWd/MTU    27634.9

                    Axial Profile     Edit   Radial Power
          N(PRA)  Power  Exposure    Zone   Avg.   Max.   IR JR
Top 25    0.188    5.214      4    0.791  0.866  19 34
    24    0.570   15.110      5    0.469  0.525   1 36
    23    0.752   21.035      6    0.455  0.482  11 54
    22    0.850   25.364      9    0.393  0.469  23 60
    21    0.905   28.368     10    0.447  0.452  59 34
    20    0.930   30.233     11    0.460  0.461   1 32
    19    0.948   31.248     14    1.007  1.186  13 36
    18    0.963   31.631     15    0.894  1.175  15 46
    17    0.978   31.601     16    1.065  1.176  47 40
    16    1.013   29.653     17    0.888  1.184  17 14
    15    1.054   29.686     18    0.978  1.190  11 28
    14    1.158   29.167     19    1.183  1.355  11 40
    13    1.202   29.942     20    1.231  1.358  11 36
    12    1.234   30.855     21    1.194  1.331   9 42
    11    1.253   31.681
    10    1.264   32.291
     9    1.269*  32.548
     8    1.263   33.116
     7    1.249   33.789
     6    1.236   34.276*
     5    1.231   34.101
     4    1.223   32.371
     3    1.144   27.695
     2    0.877   19.420
Bottom 1  0.247    5.364

% AXIAL TILT -13.361  -5.608
AVG BOT 8ft/12ft  1.0831  1.0250
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.358	20	11	36	1.597	0.902	21	17	50	8.43	0.723	23.4	21	7	26	4	7.32	0.840	42.5	15	15	34	4
1.355	19	11	40	1.600	0.900	20	21	52	8.41	0.720	23.2	20	49	30	4	7.09	0.839	44.9	18	49	34	4
1.353	20	11	32	1.601	0.900	20	9	22	8.60	0.718	20.2	19	13	34	4	7.02	0.838	45.7	16	9	26	4
1.351	19	13	34	1.601	0.899	19	17	46	8.36	0.714	22.9	20	49	26	4	7.15	0.836	44.0	16	9	32	4
1.344	20	9	40	1.607	0.896	19	19	48	8.26	0.714	24.3	20	51	22	4	7.63	0.834	38.3	14	47	26	4
1.343	19	9	24	1.609	0.895	21	41	10	8.30	0.710	23.2	19	9	24	4	7.21	0.831	42.8	14	47	32	4
1.341	19	13	38	1.610	0.894	19	13	42	8.24	0.709	23.7	20	51	28	4	6.80	0.829	47.4	16	7	24	5
1.339	19	17	46	1.613	0.893	19	13	38	8.17	0.699	23.2	21	53	30	4	6.88	0.825	46.0	14	49	24	4
1.335	19	19	48	1.616	0.891	19	9	38	8.37	0.699	20.2	19	15	32	4	7.31	0.814	39.8	14	7	34	4
1.335	19	13	42	1.623	0.887	19	13	34	8.05	0.690	23.3	19	49	22	4	6.80	0.798	44.3	16	47	40	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.97 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,000.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      16000.2 (2179.10 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -26.73
Flow: Mlb/hr                  103.25 (100.73 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- 14 -- 14 -- -- -- --       47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- --    43
11  -- -- -- -- 10 -- 14 -- 14 -- 10 -- -- --    39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- --    35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- --    31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- --    27
19  -- -- -- -- 10 -- 14 -- 14 -- 10 -- -- --    23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- --    19
23     -- -- -- -- 14 -- 14 -- -- -- -- --       15
25        -- -- -- -- -- -- -- -- -- -- --       11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              4.77

k-effective:                     1.00229
Void Fraction:                     0.452
Core Delta-P: psia                24.917
Core Plate Delta-P: psia          20.377
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr           87.23
Total Bypass Flow (%):             15.5
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00005

                                  Core Average Exposure: MWd/MTU    27635.1

                                  Axial Profile    Edit   Radial Power
                                N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                                Top 25  0.190   5.214    4  0.802 0.873  19 34
                                    24  0.575  15.110    5  0.467 0.523   1 36
                                    23  0.759  21.035    6  0.452 0.480  11 54
                                    22  0.860  25.365    9  0.391 0.466  23 60
                                    21  0.921  28.368   10  0.445 0.450  59 34
                                    20  0.955  30.233   11  0.458 0.459   1 32
                                    19  0.971  31.248   14  1.005 1.184  13 36
                                    18  0.986  31.631   15  0.901 1.170  15 46
                                    17  0.992  31.601   16  1.061 1.175  47 40
                                    16  1.020  29.654   17  0.883 1.178  17 14
                                    15  1.055  29.687   18  0.975 1.186  11 28
                                    14  1.154  29.168   19  1.187 1.350  11 40
                                    13  1.194  29.943   20  1.224 1.352  11 36
                                    12  1.223  30.855   21  1.187 1.323  11 44
                                    11  1.240  31.681
                                    10  1.249  32.291
                                     9  1.253* 32.548
                                     8  1.248  33.116
                                     7  1.235  33.789
                                     6  1.224  34.276*
                                     5  1.221  34.101
                                     4  1.216  32.371
                                     3  1.140  27.695
                                     2  0.874  19.420
                                Bottom  1  0.246   5.364
                              % AXIAL TILT -12.314  -5.609
                            AVG BOT 8ft/12ft  1.0757  1.0250
                      Active Channel Flow: Mlb/hr        87.23
                      (of total core flow)
                      (of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.352	20	11	36	1.574	0.915	19	17	46	8.37	0.718	23.4	21	7	26	4	7.26	0.834	42.5	15	15	34	4
1.350	19	11	40	1.574	0.915	20	9	22	8.34	0.714	23.2	20	49	30	4	7.04	0.833	44.9	18	49	34	4
1.348	19	13	34	1.574	0.915	19	13	38	8.53	0.712	20.2	19	47	28	4	6.96	0.832	45.7	16	9	26	4
1.348	20	11	32	1.577	0.913	19	13	42	8.19	0.709	24.3	20	51	22	4	7.09	0.830	44.0	16	9	32	4
1.340	19	13	38	1.579	0.912	21	17	50	8.30	0.708	22.9	20	49	26	4	7.57	0.828	38.3	14	47	26	4
1.336	20	9	40	1.580	0.912	19	19	48	8.23	0.705	23.2	19	9	24	4	7.15	0.824	42.8	14	47	32	4
1.336	19	9	24	1.581	0.911	20	21	52	8.18	0.703	23.7	20	51	28	4	6.91	0.822	45.5	16	7	24	4
1.335	19	17	46	1.586	0.908	19	13	34	8.11	0.694	23.2	21	53	30	4	6.82	0.818	46.0	14	49	24	4
1.332	19	13	42	1.589	0.906	19	9	38	8.31	0.693	20.2	19	15	32	4	7.26	0.808	39.8	14	7	34	4
1.330	19	19	48	1.593	0.904	21	41	10	7.99	0.685	23.3	19	49	22	4	6.98	0.798	42.1	15	33	16	19

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.98 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,000.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       16150.0 (2199.50 )
Delta E: MWd/MTU, (GWd)         149.8 (  20.40 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.88
Flow: Mlb/hr                   106.35 (103.75 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- 14 -- 14 -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- -- 10 -- 14 -- 14 -- 10 -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- -- 10 -- 14 -- 14 -- 10 -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- 14 -- 14 -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --            7
29              -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              4.77

k-effective:                     1.00243
Void Fraction:                     0.444
Core Delta-P: psia                26.021
Core Plate Delta-P: psia          21.480
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr            89.96
Total Bypass Flow (%):             15.4
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00007

                                Core Average Exposure: MWd/MTU    27784.8

                                    Axial Profile    Edit   Radial Power
                                N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                                Top 25  0.193   5.248    4  0.799 0.870  19 34
                                    24  0.585  15.202    5  0.467 0.522   1 36
                                    23  0.772  21.157    6  0.452 0.480  11 54
                                    22  0.874  25.504    9  0.391 0.466  23 60
                                    21  0.934  28.517   10  0.444 0.449  59 34
                                    20  0.967  30.387   11  0.457 0.458   1 32
                                    19  0.982  31.405   14  1.004 1.183  13 36
                                    18  0.996  31.790   15  0.900 1.171  15 46
                                    17  1.003  31.762   16  1.061 1.175  47 40
                                    16  1.031  29.812   17  0.884 1.179  17 14
                                    15  1.066  29.850   18  0.976 1.184  11 28
                                    14  1.167  29.331   19  1.187 1.351  11 40
                                    13  1.205  30.111   20  1.225 1.352  11 36
                                    12  1.232  31.028   21  1.190 1.326  11 44
                                    11  1.246  31.856
                                    10  1.252* 32.467
                                     9  1.252  32.726
                                     8  1.241  33.293
                                     7  1.222  33.964
                                     6  1.204  34.450*
                                     5  1.195  34.274
                                     4  1.184  32.544
                                     3  1.108  27.857
                                     2  0.850  19.544
                                Bottom  1  0.239   5.399
                                % AXIAL TILT -11.147  -5.613
                              AVG BOT 8ft/12ft  1.0698  1.0251
Active Channel Flow: Mlb/hr        89.96
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.352	20	11	36	1.592	0.904	20	9	22	8.16	0.702	23.7	21	7	26	4	7.08	0.815	42.7	15	15	34	4
1.351	19	11	40	1.592	0.904	19	17	46	8.13	0.698	23.5	20	49	30	4	6.85	0.813	45.1	18	49	34	4
1.347	19	13	34	1.594	0.904	21	17	50	8.33	0.697	20.5	19	13	34	4	6.66	0.813	47.4	16	9	26	5
1.346	20	11	32	1.596	0.902	19	13	38	7.99	0.692	24.6	20	51	22	4	6.90	0.810	44.3	16	9	32	4
1.340	19	13	38	1.597	0.902	19	13	42	8.09	0.692	23.2	20	49	26	4	7.38	0.809	38.6	14	47	26	4
1.338	20	9	40	1.598	0.901	19	19	48	8.03	0.688	23.4	19	51	24	4	6.60	0.807	47.6	16	7	24	5
1.337	19	9	24	1.598	0.901	20	21	52	7.97	0.687	24.0	20	51	28	4	6.97	0.806	43.0	14	47	32	4
1.336	19	17	46	1.608	0.896	21	41	10	8.12	0.679	20.4	19	15	32	4	7.01	0.804	42.4	15	33	16	19
1.333	19	13	42	1.609	0.895	19	9	38	7.90	0.678	23.5	21	53	30	4	6.64	0.799	46.3	14	49	24	4
1.330	19	19	48	1.611	0.894	19	13	34	7.78	0.668	23.6	19	49	22	4	7.14	0.795	39.9	14	25	48	19

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.99 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,150.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      16150.2 (2199.50 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm     -26.78
Flow: Mlb/hr                  103.05 (100.53 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- 18 -- 18 -- -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- --  10 -- 14 -- 14 -- 10 -- -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- -- --  10 -- 14 -- 14 -- 10 -- -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- -- 18 -- 18 -- -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %             4.59

k-effective:                    1.00246
Void Fraction:                    0.448
Core Delta-P: psia               24.832
Core Plate Delta-P: psia         20.292
Coolant Temp: Deg-F              548.3
In Channel Flow: Mlb/hr          87.07   Active Channel Flow: Mlb/hr        87.07
Total Bypass Flow (%):           15.5    (of total core flow)
Total Water Rod Flow (%):        -0.0    (of total core flow)
Source Convergence              0.00007

                                        Core Average Exposure: MWd/MTU    27785.0

                                        Axial Profile     Edit   Radial Power
                                  N(PRA) Power Exposure   Zone  Avg.   Max.   IR JR
                                  Top 25 0.191   5.248     4  0.800 0.865  19 34
                                     24  0.577  15.203     5  0.465 0.517   1 36
                                     23  0.761  21.158     6  0.451 0.478  11 54
                                     22  0.864  25.504     9  0.389 0.469  23 60
                                     21  0.927  28.517    10  0.444 0.449  33 60
                                     20  0.965  30.387    11  0.457 0.459  31 60
                                     19  0.987  31.405    14  1.008 1.171  13 36
                                     18  1.011  31.790    15  0.902 1.165  15 46
                                     17  1.031  31.762    16  1.061 1.172  19 46
                                     16  1.061  29.812    17  0.881 1.177  17 14
                                     15  1.086  29.850    18  0.973 1.172  11 28
                                     14  1.178  29.331    19  1.189 1.338  11 40
                                     13  1.210  30.112    20  1.227 1.338  11 36
                                     12  1.231  31.029    21  1.185 1.320  17 50
                                     11  1.242  31.856
                                     10  1.245* 32.468
                                      9  1.243  32.726
                                      8  1.232  33.293
                                      7  1.213  33.965
                                      6  1.195  34.450*
                                      5  1.187  34.274
                                      4  1.177  32.544
                                      3  1.102  27.857
                                      2  0.846  19.544
                                  Bottom  1  0.238   5.399
                                % AXIAL TILT -10.555  -5.613
                              AVG BOT 8ft/12ft  1.0693  1.0251
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.338	20	11	36	1.563	0.921	20	21	52	8.11	0.697	23.7	21	7	26	4	7.73	0.857	39.6	14	25	48	17
1.338	19	11	40	1.566	0.920	19	19	48	8.07	0.693	23.5	20	49	30	4	7.54	0.854	41.3	15	33	16	17
1.334	19	13	34	1.568	0.918	19	17	46	8.27	0.692	20.5	19	13	34	4	7.03	0.810	42.7	15	15	34	4
1.333	19	19	48	1.571	0.916	21	17	50	7.93	0.687	24.6	20	51	22	4	6.81	0.807	45.1	18	49	34	4
1.333	19	17	46	1.576	0.914	19	21	46	8.03	0.687	23.2	20	49	26	4	6.73	0.807	45.9	16	9	26	4
1.332	20	11	32	1.581	0.911	21	41	10	7.10	0.685	42.7	14	25	14	17	6.85	0.805	44.3	16	9	32	4
1.328	19	13	38	1.582	0.910	20	9	22	7.97	0.683	23.4	19	51	24	4	7.33	0.804	38.6	14	47	26	4
1.325	20	9	40	1.583	0.910	19	13	42	7.91	0.682	24.0	20	51	28	4	6.55	0.801	47.6	16	7	24	5
1.323	19	9	24	1.584	0.909	19	13	38	8.06	0.674	20.4	19	15	32	4	6.93	0.801	43.0	14	47	32	4
1.323	19	15	44	1.591	0.905	19	21	50	7.84	0.673	23.5	21	53	30	4	6.60	0.793	46.3	14	49	24	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.100 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,150.2 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    27934.9
Exposure: MWd/MTU (GWd)       16300.0 (2219.90 )
Delta E: MWd/MTU, (GWd)         149.8 (  20.40 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.194   5.281     4  0.796 0.862  19 34
Inlet Subcooling: Btu/lbm       -25.87                       24  0.587  15.295     5  0.464 0.517   1 36
Flow: Mlb/hr                   106.40 (103.80 %)            23  0.774  21.280     6  0.451 0.478  11 54
                                                            22  0.877  25.643     9  0.389 0.468  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.940  28.667    10  0.443 0.449  33 60
 1              -- -- -- -- -- -- --              59  :JR  20  0.976  30.543    11  0.456 0.459  31 60
 3           -- -- -- -- -- -- -- -- -- --        55       19  0.997  31.565    14  1.008 1.170  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51       18  1.021  31.954    15  0.900 1.166  15 46
 7     -- -- -- -- -- 18 -- 18 -- -- -- -- --     47       17  1.041  31.929    16  1.061 1.172  19 46
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43       16  1.072  29.977    17  0.882 1.178  17 14
11 -- -- -- -- 10 -- 14 -- 14 -- 10 -- -- -- --  39       15  1.098  30.019    18  0.974 1.171  11 28
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35       14  1.190  29.498    19  1.188 1.339  11 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31       13  1.221  30.283    20  1.228 1.338  11 36
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27       12  1.240  31.203    21  1.188 1.323  17 50
19 -- -- -- -- 10 -- 14 -- 14 -- 10 -- -- -- --  23       11  1.247* 32.032
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19       10  1.247  32.644
23    -- -- -- -- -- 18 -- 18 -- -- -- -- --     15        9  1.241  32.902
25       -- -- -- -- -- -- -- -- -- -- -- --     11        8  1.224  33.468
27          -- -- -- -- -- -- -- -- -- --         7        7  1.199  34.136
29             -- -- -- -- -- -- --               3        6  1.176  34.619*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.161  34.443
                                                            4  1.148  32.711
Control Rod Density: %          4.59                        3  1.073  28.013
                                                            2  0.823  19.664
k-effective:                 1.00253                Bottom  1  0.232   5.433
Void Fraction:                0.440
Core Delta-P: psia           25.990              % AXIAL TILT  -9.440  -5.607
Core Plate Delta-P: psia     21.449          AVG BOT 8ft/12ft  1.0638  1.0251
Coolant Temp: Deg-F          548.3
In Channel Flow: Mlb/hr       90.04   Active Channel Flow: Mlb/hr        90.04
Total Bypass Flow (%):        15.4    (of total core flow)
Total Water Rod Flow (%):     -0.0    (of total core flow)
Source Convergence         0.00006
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.339	19	11	40	1.582	0.910	20	21	52	7.15	0.691	42.9	14	25	14	17	7.78	0.866	39.8	14	25	48	17
1.338	20	11	36	1.586	0.908	19	19	48	7.91	0.682	24.0	21	7	26	4	7.57	0.860	41.6	15	33	16	17
1.334	19	19	48	1.588	0.907	21	17	50	7.87	0.677	23.8	20	49	30	4	6.88	0.794	42.9	16	9	26	9
1.333	19	17	46	1.589	0.906	19	17	46	8.07	0.677	20.7	19	13	34	4	6.86	0.792	43.0	15	15	34	4
1.332	19	13	34	1.597	0.902	21	41	10	7.04	0.677	42.4	15	33	46	17	6.63	0.789	45.4	18	49	34	4
1.331	20	11	32	1.598	0.901	19	21	46	7.74	0.672	24.9	20	51	22	4	6.42	0.787	47.8	16	7	24	5
1.328	19	13	38	1.603	0.898	20	9	22	7.83	0.672	23.4	20	49	26	4	7.15	0.786	38.8	14	47	26	4
1.327	20	9	40	1.605	0.897	19	13	42	7.77	0.668	23.7	19	9	24	4	6.68	0.786	44.5	16	9	32	4
1.325	19	9	24	1.609	0.895	19	13	38	7.71	0.666	24.3	20	51	28	4	6.76	0.784	43.3	14	47	32	4
1.323	19	13	42	1.610	0.894	19	21	50	7.87	0.664	21.5	19	35	46	17	6.95	0.780	40.6	16	37	16	17

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.101 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,300.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       16300.2 (2219.90 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.66
Flow: Mlb/hr                   103.48 (100.95 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43
11  -- -- -- -- 10 --  8 --  8 -- 10 -- -- -- -- 39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19  -- -- -- -- 10 --  8 --  8 -- 10 -- -- -- -- 23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %             3.51

k-effective:                    1.00254
Void Fraction:                    0.462
Core Delta-P: psia               25.363
Core Plate Delta-P: psia         20.826
Coolant Temp: Deg-F              548.4
In Channel Flow: Mlb/hr           87.70   Active Channel Flow: Mlb/hr        87.70
Total Bypass Flow (%):            15.2   (of total core flow)
Total Water Rod Flow (%):         -0.0   (of total core flow)
Source Convergence             0.00008
```

```
Core Average Exposure: MWd/MTU    27935.1

                    Axial Profile     Edit   Radial Power
          N(PRA)  Power  Exposure    Zone   Avg.   Max.   IR JR
Top 25    0.171   5.281      4     0.774 0.837  19 34
    24    0.516  15.296      5     0.458 0.509   1 36
    23    0.679  21.280      6     0.445 0.471  11 54
    22    0.768  25.644      9     0.384 0.467  23 60
    21    0.820  28.667     10     0.440 0.451  33 60
    20    0.848  30.543     11     0.454 0.461  29  2
    19    0.871  31.565     14     1.036 1.197  25 48
    18    0.906  31.954     15     0.896 1.153  15 46
    17    0.950  31.929     16     1.068 1.199  21 48
    16    1.009  29.977     17     0.875 1.171  17 14
    15    1.066  30.019     18     0.970 1.186  27 12
    14    1.182  29.498     19     1.191 1.368  23 48
    13    1.232  30.283     20     1.246 1.355  29 50
    12    1.266  31.203     21     1.176 1.315  17 50
    11    1.284  32.032
    10    1.293  32.644
     9    1.296* 32.902
     8    1.290  33.468
     7    1.278  34.137
     6    1.271  34.620*
     5    1.278  34.443
     4    1.286  32.711
     3    1.223  28.013
     2    0.948  19.664
Bottom 1  0.269   5.434

% AXIAL TILT -17.656  -5.607
AVG BOT 8ft/12ft  1.1159  1.0251
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.368	19	23	48	1.576	0.914	19	37	14	8.66	0.732	21.7	20	29	12	4	7.30	0.850	43.6	16	31	10	4
1.355	20	29	50	1.598	0.901	19	19	48	8.54	0.721	21.6	19	27	14	4	7.08	0.843	45.4	18	33	50	4
1.353	19	21	46	1.609	0.895	19	21	46	8.35	0.718	23.7	21	25	8	4	7.32	0.840	42.4	15	27	16	4
1.351	20	25	50	1.610	0.894	20	21	52	8.32	0.715	23.7	20	25	12	4	7.61	0.839	39.1	14	25	48	4
1.345	19	21	50	1.621	0.888	19	27	48	8.29	0.712	23.6	20	27	10	4	7.18	0.838	43.8	14	31	48	4
1.344	19	27	14	1.629	0.884	19	23	52	8.43	0.709	21.1	19	37	14	4	7.25	0.834	42.6	16	23	16	4
1.341	19	19	48	1.629	0.884	19	21	50	8.26	0.704	22.7	21	29	8	4	7.06	0.834	44.8	16	25	10	4
1.326	19	25	46	1.631	0.883	21	17	50	8.41	0.703	20.5	19	25	16	4	6.91	0.821	45.3	16	39	48	4
1.324	19	17	46	1.632	0.882	20	27	52	8.11	0.699	24.0	19	37	10	4	6.70	0.819	47.6	14	23	50	4
1.323	20	27	52	1.633	0.882	19	17	46	8.00	0.698	25.4	20	39	10	4	7.34	0.816	39.6	14	33	8	4

```
* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:
```

Figure A.102 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,300.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    28034.8
Exposure: MWd/MTU (GWd)       16400.0 (2233.50 )
Delta E: MWd/MTU, (GWd)          99.8 (  13.59 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.173   5.302     4  0.771 0.835  19 34
Inlet Subcooling: Btu/lbm       -25.82                      24  0.522  15.351     5  0.458 0.509   1 36
Flow: Mlb/hr                   106.57 (103.97 %)            23  0.687  21.353     6  0.445 0.471  11 54
                                                            22  0.777  25.726     9  0.384 0.466  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.828  28.756    10  0.440 0.450  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.855  30.635    11  0.453 0.460  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.877  31.659    14  1.036 1.196  25 48
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  0.912  32.052    15  0.895 1.154  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  0.956  32.031    16  1.068 1.199  21 48
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43         16  1.015  30.081    17  0.876 1.172  17 14
11 -- -- -- -- 10 --  8 --  8 -- 10 -- -- -- -- 39         15  1.073  30.129    18  0.970 1.185  27 12
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.190  29.609    19  1.191 1.368  23 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.239  30.399    20  1.247 1.355  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.271  31.322    21  1.178 1.316  17 50
19 -- -- -- -- 10 --  8 --  8 -- 10 -- -- -- -- 23         11  1.288  32.153
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.295  32.766
23    -- -- -- -- -- -- -- -- -- -- -- -- -- --    15          9  1.296* 33.025
25       -- -- -- -- -- -- -- -- -- -- -- --       11          8  1.286  33.590
27          -- -- -- -- -- -- -- -- -- --          7          7  1.270  34.257
29             -- -- -- -- -- -- -- --             3          6  1.259  34.740*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58               5  1.261  34.563
                                                              4  1.267  32.832
Control Rod Density: %            3.51                        3  1.203  28.129
                                                              2  0.934  19.754
k-effective:                   1.00263                 Bottom  1  0.265   5.459
Void Fraction:                   0.456
Core Delta-P: psia              26.369            % AXIAL TILT -16.952  -5.629
Core Plate Delta-P: psia        21.827          AVG BOT 8ft/12ft  1.1124  1.0253
Coolant Temp: Deg-F             548.5
In Channel Flow: Mlb/hr         89.98   Active Channel Flow: Mlb/hr        89.98
Total Bypass Flow (%):           15.6   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00010
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.368	19	23	48	1.596	0.902	19	37	14	8.57	0.726	21.9	20	29	12	4	7.21	0.841	43.8	16	31	10	4
1.355	20	29	50	1.616	0.891	19	19	48	8.46	0.715	21.8	19	27	14	4	7.00	0.835	45.6	18	33	50	4
1.353	19	21	46	1.629	0.884	20	21	52	8.25	0.710	23.9	21	25	8	4	7.25	0.833	42.5	15	27	16	4
1.351	20	25	50	1.630	0.884	19	21	46	8.22	0.708	23.8	20	25	12	4	7.52	0.832	39.2	14	25	48	4
1.345	19	21	50	1.644	0.876	19	27	48	8.20	0.705	23.8	20	27	10	4	7.11	0.831	44.0	14	31	48	4
1.343	19	27	14	1.646	0.875	21	17	50	8.33	0.702	21.3	19	37	14	4	7.17	0.826	42.8	16	23	16	4
1.341	19	19	48	1.647	0.874	19	21	50	8.33	0.698	20.6	19	25	16	4	6.96	0.824	45.0	16	25	10	4
1.325	19	25	46	1.648	0.874	19	23	52	8.16	0.697	22.9	21	29	8	4	6.81	0.811	45.5	16	39	48	4
1.325	19	17	46	1.651	0.872	21	41	10	8.00	0.691	24.2	19	37	10	4	6.60	0.810	47.7	14	23	50	4
1.323	20	27	52	1.651	0.872	20	9	22	7.89	0.690	25.6	20	39	10	4	7.25	0.807	39.8	14	33	8	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.103 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,400.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    28035.0
Exposure: MWd/MTU (GWd)      16400.2 (2233.60 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                    3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia           1050.0                     Top 25  0.174   5.302     4  0.776 0.846  19 34
Inlet Subcooling: Btu/lbm      -26.98                        24  0.524  15.351     5  0.457 0.508   1 36
Flow: Mlb/hr                  102.36 ( 99.86 %)             23  0.690  21.353     6  0.444 0.470  11 54
                                                            22  0.783  25.727     9  0.383 0.463  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.839  28.756    10  0.438 0.447  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.873  30.635    11  0.451 0.456  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.904  31.659    14  1.034 1.188  25 48
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  0.940  32.052    15  0.901 1.152  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  0.974  32.031    16  1.066 1.193  21 48
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43         16  1.025  30.081    17  0.872 1.167  17 14
11 -- -- -- -- 14 --  8 --  8 -- 14 -- -- -- -- 39         15  1.076  30.130    18  0.969 1.176  27 12
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.187  29.609    19  1.195 1.360  23 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.232  30.399    20  1.241 1.343  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.261  31.322    21  1.172 1.309  17 50
19 -- -- -- -- 14 --  8 --  8 -- 14 -- -- -- -- 23         11  1.275  32.153
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.281  32.766
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15          9  1.281* 33.025
25       -- -- -- -- -- -- -- -- -- -- --       11          8  1.271  33.590
27          -- -- -- -- -- -- -- -- -- --        7          7  1.257  34.257
29             -- -- -- -- -- -- --              3          6  1.248  34.740*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.252  34.564
                                                            4  1.260  32.833
Control Rod Density: %            3.33                      3  1.199  28.129
                                                            2  0.931  19.754
k-effective:                   1.00256                Bottom  1  0.264   5.459
Void Fraction:                   0.460
Core Delta-P: psia              24.900          % AXIAL TILT -15.949  -5.629
Core Plate Delta-P: psia        20.362       AVG BOT 8ft/12ft  1.1056  1.0253
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          86.53   Active Channel Flow: Mlb/hr        86.53
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.360	19	23	48	1.566	0.919	19	37	14	8.51	0.721	21.9	20	29	12	4	7.17	0.836	43.8	16	31	10	4
1.350	19	21	46	1.583	0.909	19	19	48	8.40	0.710	21.8	19	27	14	4	6.95	0.830	45.6	18	33	50	4
1.343	20	29	50	1.595	0.903	19	21	46	8.19	0.706	23.9	21	25	8	4	7.20	0.828	42.5	15	27	16	4
1.340	20	25	50	1.606	0.897	20	21	52	8.17	0.703	23.8	20	25	12	4	7.47	0.826	39.2	14	25	48	4
1.336	19	21	50	1.613	0.893	20	9	22	8.14	0.700	23.8	20	27	10	4	7.06	0.826	44.0	14	31	48	4
1.335	19	19	48	1.613	0.893	19	17	46	8.28	0.697	21.3	19	37	14	4	7.12	0.821	42.8	16	23	16	4
1.333	19	27	14	1.616	0.891	19	27	48	8.27	0.693	20.6	19	25	16	4	6.92	0.819	45.0	16	25	10	4
1.323	19	17	46	1.618	0.890	19	13	38	8.11	0.693	22.9	21	29	8	4	6.77	0.806	45.5	16	39	48	4
1.319	19	25	46	1.620	0.889	19	13	42	7.95	0.686	24.2	19	37	10	4	6.56	0.805	47.7	14	23	50	4
1.319	19	11	40	1.622	0.888	21	17	50	7.84	0.685	25.6	20	39	10	4	7.20	0.802	39.8	14	33	8	4

```
  * LHGR calculated with pin-power reconstruction
  * CPR calculated with pin-power reconstruction & CPR limit type 3
  * Thermal limit file:
```

Figure A.104 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,400.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    28209.8
Exposure: MWd/MTU (GWd)       16575.0 (2257.40 )
Delta E: MWd/MTU, (GWd)         174.8 (  23.81 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.178   5.337     4  0.773 0.843  19 34
Inlet Subcooling: Btu/lbm       -25.84                       24  0.539  15.449     5  0.457 0.508   1 36
Flow: Mlb/hr                   106.49 (103.89 %)            23  0.709  21.483     6  0.443 0.470  11 54
                                                            22  0.803  25.874     9  0.383 0.462  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.859  28.914    10  0.437 0.445  33 60
 1              -- -- -- -- -- -- --              59  :JR  20  0.891  30.800    11  0.450 0.455  29  2
 3           -- -- -- -- -- -- -- -- -- --        55       19  0.922  31.829    14  1.033 1.185  25 48
 5        -- -- -- -- -- -- -- -- -- -- -- --     51       18  0.956  32.229    15  0.899 1.153  15 46
 7     -- -- -- -- -- -- -- -- -- -- -- -- -- --  47       17  0.990  32.215    16  1.066 1.192  21 48
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43       16  1.041  30.267    17  0.873 1.169  17 14
11 -- -- -- -- 14 --  8 --  8 -- 14 -- -- -- --  39       15  1.092  30.324    18  0.970 1.173  27 12
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35       14  1.204  29.805    19  1.194 1.358  23 48
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31       13  1.246  30.602    20  1.242 1.340  29 50
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27       12  1.272  31.530    21  1.175 1.311  17 50
19 -- -- -- -- 14 --  8 --  8 -- 14 -- -- -- --  23       11  1.282  32.364
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19       10  1.283* 32.977
23    -- -- -- -- -- -- -- -- -- -- -- -- -- --     15        9  1.277  33.237
25       -- -- -- -- -- -- -- -- -- -- -- --        11        8  1.261  33.800
27          -- -- -- -- -- -- -- -- -- --           7        7  1.239  34.465
29             -- -- -- -- -- -- -- --              3        6  1.220  34.946*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.216  34.771
                                                             4  1.217  33.041
Control Rod Density: %           3.33                        3  1.154  28.327
                                                             2  0.896  19.908
k-effective:                  1.00264                 Bottom  1  0.254   5.503
Void Fraction:                  0.450
Core Delta-P: psia             26.232              % AXIAL TILT -14.249  -5.657
Core Plate Delta-P: psia       21.691          AVG BOT 8ft/12ft  1.0969  1.0255
Coolant Temp: Deg-F            548.4
In Channel Flow: Mlb/hr         89.97   Active Channel Flow: Mlb/hr        89.97
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00005
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.358	19	23	48	1.594	0.903	19	37	14	8.19	0.696	22.2	20	29	12	4	6.89	0.807	44.0	16	31	10	4
1.349	19	21	46	1.607	0.896	19	19	48	8.08	0.685	22.1	19	27	14	4	6.68	0.800	45.9	18	33	50	4
1.340	20	29	50	1.620	0.889	19	21	46	7.91	0.683	24.2	21	25	8	4	6.91	0.797	42.8	15	27	16	4
1.338	20	25	50	1.629	0.884	20	21	52	7.86	0.679	24.2	20	25	12	4	7.18	0.797	39.6	14	25	48	4
1.336	19	21	50	1.634	0.881	20	9	22	7.84	0.677	24.1	20	27	10	4	6.78	0.796	44.3	14	31	48	4
1.336	19	19	48	1.636	0.880	19	17	46	7.97	0.673	21.6	19	37	14	4	6.85	0.792	43.0	16	23	16	4
1.329	19	27	14	1.640	0.878	21	17	50	7.82	0.670	23.2	21	29	8	4	6.66	0.791	45.2	16	25	10	4
1.324	19	17	46	1.642	0.877	19	13	42	7.97	0.669	21.0	19	25	16	4	6.92	0.787	41.7	16	39	48	9
1.321	19	11	40	1.642	0.877	19	13	38	7.66	0.663	24.5	19	37	10	4	6.75	0.784	43.4	16	9	26	9
1.317	20	11	36	1.648	0.874	19	21	50	7.56	0.662	25.9	20	39	10	4	6.56	0.776	44.9	14	23	50	9

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.105 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,575.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      16575.2 (2257.40 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm     -26.70
Flow: Mlb/hr                  103.32 (100.80 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- -- 18 --  8 --  8 -- 18 -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- -- 18 --  8 --  8 -- 18 -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --            7
29              -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              3.15

k-effective:                     1.00281
Void Fraction:                     0.454
Core Delta-P: psia                25.046
Core Plate Delta-P: psia          20.506
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr           87.23   Active Channel Flow: Mlb/hr        87.23
Total Bypass Flow (%):            15.6    (of total core flow)
Total Water Rod Flow (%):         -0.0    (of total core flow)
Source Convergence             0.00007
```

Core Average Exposure: MWd/MTU 28210.0

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.176	5.337	4	0.777	0.854	19	34
24	0.532	15.450	5	0.455	0.507	1	36
23	0.701	21.483	6	0.442	0.467	11	54
22	0.797	25.874	9	0.381	0.459	23	60
21	0.855	28.914	10	0.435	0.442	33	60
20	0.892	30.800	11	0.447	0.451	29	2
19	0.929	31.830	14	1.031	1.177	25	48
18	0.972	32.229	15	0.905	1.152	15	46
17	1.018	32.215	16	1.064	1.187	21	48
16	1.071	30.267	17	0.869	1.165	17	14
15	1.112	30.325	18	0.969	1.164	27	12
14	1.215	29.806	19	1.199	1.351	23	48
13	1.251	30.603	20	1.236	1.329	29	50
12	1.271	31.531	21	1.169	1.304	17	50
11	1.277*	32.364					
10	1.276	32.978					
9	1.268	33.237					
8	1.251	33.800					
7	1.228	34.466					
6	1.210	34.946*					
5	1.206	34.771					
4	1.207	33.041					
3	1.144	28.327					
2	0.889	19.908					
Bottom 1	0.252	5.503					
% AXIAL TILT	-13.507	-5.657					
AVG BOT 8ft/12ft	1.0954	1.0255					

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.351	19	23	48	1.575	0.927	19	37	14	8.12	0.690	22.2	20	29	12	4	7.49	0.841	40.6	15	17	40	17
1.346	19	21	46	1.586	0.921	19	19	48	8.01	0.679	22.1	19	27	14	4	6.84	0.800	44.0	16	31	10	4
1.331	19	19	48	1.594	0.916	19	21	46	7.84	0.677	24.2	21	25	8	4	6.62	0.793	45.9	18	33	50	4
1.329	20	29	50	1.601	0.912	19	13	38	7.79	0.673	24.2	20	25	12	4	6.85	0.790	42.8	15	27	16	4
1.328	20	25	50	1.606	0.909	19	13	42	7.77	0.671	24.1	20	27	10	4	7.12	0.790	39.6	14	25	48	4
1.327	19	21	50	1.608	0.908	19	17	46	7.90	0.667	21.6	19	37	14	4	6.72	0.789	44.3	14	31	48	4
1.324	19	17	46	1.608	0.908	20	9	22	7.76	0.664	23.2	21	29	8	4	6.98	0.786	40.8	15	41	24	17
1.322	19	11	40	1.612	0.906	19	19	44	7.90	0.663	21.0	19	25	16	4	6.79	0.785	43.0	16	23	16	4
1.321	19	13	38	1.615	0.904	20	21	52	6.90	0.659	41.7	15	17	40	17	6.60	0.784	45.2	16	25	10	4
1.320	19	27	14	1.615	0.904	19	15	44	7.59	0.657	24.5	19	37	10	4	6.86	0.780	41.7	16	39	48	9

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.106 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,575.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       16740.0 (2279.80 )
Delta E: MWd/MTU, (GWd)         164.8 (  22.44 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm      -25.78
Flow: Mlb/hr                   106.72 (104.12 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- -- 18 --  8 --  8 -- 18 -- -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- -- -- 18 --  8 --  8 -- 18 -- -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --            7
29             -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              3.15

k-effective:                     1.00272
Void Fraction:                     0.445
Core Delta-P: psia                26.234
Core Plate Delta-P: psia          21.693
Coolant Temp: Deg-F               548.4
In Channel Flow: Mlb/hr           90.24   Active Channel Flow: Mlb/hr        90.24
Total Bypass Flow (%):             15.4   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence              0.00010

                                   Core Average Exposure: MWd/MTU    28374.8

                                   Axial Profile    Edit   Radial Power
                                N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                               Top 25  0.180   5.372     4  0.774 0.851  19 34
                                   24  0.545  15.544     5  0.455 0.506   1 36
                                   23  0.717  21.608     6  0.442 0.468  11 54
                                   22  0.814  26.016     9  0.381 0.459  23 60
                                   21  0.872  29.066    10  0.435 0.441  33 60
                                   20  0.907  30.958    11  0.447 0.451  29  2
                                   19  0.943  31.995    14  1.030 1.175  25 48
                                   18  0.986  32.402    15  0.904 1.152  15 46
                                   17  1.031  32.396    16  1.064 1.187  21 48
                                   16  1.084  30.450    17  0.870 1.166  17 14
                                   15  1.125  30.514    18  0.970 1.162  27 12
                                   14  1.228  29.995    19  1.198 1.350  23 48
                                   13  1.262  30.797    20  1.237 1.327  29 50
                                   12  1.280  31.728    21  1.171 1.306  17 50
                                   11  1.283* 32.563
                                   10  1.277  33.176
                                    9  1.264  33.434
                                    8  1.241  33.995
                                    7  1.212  34.657
                                    6  1.187  35.135*
                                    5  1.176  34.959
                                    4  1.171  33.229
                                    3  1.109  28.506
                                    2  0.861  20.047
                                Bottom  1  0.244   5.543
                                % AXIAL TILT -12.099  -5.668
                              AVG BOT 8ft/12ft  1.0881  1.0257
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.350	19	23	48	1.599	0.913	19	37	14	7.87	0.670	22.5	20	29	12	4	7.56	0.852	40.9	15	17	40	17
1.346	19	21	46	1.607	0.908	19	19	48	6.96	0.666	42.0	15	17	40	17	7.03	0.794	41.1	15	41	24	17
1.331	19	19	48	1.616	0.903	19	21	46	7.75	0.659	22.4	19	27	14	4	7.11	0.791	39.8	15	15	16	15
1.327	19	21	50	1.624	0.899	19	13	38	7.61	0.658	24.5	21	25	8	4	6.92	0.785	41.5	16	45	42	15
1.327	20	29	50	1.627	0.898	19	13	42	7.55	0.653	24.4	20	25	12	4	7.11	0.785	39.2	18	49	42	15
1.326	20	25	50	1.628	0.897	20	9	22	7.53	0.652	24.4	20	27	10	4	6.96	0.785	40.9	16	19	46	15
1.324	19	17	46	1.628	0.897	19	17	46	6.78	0.650	42.1	18	17	18	15	7.16	0.784	38.5	18	17	18	15
1.323	19	11	40	1.634	0.893	20	21	52	7.49	0.649	24.6	21	17	50	11	7.01	0.784	40.2	14	49	24	15
1.321	19	13	38	1.635	0.893	19	19	44	7.52	0.649	24.2	21	49	44	11	7.03	0.782	39.8	18	41	50	15
1.318	20	11	36	1.636	0.892	19	15	44	7.65	0.648	21.9	19	37	14	4	7.12	0.781	38.5	16	39	48	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.107 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,740.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    28375.0
Exposure: MWd/MTU (GWd)       16740.2 (2279.90 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.150   5.372     4  0.766 0.892  19 34
Inlet Subcooling: Btu/lbm       -27.01                       24  0.455  15.544     5  0.447 0.498   1 36
Flow: Mlb/hr                   102.24 ( 99.75 %)            23  0.601  21.608     6  0.433 0.460  53 50
                                                            22  0.687  26.016     9  0.373 0.448  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.747  29.067    10  0.426 0.430  33 60
 1           -- -- -- -- -- -- --              59  :JR     20  0.796  30.959    11  0.438 0.439  29  2
 3        -- -- -- -- -- -- -- -- -- --        55          19  0.844  31.995    14  1.023 1.188  13 36
 5     -- -- -- -- -- -- -- -- -- -- --        51          18  0.899  32.403    15  0.921 1.179  17 22
 7  -- -- -- -- -- -- -- -- -- -- -- -- --     47          17  0.960  32.396    16  1.063 1.197  15 38
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.034  30.450    17  0.857 1.161  13 18
11 -- -- -- -- -- --  0 --  0 -- -- -- -- -- -- 39          15  1.101  30.515    18  0.969 1.184  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.225  29.995    19  1.213 1.365  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.274  30.797    20  1.221 1.327  11 36
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.304  31.729    21  1.152 1.295  11 44
19 -- -- -- -- -- --  0 --  0 -- -- -- -- -- -- 23          11  1.316  32.563
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.318* 33.176
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.314  33.435
25       -- -- -- -- -- -- -- -- -- -- --       11           8  1.301  33.996
27          -- -- -- -- -- -- -- -- --          7           7  1.284  34.657
29             -- -- -- -- -- -- --             3           6  1.275  35.135*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.285  34.959
                                                            4  1.305  33.229
Control Rod Density: %            2.16                      3  1.256  28.506
                                                            2  0.987  20.047
k-effective:                   1.00290                 Bottom  1  0.282   5.543
Void Fraction:                   0.467
Core Delta-P: psia              25.046              % AXIAL TILT -19.930  -5.668
Core Plate Delta-P: psia        20.509          AVG BOT 8ft/12ft  1.1385  1.0257
Coolant Temp: Deg-F              548.4
In Channel Flow: Mlb/hr          86.66   Active Channel Flow: Mlb/hr        86.66
Total Bypass Flow (%):           15.2   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.365	19	45	40	1.573	0.928	19	13	38	8.75	0.730	20.2	19	45	26	4	7.44	0.860	43.1	15	15	34	4
1.362	19	13	38	1.582	0.923	19	45	40	8.63	0.722	20.5	19	43	24	4	7.35	0.851	43.2	16	15	24	4
1.345	19	15	36	1.594	0.916	19	15	26	8.47	0.715	21.5	19	13	34	4	7.38	0.849	42.6	15	17	40	4
1.343	19	17	42	1.606	0.909	19	13	34	8.42	0.710	21.4	19	15	32	4	7.58	0.846	40.1	15	17	26	4
1.337	19	21	46	1.611	0.906	19	17	24	8.40	0.709	21.5	19	47	24	4	7.40	0.845	42.0	15	41	24	4
1.335	19	13	42	1.618	0.902	19	13	42	8.37	0.706	21.5	19	15	22	4	7.60	0.844	39.6	14	47	26	4
1.335	19	17	38	1.619	0.902	20	49	36	8.44	0.704	20.0	19	17	34	4	7.08	0.828	43.9	14	47	32	4
1.334	19	13	34	1.621	0.901	19	43	20	8.36	0.701	20.8	19	41	22	4	7.28	0.820	40.8	15	39	18	4
1.334	19	19	44	1.628	0.897	19	15	44	8.34	0.693	19.8	19	19	36	4	7.03	0.818	43.5	16	47	40	4
1.333	19	15	44	1.631	0.895	19	19	44	8.00	0.691	24.2	20	49	26	4	6.79	0.815	46.0	18	49	34	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.108 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,740.2 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    28534.9
Exposure: MWd/MTU (GWd)       16900.0 (2301.60 )
Delta E: MWd/MTU, (GWd)         159.8 (  21.76 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.154   5.400     4  0.763 0.889  19 34
Inlet Subcooling: Btu/lbm       -25.84                        24  0.467  15.622     5  0.447 0.498   1 36
Flow: Mlb/hr                   106.49 (103.89 %)             23  0.616  21.711     6  0.433 0.460  53 50
                                                             22  0.703  26.135     9  0.373 0.448  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.763  29.196    10  0.425 0.430  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  0.810  31.096    11  0.437 0.439  29  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  0.857  32.140    14  1.023 1.187  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  0.912  32.558    15  0.919 1.177  17 22
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47          17  0.972  32.562    16  1.063 1.195  15 38
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43          16  1.047  30.621    17  0.858 1.163  13 18
11 -- -- -- -- -- --  0 --  0 -- -- -- -- -- --  39          15  1.114  30.697    18  0.970 1.183  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35          14  1.238  30.180    19  1.212 1.364  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31          13  1.286  30.990    20  1.222 1.326  11 36
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27          12  1.313  31.925    21  1.155 1.298  11 44
19 -- -- -- -- -- --  0 --  0 -- -- -- -- -- --  23          11  1.322* 32.762
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19          10  1.320  33.375
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15           9  1.311  33.633
25       -- -- -- -- -- -- -- -- -- -- -- --     11           8  1.292  34.192
27          -- -- -- -- -- -- -- -- -- --        7           7  1.269  34.851
29             -- -- -- -- -- -- -- --           3           6  1.253  35.328*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.256  35.153
                                                            4  1.270  33.427
Control Rod Density: %            2.16                      3  1.221  28.696
                                                            2  0.959  20.196
k-effective:                   1.00287                Bottom  1  0.274   5.586
Void Fraction:                   0.458
Core Delta-P: psia              26.418          % AXIAL TILT -18.586  -5.715
Core Plate Delta-P: psia        21.876       AVG BOT 8ft/12ft  1.1317  1.0261
Coolant Temp: Deg-F             548.5
In Channel Flow: Mlb/hr          89.85   Active Channel Flow: Mlb/hr        89.85
Total Bypass Flow (%):           15.6   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00004
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.364	19	45	40	1.598	0.914	19	13	38	8.56	0.716	20.5	19	45	26	4	7.26	0.842	43.4	15	15	34	4
1.361	19	13	38	1.607	0.908	19	45	40	8.45	0.709	20.8	19	43	24	4	7.17	0.833	43.5	16	15	24	4
1.343	19	15	36	1.620	0.901	19	15	26	8.26	0.699	21.8	19	47	28	4	7.20	0.831	42.9	15	17	40	4
1.343	19	17	42	1.633	0.894	19	13	34	8.22	0.695	21.7	19	15	32	4	7.40	0.829	40.4	15	17	26	4
1.337	19	21	46	1.637	0.892	19	17	24	8.20	0.694	21.8	19	47	24	4	7.23	0.828	42.3	15	41	24	4
1.336	19	13	42	1.642	0.889	19	13	42	8.17	0.691	21.8	19	15	22	4	7.42	0.826	39.9	14	47	26	4
1.334	19	15	44	1.643	0.889	20	49	36	8.26	0.690	20.3	19	17	34	4	7.02	0.812	43.2	16	47	40	10
1.333	19	19	44	1.648	0.886	19	43	20	8.17	0.687	21.1	19	41	22	4	6.90	0.809	44.2	14	47	32	4
1.333	19	17	38	1.653	0.883	19	15	44	8.16	0.681	20.1	19	19	36	4	6.91	0.802	43.4	18	17	18	11
1.333	19	11	22	1.658	0.880	19	19	44	7.80	0.675	24.5	20	49	26	4	7.09	0.801	41.1	15	39	18	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.109 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,900.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    28535.1
Exposure: MWd/MTU (GWd)       16900.2 (2301.70 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                 Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.162   5.400     4  0.775 0.890  19 34
Inlet Subcooling: Btu/lbm       -26.42                      24  0.490  15.622     5  0.445 0.495   1 36
Flow: Mlb/hr                   104.34 (101.80 %)            23  0.644  21.711     6  0.432 0.458  53 50
                                                            22  0.730  26.135     9  0.372 0.446  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.782  29.196    10  0.424 0.429  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.822  31.096    11  0.435 0.438  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.865  32.141    14  1.021 1.181  13 36
 5        -- -- -- -- -- -- -- -- -- -- --        51         18  0.915  32.558    15  0.926 1.175  17 22
 7     -- -- -- -- -- -- -- -- -- -- -- --        47         17  0.972  32.562    16  1.059 1.191  15 38
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43         16  1.044  30.622    17  0.854 1.157  13 18
11 -- -- -- -- -- --  6 --  6 -- -- -- -- --     39         15  1.109  30.697    18  0.966 1.180  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- --     35         14  1.230  30.180    19  1.215 1.359  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- --     31         13  1.277  30.990    20  1.216 1.319  11 36
17 -- -- -- -- -- -- -- -- -- -- -- -- -- --     27         12  1.303  31.926    21  1.151 1.291  11 44
19 -- -- -- -- -- --  6 --  6 -- -- -- -- --     23         11  1.311* 32.762
21 -- -- -- -- -- -- -- -- -- -- -- -- -- --     19         10  1.308  33.375
23    -- -- -- -- -- -- -- -- -- -- -- --        15          9  1.300  33.634
25       -- -- -- -- -- -- -- -- -- --           11          8  1.281  34.192
27          -- -- -- -- -- -- -- -- --            7          7  1.259  34.851
29             -- -- -- -- -- -- --               3          6  1.244  35.328*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.248  35.153
                                                             4  1.263  33.427
Control Rod Density: %            1.89                       3  1.215  28.696
                                                             2  0.955  20.196
k-effective:                   1.00289                Bottom  1  0.273   5.586
Void Fraction:                   0.460
Core Delta-P: psia              25.591          % AXIAL TILT -17.688  -5.715
Core Plate Delta-P: psia        21.051       AVG BOT 8ft/12ft  1.1244  1.0261
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          88.00   Active Channel Flow: Mlb/hr        88.00
Total Bypass Flow (%):           15.7   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.359	19	45	40	1.598	0.914	19	13	38	8.51	0.712	20.5	19	45	26	4	7.21	0.837	43.4	15	15	34	4
1.355	19	13	38	1.608	0.908	19	45	40	8.40	0.704	20.8	19	43	24	4	7.12	0.828	43.5	16	15	24	4
1.340	19	17	42	1.621	0.901	19	15	26	8.21	0.695	21.8	19	47	28	4	7.15	0.826	42.9	15	17	40	4
1.339	19	15	36	1.622	0.900	19	43	20	8.17	0.691	21.7	19	15	32	4	7.36	0.824	40.4	15	17	26	4
1.335	19	21	46	1.626	0.898	19	13	42	8.15	0.689	21.8	19	47	24	4	7.19	0.823	42.3	15	41	24	4
1.332	19	19	44	1.633	0.894	19	13	34	8.12	0.687	21.8	19	15	22	4	7.37	0.821	39.9	14	47	26	4
1.331	19	17	38	1.635	0.893	19	19	44	8.21	0.686	20.3	19	17	34	4	6.95	0.805	43.2	16	47	40	10
1.329	19	13	42	1.636	0.893	19	21	46	8.12	0.683	21.1	19	41	22	4	6.86	0.805	44.2	14	47	32	4
1.328	19	15	44	1.639	0.891	19	17	24	8.11	0.676	20.1	19	19	36	4	7.05	0.796	41.1	15	39	18	4
1.326	19	13	34	1.639	0.891	19	15	44	7.75	0.671	24.5	20	49	26	4	6.85	0.795	43.4	18	17	18	11

```
  * LHGR calculated with pin-power reconstruction
  * CPR calculated with pin-power reconstruction & CPR limit type 3
  * Thermal limit file:
```

Figure A.110 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 16,900.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       17000.0 (2315.20 )
Delta E: MWd/MTU, (GWd)          99.8 (  13.59 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -25.89
Flow: Mlb/hr                  106.33 (103.74 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43
11  -- -- -- -- -- --  6 --  6 -- -- -- -- -- -- 39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19  -- -- -- -- -- --  6 --  6 -- -- -- -- -- -- 23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            1.89

k-effective:                   1.00297
Void Fraction:                   0.454
Core Delta-P: psia              26.405
Core Plate Delta-P: psia        21.866
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          89.96
Total Bypass Flow (%):           15.4
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00007
```

```
Core Average Exposure: MWd/MTU    28634.8

                 Axial Profile    Edit   Radial Power
N(PRA)  Power  Exposure  Zone   Avg.   Max.   IR JR
Top 25  0.165    5.419     4  0.773  0.888  19 34
    24  0.499   15.675     5  0.445  0.495   1 36
    23  0.655   21.780     6  0.432  0.458  53 50
    22  0.742   26.214     9  0.372  0.447  23 60
    21  0.793   29.280    10  0.423  0.428  33 60
    20  0.834   31.185    11  0.435  0.437  29  2
    19  0.875   32.234    14  1.021  1.180  13 36
    18  0.925   32.656    15  0.924  1.173  17 22
    17  0.981   32.667    16  1.059  1.190  15 38
    16  1.053   30.729    17  0.855  1.158  13 18
    15  1.117   30.812    18  0.967  1.180  17 18
    14  1.239   30.296    19  1.214  1.358  45 40
    13  1.285   31.110    20  1.217  1.318  11 36
    12  1.309   32.048    21  1.153  1.292  11 44
    11  1.315*  32.885
    10  1.310   33.499
     9  1.298   33.756
     8  1.276   34.313
     7  1.249   34.970
     6  1.229   35.446*
     5  1.227   35.271
     4  1.237   33.546
     3  1.187   28.811
     2  0.932   20.286
Bottom  1  0.266    5.612

% AXIAL TILT -16.691  -5.736
AVG BOT 8ft/12ft  1.1192  1.0263

Active Channel Flow: Mlb/hr       89.96
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.358	19	45	40	1.615	0.904	19	13	38	8.34	0.699	20.7	19	45	26	4	7.06	0.821	43.5	15	15	34	4
1.354	19	13	38	1.626	0.898	19	45	40	8.22	0.691	21.0	19	43	24	4	6.97	0.812	43.6	16	15	24	4
1.338	19	17	42	1.638	0.891	19	43	20	8.05	0.682	22.0	19	47	28	4	6.99	0.809	43.1	15	17	40	4
1.337	19	15	36	1.639	0.891	19	15	26	8.01	0.678	21.9	19	15	32	4	7.20	0.808	40.6	15	17	26	4
1.335	19	21	46	1.641	0.890	19	13	42	7.98	0.676	22.0	19	47	24	4	7.05	0.808	42.2	16	47	40	11
1.331	19	19	44	1.650	0.885	19	21	46	7.95	0.673	22.0	19	15	22	4	7.03	0.807	42.4	15	41	24	4
1.329	19	13	42	1.651	0.884	19	19	44	8.04	0.673	20.5	19	17	34	4	7.22	0.806	40.0	14	47	26	4
1.329	19	17	38	1.651	0.884	19	13	34	7.95	0.669	21.2	19	41	22	4	6.86	0.798	43.6	18	17	18	11
1.328	19	15	44	1.654	0.883	19	15	44	7.95	0.664	20.2	19	19	36	4	6.96	0.797	42.3	16	15	42	11
1.326	19	11	22	1.655	0.882	19	17	46	7.69	0.661	23.8	19	47	42	11	6.79	0.795	44.0	16	9	26	9

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.111 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,000.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    28635.0
Exposure: MWd/MTU (GWd)       17000.2 (2315.30 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.169   5.419     4  0.795 0.892  19 34
Inlet Subcooling: Btu/lbm       -26.95                       24  0.510  15.675     5  0.442 0.491   1 36
Flow: Mlb/hr                   102.46 ( 99.96 %)            23  0.672  21.780     6  0.429 0.455  53 50
                                                            22  0.765  26.214     9  0.370 0.444  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.824  29.280    10  0.421 0.426  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.866  31.185    11  0.432 0.436  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.904  32.234    14  1.017 1.171  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  0.942  32.657    15  0.935 1.170  17 22
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  0.990  32.667    16  1.052 1.184  15 38
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43         16  1.055  30.730    17  0.848 1.148  13 18
11 -- -- -- -- -- -- 12 -- 12 -- -- -- -- -- -- 39         15  1.114  30.812    18  0.961 1.175  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.231  30.296    19  1.220 1.351  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.272  31.110    20  1.208 1.307  11 26
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.294  32.049    21  1.146 1.280  11 44
19 -- -- -- -- -- -- 12 -- 12 -- -- -- -- -- -- 23         11  1.298* 32.886
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.293  33.499
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15          9  1.281  33.756
25       -- -- -- -- -- -- -- -- -- -- -- --     11          8  1.259  34.314
27          -- -- -- -- -- -- -- -- -- --        7          7  1.234  34.971
29             -- -- -- -- -- -- -- --           3          6  1.215  35.446*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.215  35.271
                                                            4  1.227  33.546
Control Rod Density: %            1.62                      3  1.179  28.811
                                                            2  0.927  20.286
k-effective:                   1.00296                Bottom  1  0.265   5.612
Void Fraction:                   0.457
Core Delta-P: psia              24.924            % AXIAL TILT -15.360  -5.736
Core Plate Delta-P: psia        20.386          AVG BOT 8ft/12ft  1.1090  1.0263
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          86.59   Active Channel Flow: Mlb/hr        86.59
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00007
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.351	19	45	40	1.597	0.914	19	13	38	8.26	0.692	20.7	19	45	26	4	7.00	0.814	43.5	15	15	34	4
1.344	19	13	38	1.598	0.913	19	43	20	8.14	0.684	21.0	19	43	24	4	6.91	0.805	43.6	16	15	24	4
1.334	19	17	42	1.605	0.910	19	45	40	7.97	0.676	22.0	19	47	28	4	6.93	0.801	43.1	15	17	40	4
1.334	19	21	46	1.609	0.908	19	21	46	7.93	0.672	21.9	19	15	32	4	7.14	0.801	40.6	15	17	26	4
1.330	19	15	36	1.611	0.906	19	19	44	7.91	0.670	22.0	19	47	24	4	6.97	0.800	42.4	15	41	24	4
1.329	19	19	44	1.614	0.905	19	13	42	7.87	0.667	22.0	19	15	22	4	7.16	0.799	40.0	14	47	26	4
1.326	19	17	38	1.623	0.900	19	23	14	7.97	0.667	20.5	19	17	34	4	6.95	0.796	42.2	16	47	40	11
1.320	19	23	48	1.624	0.899	19	17	46	7.87	0.663	21.2	19	41	22	4	6.77	0.787	43.6	18	17	18	11
1.319	19	15	44	1.625	0.898	19	17	38	7.88	0.658	20.2	19	19	36	4	6.86	0.786	42.3	16	15	42	11
1.319	19	47	42	1.627	0.897	19	15	44	7.53	0.652	24.6	20	49	26	4	6.69	0.783	44.0	16	9	26	9

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.112 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,000.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      17150.0 (2335.70 )
Delta E: MWd/MTU, (GWd)        149.8 (  20.40 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -25.84
Flow: Mlb/hr                  106.50 (103.91 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- -- -- -- 12 -- 12 -- -- -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- -- -- -- 12 -- 12 -- -- -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            1.62

k-effective:                   1.00305
Void Fraction:                   0.448
Core Delta-P: psia              26.236
Core Plate Delta-P: psia        21.696
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          89.99   Active Channel Flow: Mlb/hr        89.99
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00005

                                        Core Average Exposure: MWd/MTU    28785.0

                                                Axial Profile    Edit   Radial Power
                                      N(PRA)  Power  Exposure   Zone   Avg.   Max.   IR JR
                                 Top  25    0.173    5.449      4   0.792  0.888   19 34
                                      24    0.525   15.757      5   0.442  0.490    1 36
                                      23    0.690   21.889      6   0.429  0.455   53 50
                                      22    0.784   26.337      9   0.369  0.444   23 60
                                      21    0.843   29.413     10   0.420  0.426   33 60
                                      20    0.884   31.325     11   0.431  0.435   29  2
                                      19    0.920   32.380     14   1.017  1.169   13 36
                                      18    0.958   32.809     15   0.933  1.168   17 22
                                      17    1.004   32.827     16   1.053  1.182   15 24
                                      16    1.069   30.893     17   0.849  1.150   13 18
                                      15    1.128   30.985     18   0.962  1.174   17 18
                                      14    1.244   30.470     19   1.219  1.349   45 40
                                      13    1.283   31.290     20   1.209  1.306   11 26
                                      12    1.302   32.232     21   1.149  1.283   11 44
                                      11    1.303*  33.069
                                      10    1.294   33.682
                                       9    1.277   33.938
                                       8    1.250   34.492
                                       7    1.217   35.145
                                       6    1.191   35.618*
                                       5    1.183   35.444
                                       4    1.188   33.720
                                       3    1.138   28.978
                                       2    0.895   20.418
                                 Bottom  1    0.255    5.650
                                % AXIAL TILT -13.794   -5.756
                              AVG BOT 8ft/12ft  1.1007  1.0265
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.349	19	45	40	1.625	0.898	19	13	38	8.02	0.673	21.0	19	45	26	4	6.97	0.801	42.5	16	47	40	11
1.343	19	13	38	1.625	0.898	19	43	20	7.90	0.665	21.2	19	43	24	4	6.78	0.791	43.8	18	17	18	11
1.333	19	21	46	1.632	0.894	19	45	40	7.73	0.656	22.3	19	47	28	4	6.78	0.791	43.8	15	15	34	4
1.333	19	17	42	1.634	0.894	19	21	46	6.80	0.656	42.7	18	17	18	15	6.88	0.790	42.5	16	15	42	11
1.328	19	19	44	1.638	0.892	19	19	44	7.61	0.656	24.0	19	47	42	11	7.05	0.790	40.4	15	15	16	15
1.328	19	15	36	1.639	0.891	19	13	42	7.69	0.655	22.6	19	47	38	11	6.85	0.786	42.5	16	15	24	11
1.323	19	17	38	1.648	0.886	19	17	46	6.69	0.655	44.0	14	49	38	11	6.96	0.784	40.9	14	49	24	15
1.320	19	23	48	1.648	0.886	19	23	14	6.85	0.655	41.8	16	13	22	11	7.05	0.784	39.8	18	49	42	15
1.320	19	15	44	1.652	0.884	19	15	44	6.67	0.655	44.2	18	49	42	11	6.63	0.784	44.9	16	9	26	11
1.319	19	47	42	1.654	0.882	19	19	48	7.60	0.654	23.9	19	49	40	11	6.68	0.782	44.1	18	49	34	10

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.113 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,150.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    28785.2
Exposure: MWd/MTU (GWd)       17150.2 (2335.70 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.173   5.449     4  0.807 0.891  19 34
Inlet Subcooling: Btu/lbm       -26.73                      24  0.522  15.757     5  0.439 0.487   1 36
Flow: Mlb/hr                   103.25 (100.73 %)            23  0.687  21.889     6  0.427 0.453  53 50
                                                            22  0.783  26.338     9  0.368 0.442  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.845  29.413    10  0.418 0.424  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.891  31.325    11  0.429 0.433  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.933  32.380    14  1.014 1.163  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  0.979  32.809    15  0.940 1.166  17 22
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  1.027  32.827    16  1.048 1.178  15 24
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43         16  1.083  30.894    17  0.844 1.143  13 18
11 -- -- -- -- -- -- 16 -- 16 -- -- -- -- -- -- 39         15  1.134  30.985    18  0.958 1.170  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.245  30.470    19  1.223 1.344  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.280  31.291    20  1.203 1.298  11 26
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.296* 32.232    21  1.144 1.274  11 44
19 -- -- -- -- -- -- 16 -- 16 -- -- -- -- -- -- 23         11  1.295  33.069
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.284  33.682
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.267  33.938
25       -- -- -- -- -- -- -- -- -- -- -- --     11          8  1.240  34.492
27          -- -- -- -- -- -- -- -- -- --         7          7  1.208  35.146
29             -- -- -- -- -- -- -- --            3          6  1.184  35.618*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.177  35.444
                                                            4  1.184  33.720
Control Rod Density: %            1.44                      3  1.136  28.978
                                                            2  0.894  20.418
k-effective:                   1.00300                Bottom  1  0.255   5.650
Void Fraction:                   0.451
Core Delta-P: psia              25.114              % AXIAL TILT -13.136  -5.756
Core Plate Delta-P: psia        20.577          AVG BOT 8ft/12ft  1.0972  1.0265
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          87.49   Active Channel Flow: Mlb/hr        87.49
Total Bypass Flow (%):           15.3   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.344	19	45	40	1.602	0.911	19	17	20	7.98	0.670	21.0	19	45	26	4	6.91	0.794	42.5	16	47	40	11
1.336	19	13	38	1.608	0.908	19	13	38	7.86	0.662	21.2	19	43	24	4	7.13	0.788	39.3	18	17	18	15
1.332	19	21	46	1.608	0.908	19	21	46	6.81	0.656	42.7	18	17	18	15	7.18	0.788	38.5	16	15	42	15
1.330	19	17	42	1.613	0.905	19	19	44	7.69	0.653	22.3	19	47	28	4	6.75	0.787	43.8	15	15	34	4
1.326	19	19	44	1.613	0.905	19	45	40	7.66	0.650	22.2	19	15	32	4	7.02	0.787	40.4	15	15	16	15
1.323	19	15	36	1.623	0.899	19	13	42	7.54	0.650	24.0	19	47	42	11	7.00	0.781	39.9	15	17	40	15
1.322	19	17	38	1.623	0.899	19	23	14	7.63	0.650	22.6	19	47	38	11	6.87	0.781	41.5	16	19	46	15
1.318	19	23	48	1.628	0.897	19	17	38	6.63	0.649	44.0	14	49	38	11	6.80	0.780	42.5	16	15	24	11
1.313	19	15	44	1.630	0.896	19	17	46	6.79	0.649	41.8	16	13	22	11	6.92	0.780	40.9	14	49	24	15
1.312	19	47	42	1.636	0.893	19	15	44	6.61	0.649	44.2	18	49	42	11	7.01	0.779	39.7	18	49	42	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.114 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,150.2 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    28914.9
Exposure: MWd/MTU (GWd)       17280.0 (2353.40 )
Delta E: MWd/MTU, (GWd)         129.8 (  17.68 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                    Top 25  0.176   5.476     4  0.804 0.888  19 34
Inlet Subcooling: Btu/lbm       -25.75                      24  0.533  15.830     5  0.439 0.487   1 36
Flow: Mlb/hr                   106.84 (104.23 %)            23  0.701  21.985     6  0.426 0.453  53 50
                                                            22  0.798  26.447     9  0.368 0.442  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.859  29.532    10  0.418 0.424  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.904  31.450    11  0.429 0.433  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.945  32.511    14  1.014 1.162  13 36
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  0.991  32.946    15  0.939 1.164  17 22
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  1.038  32.971    16  1.048 1.177  15 24
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43         16  1.093  31.039    17  0.845 1.144  13 18
11 -- -- -- -- -- -- 16 -- 16 -- -- -- -- -- -- 39         15  1.144  31.138    18  0.959 1.170  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.255  30.623    19  1.222 1.343  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.290  31.447    20  1.203 1.297  11 26
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.303* 32.391    21  1.146 1.277  11 44
19 -- -- -- -- -- -- 16 -- 16 -- -- -- -- -- -- 23         11  1.299  33.228
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.285  33.839
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.264  34.094
25       -- -- -- -- -- -- -- -- -- -- -- --     11          8  1.233  34.644
27          -- -- -- -- -- -- -- -- -- --        7          7  1.196  35.294
29             -- -- -- -- -- -- -- --           3          6  1.165  35.763*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.152  35.588
                                                            4  1.153  33.866
Control Rod Density: %           1.44                       3  1.104  29.117
                                                            2  0.869  20.528
k-effective:                  1.00303                Bottom  1  0.248   5.682
Void Fraction:                  0.443
Core Delta-P: psia             26.307          % AXIAL TILT -11.953  -5.762
Core Plate Delta-P: psia       21.766       AVG BOT 8ft/12ft  1.0910  1.0266
Coolant Temp: Deg-F            548.3
In Channel Flow: Mlb/hr         90.32  Active Channel Flow: Mlb/hr        90.32
Total Bypass Flow (%):          15.5  (of total core flow)
Total Water Rod Flow (%):       -0.0  (of total core flow)
Source Convergence           0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.343	19	45	40	1.625	0.898	19	17	20	6.86	0.663	42.8	18	17	18	15	6.93	0.798	42.7	16	47	40	11
1.336	19	13	38	1.630	0.896	19	21	46	7.79	0.656	21.2	19	45	26	4	7.19	0.797	39.5	18	17	18	15
1.332	19	21	46	1.631	0.895	19	13	38	7.63	0.654	23.5	19	47	42	12	7.25	0.797	38.8	16	15	42	15
1.329	19	17	42	1.635	0.893	19	19	44	6.66	0.653	44.2	14	49	38	11	7.09	0.797	40.6	15	15	16	15
1.326	19	19	44	1.637	0.892	19	45	40	6.65	0.653	44.4	18	49	42	11	7.08	0.790	40.0	18	49	42	15
1.321	19	15	36	1.644	0.888	19	13	42	7.60	0.653	23.7	19	15	44	12	6.99	0.790	41.1	14	49	24	15
1.320	19	17	38	1.645	0.887	19	23	14	6.82	0.653	42.0	16	13	22	11	7.06	0.789	40.2	15	17	40	15
1.318	19	23	48	1.650	0.885	19	17	46	7.65	0.653	22.8	19	47	38	11	6.93	0.788	41.7	16	19	46	15
1.313	19	15	44	1.655	0.882	19	17	38	7.50	0.653	25.1	21	49	44	11	7.10	0.786	39.3	16	39	48	15
1.312	19	47	42	1.656	0.882	19	19	48	7.56	0.652	24.2	19	49	40	11	6.99	0.786	40.7	18	41	50	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.115 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,280.0 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      17280.2 (2353.40 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm     -26.57
Flow: Mlb/hr                  103.83 (101.29 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- -- -- -- 20 -- 20 -- -- -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- -- -- -- 20 -- 20 -- -- -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              1.26

k-effective:                     1.00305
Void Fraction:                     0.447
Core Delta-P: psia                25.228
Core Plate Delta-P: psia          20.688
Coolant Temp: Deg-F               548.2
In Channel Flow: Mlb/hr           87.68
Total Bypass Flow (%):             15.5
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00008
```

Core Average Exposure: MWd/MTU 28915.1

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.174	5.476	4	0.821	0.892	19	34
24	0.525	15.830	5	0.437	0.484	1	36
23	0.691	21.985	6	0.424	0.450	53	50
22	0.788	26.447	9	0.365	0.440	23	60
21	0.851	29.532	10	0.415	0.422	33	60
20	0.898	31.450	11	0.426	0.431	29	2
19	0.943	32.511	14	1.012	1.156	13	36
18	0.995	32.947	15	0.947	1.162	17	22
17	1.050	32.971	16	1.043	1.172	15	24
16	1.118	31.039	17	0.840	1.137	13	18
15	1.171	31.138	18	0.954	1.167	19	42
14	1.272	30.623	19	1.227	1.338	45	40
13	1.298	31.448	20	1.197	1.289	11	26
12	1.306*	32.391	21	1.141	1.267	11	44
11	1.299	33.228					
10	1.282	33.839					
9	1.259	34.094					
8	1.227	34.645					
7	1.189	35.294					
6	1.159	35.764*					
5	1.147	35.589					
4	1.148	33.866					
3	1.099	29.118					
2	0.865	20.528					
Bottom 1	0.247	5.682					
% AXIAL TILT	-11.610	-5.762					
AVG BOT 8ft/12ft	1.0928	1.0266					

Active Channel Flow: Mlb/hr 87.68
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.338	19	45	40	1.604	0.910	19	17	20	6.89	0.666	42.8	18	17	18	15	7.24	0.812	40.4	15	25	40	16
1.330	19	21	46	1.606	0.909	19	21	46	6.84	0.658	42.4	18	19	42	15	7.21	0.799	39.5	18	17	18	15
1.328	19	13	38	1.612	0.906	19	19	44	7.75	0.652	21.2	19	45	26	4	7.26	0.798	38.8	16	15	42	15
1.325	19	17	42	1.615	0.904	19	13	38	7.59	0.651	23.5	19	47	42	12	7.12	0.795	40.2	15	17	40	15
1.324	19	19	44	1.618	0.902	19	45	40	7.57	0.651	23.7	19	15	44	12	7.08	0.795	40.6	15	15	16	15
1.318	19	17	38	1.623	0.899	19	23	14	7.65	0.650	22.3	19	45	40	12	6.89	0.794	42.7	16	47	40	11
1.316	19	15	36	1.630	0.896	19	13	42	6.78	0.650	42.0	16	13	22	11	7.23	0.792	38.4	16	41	16	15
1.315	19	23	48	1.630	0.896	19	17	38	7.61	0.649	22.8	19	47	38	11	7.09	0.792	40.1	15	39	44	15
1.312	19	19	40	1.631	0.895	19	21	42	6.62	0.649	44.2	14	49	38	11	7.13	0.789	39.3	16	39	48	15
1.309	19	21	42	1.633	0.894	19	17	46	6.60	0.649	44.4	18	49	42	11	7.18	0.788	38.7	18	41	42	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.116 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,280.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       17340.0 (2361.50 )
Delta E: MWd/MTU, (GWd)          59.8 (   8.14 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -26.14
Flow: Mlb/hr                   105.38 (102.81 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11  -- -- -- -- -- -- 20 -- 20 -- -- -- -- -- --  39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19  -- -- -- -- -- -- 20 -- 20 -- -- -- -- -- --  23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23     -- -- -- -- -- -- -- -- -- -- -- -- --     15
25        -- -- -- -- -- -- -- -- -- -- --        11
27           -- -- -- -- -- -- -- -- --           7
29              -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %              1.26

k-effective:                     1.00300
Void Fraction:                     0.444
Core Delta-P: psia                25.742
Core Plate Delta-P: psia          21.202
Coolant Temp: Deg-F               548.3
In Channel Flow: Mlb/hr            89.07
Total Bypass Flow (%):             15.5
Total Water Rod Flow (%):          -0.0
Source Convergence              0.00009
```

Core Average Exposure: MWd/MTU 28974.9

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.175	5.488	4	0.819	0.890	19	34
24	0.530	15.864	5	0.437	0.484	1	36
23	0.697	22.029	6	0.424	0.450	53	50
22	0.794	26.498	9	0.366	0.440	23	60
21	0.856	29.587	10	0.415	0.422	33	60
20	0.903	31.508	11	0.426	0.431	29	2
19	0.948	32.572	14	1.011	1.155	13	36
18	0.999	33.011	15	0.946	1.162	17	22
17	1.054	33.039	16	1.043	1.172	15	24
16	1.122	31.109	17	0.840	1.137	13	18
15	1.175	31.210	18	0.954	1.166	19	42
14	1.277	30.695	19	1.227	1.337	45	40
13	1.302	31.521	20	1.197	1.289	11	26
12	1.309*	32.465	21	1.142	1.268	11	44
11	1.300	33.302					
10	1.282	33.912					
9	1.257	34.165					
8	1.223	34.714					
7	1.184	35.361					
6	1.151	35.829*					
5	1.137	35.653					
4	1.136	33.931					
3	1.088	29.180					
2	0.857	20.577					
Bottom 1	0.245	5.696					
% AXIAL TILT	-11.136	-5.762					
AVG BOT 8ft/12ft	1.0903	1.0267					

Active Channel Flow: Mlb/hr 89.07
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.337	19	45	40	1.616	0.903	19	17	20	6.91	0.669	42.9	18	17	18	15	7.25	0.814	40.5	15	25	40	16
1.330	19	21	46	1.618	0.902	19	21	46	6.86	0.660	42.5	18	19	42	15	7.23	0.803	39.6	18	17	18	15
1.328	19	13	38	1.624	0.899	19	19	44	7.60	0.653	23.6	19	47	42	12	7.28	0.801	38.9	16	15	42	15
1.325	19	17	42	1.628	0.897	19	13	38	7.59	0.653	23.8	19	15	44	12	7.10	0.799	40.7	15	15	16	15
1.324	19	19	44	1.630	0.896	19	45	40	7.66	0.651	22.4	19	45	40	12	7.13	0.798	40.3	15	17	40	15
1.317	19	17	38	1.635	0.893	19	23	14	6.88	0.651	41.0	16	13	22	12	6.90	0.795	42.8	16	47	40	11
1.315	19	15	36	1.641	0.890	19	13	42	6.70	0.651	43.3	17	47	44	15	7.25	0.795	38.5	16	41	16	15
1.315	19	23	48	1.643	0.888	19	21	42	7.62	0.651	22.9	19	47	38	11	7.11	0.795	40.2	15	39	44	15
1.311	19	19	40	1.644	0.888	19	17	38	6.62	0.651	44.3	14	49	38	11	7.15	0.793	39.4	16	39	48	15
1.308	19	21	42	1.644	0.888	19	17	46	6.61	0.651	44.5	18	49	42	11	7.20	0.791	38.8	18	41	42	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.117 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,340.0 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    28975.1
Exposure: MWd/MTU (GWd)       17340.2 (2361.60 )
Delta E: MWd/MTU, (GWd)           0.2 (   0.03 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1050.0                     Top 25  0.172   5.488     4  0.836 0.893  19 34
Inlet Subcooling: Btu/lbm       -26.91                        24  0.518  15.864     5  0.434 0.480   1 36
Flow: Mlb/hr                   102.61 (100.10 %)             23  0.682  22.029     6  0.421 0.447  53 50
                                                             22  0.778  26.498     9  0.363 0.438  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  0.841  29.587    10  0.413 0.419  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  0.889  31.508    11  0.424 0.428  29  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  0.936  32.572    14  1.009 1.149  13 36
 5        -- -- -- -- -- -- -- -- -- -- --        51          18  0.991  33.011    15  0.955 1.163  21 44
 7     -- -- -- -- -- -- -- -- -- -- -- --        47          17  1.051  33.039    16  1.038 1.167  15 24
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43          16  1.126  31.109    17  0.835 1.130  13 18
11 -- -- -- -- -- -- 24 -- 24 -- -- -- -- -- -- 39          15  1.188  31.211    18  0.950 1.167  19 42
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35          14  1.305  30.695    19  1.231 1.332  45 40
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31          13  1.333* 31.521    20  1.190 1.280  11 26
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27          12  1.329  32.465    21  1.137 1.259  11 44
19 -- -- -- -- -- -- 24 -- 24 -- -- -- -- -- -- 23          11  1.311  33.302
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19          10  1.287  33.912
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15           9  1.259  34.165
25       -- -- -- -- -- -- -- -- -- -- --       11           8  1.222  34.714
27          -- -- -- -- -- -- -- -- --           7           7  1.182  35.362
29             -- -- -- -- -- -- --              3           6  1.148  35.829*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58             5  1.134  35.654
                                                            4  1.134  33.931
Control Rod Density: %            1.08                      3  1.086  29.180
                                                            2  0.855  20.577
k-effective:                   1.00301                Bottom  1  0.244   5.696
Void Fraction:                   0.448
Core Delta-P: psia              24.758            % AXIAL TILT -11.487  -5.762
Core Plate Delta-P: psia        20.219          AVG BOT 8ft/12ft  1.0962  1.0267
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          86.63   Active Channel Flow: Mlb/hr        86.63
Total Bypass Flow (%):           15.6   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.332	19	45	40	1.600	0.912	19	21	46	7.14	0.682	41.7	15	25	40	15	7.82	0.875	40.4	15	25	40	15
1.328	19	21	46	1.601	0.912	19	17	20	6.92	0.670	42.9	18	17	18	15	7.51	0.837	40.0	15	33	24	15
1.322	19	19	44	1.606	0.909	19	19	44	6.94	0.669	42.5	18	19	42	15	7.21	0.806	40.2	15	39	44	15
1.321	19	17	42	1.615	0.904	19	21	42	6.92	0.659	41.4	15	27	38	15	7.24	0.803	39.6	18	17	18	15
1.321	19	13	38	1.616	0.904	19	45	40	6.85	0.654	41.6	18	21	40	15	7.17	0.803	40.3	15	17	40	15
1.316	19	17	38	1.617	0.903	19	13	38	7.74	0.654	21.6	19	27	40	14	7.30	0.802	38.6	18	41	42	15
1.314	19	21	42	1.619	0.902	19	23	14	7.72	0.653	21.8	19	25	38	14	7.20	0.801	39.9	15	23	42	15
1.313	19	19	40	1.624	0.899	19	23	44	7.68	0.653	22.4	19	45	40	12	7.28	0.801	38.9	16	15	42	15
1.312	19	23	48	1.625	0.898	19	17	38	7.58	0.652	23.8	19	15	44	12	7.28	0.798	38.5	16	41	16	15
1.311	19	15	36	1.631	0.895	19	13	42	7.59	0.651	23.4	19	17	42	12	7.08	0.796	40.7	15	15	16	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.118 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,340.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)      17490.0 (2382.00 )
Delta E: MWd/MTU, (GWd)        149.8 (  20.40 )
Power: MWt                    3952.0 (100.00 %)
Core Pressure: psia           1050.0
Inlet Subcooling: Btu/lbm      -25.73
Flow: Mlb/hr                  106.91 (104.30 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- -- --     51
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43
11 -- -- -- -- -- -- 24 -- 24 -- -- -- -- -- -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- -- -- -- -- -- 24 -- 24 -- -- -- -- -- -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            1.08

k-effective:                   1.00304
Void Fraction:                   0.438
Core Delta-P: psia              26.289
Core Plate Delta-P: psia        21.749
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          90.41
Total Bypass Flow (%):           15.4
Total Water Rod Flow (%):        -0.0
Source Convergence            0.00008
```

```
Core Average Exposure: MWd/MTU    29124.8

                 Axial Profile    Edit   Radial Power
N(PRA)  Power  Exposure  Zone   Avg.   Max.   IR JR
Top 25  0.175    5.519     4  0.831  0.889  19 34
    24  0.531   15.948     5  0.434  0.480   1 36
    23  0.697   22.139     6  0.421  0.447  53 50
    22  0.794   26.624     9  0.363  0.438  23 60
    21  0.856   29.723    10  0.412  0.419  33 60
    20  0.903   31.652    11  0.423  0.428  29  2
    19  0.948   32.723    14  1.009  1.148  13 36
    18  1.002   33.171    15  0.952  1.162  21 44
    17  1.061   33.209    16  1.039  1.166  15 24
    16  1.136   31.284    17  0.836  1.131  13 18
    15  1.198   31.395    18  0.951  1.165  19 42
    14  1.316   30.879    19  1.230  1.331  45 40
    13  1.342*  31.710    20  1.191  1.280  11 26
    12  1.336   32.653    21  1.140  1.263  11 18
    11  1.316   33.487
    10  1.289   34.094
     9  1.257   34.344
     8  1.215   34.888
     7  1.169   35.529
     6  1.129   35.992*
     5  1.108   35.814
     4  1.103   34.092
     3  1.054   29.334
     2  0.830   20.698
Bottom  1  0.237    5.731

% AXIAL TILT -10.258  -5.761
AVG BOT 8ft/12ft  1.0897  1.0268

Active Channel Flow: Mlb/hr        90.41
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.331	19	45	40	1.632	0.895	19	21	46	7.14	0.683	42.0	15	25	40	15	7.82	0.878	40.7	15	25	40	15
1.328	19	21	46	1.634	0.894	19	17	20	6.98	0.677	43.2	18	17	18	15	7.50	0.838	40.2	15	33	24	15
1.321	19	19	44	1.638	0.891	19	19	44	6.98	0.674	42.8	18	19	42	15	7.25	0.813	40.4	15	39	44	15
1.320	19	17	42	1.648	0.886	19	45	40	6.91	0.659	41.6	15	27	38	15	7.30	0.812	39.8	18	17	18	15
1.320	19	13	38	1.650	0.885	19	13	38	6.88	0.658	41.9	18	21	40	15	7.22	0.811	40.6	15	17	40	15
1.313	19	17	38	1.650	0.885	19	21	42	7.62	0.657	24.0	19	15	44	12	7.34	0.810	39.1	16	15	42	15
1.312	19	21	42	1.651	0.884	19	23	14	7.71	0.657	22.6	19	45	40	12	7.34	0.809	39.0	18	41	42	15
1.312	19	23	48	1.659	0.880	19	23	44	7.63	0.657	23.8	19	47	42	12	7.34	0.807	38.8	16	41	16	15
1.311	19	19	40	1.661	0.879	19	13	42	6.73	0.656	43.5	17	47	44	15	7.22	0.807	40.1	15	23	42	15
1.309	19	15	36	1.662	0.879	19	17	46	6.72	0.656	43.6	17	17	48	15	7.15	0.806	41.0	15	15	16	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.119 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,490.0 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    29125.0
Exposure: MWd/MTU (GWd)      17490.2 (2382.00 )
Delta E: MWd/MTU, (GWd)          0.2 (   0.03 )                  Axial Profile    Edit   Radial Power
Power: MWt                    3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia           1050.0                     Top 25  0.164   5.519     4  0.876 0.899  27 42
Inlet Subcooling: Btu/lbm      -26.93                        24  0.496  15.948     5  0.427 0.472   1 36
Flow: Mlb/hr                  102.51 (100.01 %)             23  0.651  22.139     6  0.414 0.440  53 50
                                                            22  0.742  26.624     9  0.357 0.430  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29             21  0.800  29.723    10  0.405 0.412  33 60
 1              -- -- -- -- -- -- --              59  :JR   20  0.845  31.652    11  0.416 0.420  29  2
 3           -- -- -- -- -- -- -- -- -- --        55         19  0.889  32.724    14  1.001 1.134  25 48
 5        -- -- -- -- -- -- -- -- -- -- -- --     51         18  0.940  33.171    15  0.976 1.162  21 44
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47         17  0.998  33.209    16  1.023 1.157  23 16
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43         16  1.073  31.284    17  0.822 1.111  13 18
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39         15  1.137  31.395    18  0.938 1.160  19 42
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35         14  1.257  30.880    19  1.241 1.322  21 42
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31         13  1.297  31.710    20  1.172 1.263  29 12
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27         12  1.314* 32.653    21  1.127 1.239  11 18
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23         11  1.313  33.487
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19         10  1.301  34.094
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15          9  1.283  34.344
25       -- -- -- -- -- -- -- -- -- -- --        11          8  1.256  34.888
27          -- -- -- -- -- -- -- -- -- --         7          7  1.225  35.529
29             -- -- -- -- -- -- -- --            3          6  1.204  35.992*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  1.204  35.814
                                                             4  1.221  34.092
Control Rod Density: %            0.00                       3  1.182  29.334
                                                             2  0.938  20.698
k-effective:                   1.00305                Bottom  1  0.270   5.731
Void Fraction:                   0.457
Core Delta-P: psia              24.985          % AXIAL TILT -15.693  -5.761
Core Plate Delta-P: psia        20.448       AVG BOT 8ft/12ft  1.1158  1.0268
Coolant Temp: Deg-F             548.3
In Channel Flow: Mlb/hr          86.81   Active Channel Flow: Mlb/hr        86.81
Total Bypass Flow (%):           15.3   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.322	19	21	42	1.640	0.890	19	21	46	8.42	0.704	20.4	21	27	36	4	7.39	0.816	39.2	15	31	26	4
1.319	19	23	44	1.641	0.890	19	21	42	8.34	0.700	20.9	21	25	34	4	6.97	0.811	43.5	15	23	42	4
1.316	19	21	46	1.646	0.887	19	19	44	8.22	0.684	19.9	19	25	24	4	7.22	0.809	40.5	15	25	22	4
1.312	19	45	40	1.647	0.886	19	43	20	8.13	0.684	21.1	19	23	22	4	7.19	0.803	40.1	15	27	24	4
1.310	19	19	40	1.648	0.886	19	23	44	8.04	0.679	21.6	19	21	38	4	6.85	0.801	44.0	15	41	24	4
1.309	19	19	44	1.659	0.880	19	45	40	8.11	0.679	20.6	19	23	36	4	7.10	0.801	41.0	15	39	26	4
1.306	19	17	42	1.664	0.877	19	23	14	8.11	0.678	20.3	19	25	20	4	7.11	0.798	40.5	15	25	32	4
1.303	19	17	38	1.667	0.876	19	13	38	8.23	0.677	18.4	19	29	34	4	7.10	0.797	40.6	15	23	34	4
1.299	19	13	38	1.671	0.874	19	19	40	8.05	0.676	20.9	19	37	18	4	7.01	0.794	41.4	15	25	18	4
1.298	19	23	48	1.673	0.873	19	17	38	8.02	0.675	21.2	19	39	20	4	6.82	0.792	43.4	14	23	24	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.120 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,490.2 MWd/MTU

```
Cycle:                              9
Exposure: MWd/MTU (GWd)       17677.8 (2407.60 )
Delta E: MWd/MTU, (GWd)         187.6 (  25.55 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia            1050.0
Inlet Subcooling: Btu/lbm       -25.41
Flow: Mlb/hr                   108.16 (105.52 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9  -- -- -- -- -- -- -- -- -- -- -- -- -- --     43
11  -- -- -- -- -- -- -- -- -- -- -- -- -- --     39
13  -- -- -- -- -- -- -- -- -- -- -- -- -- --     35
15  -- -- -- -- -- -- -- -- -- -- -- -- -- --     31
17  -- -- -- -- -- -- -- -- -- -- -- -- -- --     27
19  -- -- -- -- -- -- -- -- -- -- -- -- -- --     23
21  -- -- -- -- -- -- -- -- -- -- -- -- -- --     19
23     -- -- -- -- -- -- -- -- -- -- -- --        15
25        -- -- -- -- -- -- -- -- -- --           11
27           -- -- -- -- -- -- -- -- --            7
29              -- -- -- -- -- -- --               3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            0.00

k-effective:                   1.00304
Void Fraction:                   0.445
Core Delta-P: psia              26.895
Core Plate Delta-P: psia        22.354
Coolant Temp: Deg-F             548.4
In Channel Flow: Mlb/hr          91.41   Active Channel Flow: Mlb/hr        91.41
Total Bypass Flow (%):           15.5   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00009

                                        Core Average Exposure: MWd/MTU    29312.7

                                                Axial Profile    Edit   Radial Power
                                      N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                                   Top 25  0.169   5.555     4  0.870 0.894  27 42
                                       24  0.512  16.048     5  0.427 0.472   1 36
                                       23  0.672  22.271     6  0.414 0.440  53 50
                                       22  0.764  26.775     9  0.357 0.430  23 60
                                       21  0.822  29.885    10  0.405 0.411  33 60
                                       20  0.865  31.823    11  0.415 0.419  29  2
                                       19  0.906  32.904    14  1.001 1.132  25 48
                                       18  0.956  33.362    15  0.973 1.160  21 44
                                       17  1.013  33.412    16  1.024 1.156  23 16
                                       16  1.087  31.492    17  0.824 1.114  13 18
                                       15  1.151  31.616    18  0.939 1.158  19 42
                                       14  1.270  31.102    19  1.240 1.319  21 42
                                       13  1.308  31.940    20  1.174 1.262  29 12
                                       12  1.323* 32.886    21  1.131 1.244  11 18
                                       11  1.318  33.720
                                       10  1.302  34.325
                                        9  1.279  34.572
                                        8  1.245  35.111
                                        7  1.207  35.747
                                        6  1.178  36.206*
                                        5  1.170  36.028
                                        4  1.179  34.309
                                        3  1.139  29.544
                                        2  0.903  20.865
                                   Bottom  1  0.260   5.779

                                % AXIAL TILT -13.993  -5.787
                              AVG BOT 8ft/12ft  1.1067  1.0271
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.319	19	21	42	1.678	0.870	19	21	46	8.22	0.689	20.7	21	27	36	4	7.20	0.799	39.5	15	31	26	4
1.317	19	23	44	1.684	0.867	19	21	42	8.13	0.685	21.2	21	25	34	4	6.97	0.790	41.3	15	15	16	15
1.316	19	21	46	1.685	0.866	19	19	44	8.01	0.669	20.3	19	25	24	4	7.06	0.789	40.1	18	17	18	15
1.312	19	45	40	1.686	0.866	19	43	20	7.90	0.666	21.4	19	23	22	4	7.01	0.789	40.8	15	25	22	4
1.308	19	19	44	1.691	0.863	19	23	44	8.06	0.664	18.8	19	31	28	4	7.12	0.789	39.4	16	15	42	15
1.307	19	19	40	1.698	0.860	19	15	22	7.88	0.661	20.9	19	23	36	4	6.75	0.788	43.8	15	23	42	4
1.305	19	17	42	1.702	0.858	19	23	14	7.80	0.661	22.0	19	21	38	4	6.78	0.787	43.3	16	47	40	11
1.300	19	17	38	1.705	0.856	19	13	38	8.00	0.661	19.0	19	29	24	5	7.00	0.785	40.5	15	27	24	4
1.300	19	13	38	1.714	0.852	19	13	42	7.88	0.660	20.6	19	25	20	4	6.98	0.784	40.7	18	49	42	15
1.298	19	23	48	1.714	0.852	19	17	46	7.98	0.660	19.1	19	27	22	4	6.94	0.782	40.9	15	17	40	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.121 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,677.8 MWd/MTU

```
Cycle:                                9
Exposure: MWd/MTU (GWd)       17678.1 (2407.60 )
Delta E: MWd/MTU, (GWd)           0.3 (   0.04 )
Power: MWt                     3952.0 (100.00 %)
Core Pressure: psia             1044.7
Inlet Subcooling: Btu/lbm      -35.56
Flow: Mlb/hr                    96.94 ( 94.57 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          0.00

k-effective:                 1.00296
Void Fraction:                 0.443
Core Delta-P: psia            22.549
Core Plate Delta-P: psia      17.982
Coolant Temp: Deg-F           546.4
In Channel Flow: Mlb/hr       82.09   Active Channel Flow: Mlb/hr        82.09
Total Bypass Flow (%):         15.3   (of total core flow)
Total Water Rod Flow (%):      -0.0   (of total core flow)
Source Convergence          0.00009

                                      Core Average Exposure: MWd/MTU    29313.0

                                      Axial Profile    Edit   Radial Power
                                N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
                               Top 25  0.161   5.555     4  0.872 0.895  27 42
                                   24  0.486  16.048     5  0.432 0.478   1 36
                                   23  0.638  22.271     6  0.420 0.445  53 50
                                   22  0.726  26.775     9  0.361 0.435  23 60
                                   21  0.783  29.885    10  0.410 0.416  33 60
                                   20  0.826  31.823    11  0.420 0.424  29  2
                                   19  0.868  32.904    14  1.002 1.127  25 48
                                   18  0.919  33.362    15  0.974 1.153  21 44
                                   17  0.977  33.412    16  1.025 1.149  23 16
                                   16  1.053  31.493    17  0.833 1.110  13 18
                                   15  1.119  31.617    18  0.941 1.151  19 42
                                   14  1.242  31.103    19  1.234 1.309  21 42
                                   13  1.287  31.940    20  1.172 1.255  29 12
                                   12  1.310  32.886    21  1.133 1.239  11 18
                                   11  1.316* 33.720
                                   10  1.310  34.325
                                    9  1.298  34.572
                                    8  1.276  35.111
                                    7  1.249  35.747
                                    6  1.230  36.206*
                                    5  1.233  36.029
                                    4  1.250  34.309
                                    3  1.209  29.544
                                    2  0.958  20.865
                                Bottom  1  0.275   5.779

                              % AXIAL TILT -17.350  -5.787
                          AVG BOT 8ft/12ft  1.1241  1.0271
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.309	19	21	42	1.637	0.892	19	21	46	8.65	0.725	20.7	21	27	36	4	7.59	0.842	39.5	15	31	26	4
1.306	19	23	44	1.641	0.890	19	21	42	8.55	0.720	21.2	21	25	34	4	7.13	0.832	43.8	15	23	42	4
1.305	19	21	46	1.645	0.888	19	19	44	8.43	0.704	20.3	19	25	24	4	7.39	0.832	40.8	15	25	22	4
1.302	19	45	40	1.645	0.888	19	43	20	8.32	0.702	21.4	19	23	22	4	7.38	0.827	40.5	15	27	24	4
1.298	19	19	44	1.647	0.886	19	23	44	8.47	0.699	18.8	19	31	28	4	7.26	0.822	41.3	15	39	26	4
1.297	19	19	40	1.655	0.882	19	45	40	8.22	0.696	22.0	19	21	38	4	7.00	0.822	44.3	15	41	24	4
1.294	19	17	42	1.660	0.880	19	13	38	8.29	0.696	20.9	19	23	36	4	7.29	0.821	40.8	15	25	32	4
1.291	19	17	38	1.660	0.880	19	23	14	8.30	0.696	20.6	19	25	20	4	7.27	0.819	40.9	15	23	34	4
1.291	19	13	38	1.670	0.874	19	19	40	8.39	0.694	19.1	19	33	40	4	7.17	0.815	41.7	15	25	18	4
1.288	19	23	48	1.671	0.874	19	17	38	8.34	0.694	19.8	19	27	32	4	6.98	0.814	43.7	14	23	24	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.122 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 17,678.1 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    29719.0
Exposure: MWd/MTU (GWd)       18084.1 (2462.90 )
Delta E: MWd/MTU, (GWd)         405.9 (  55.29 )                    Axial Profile    Edit   Radial Power
Power: MWt                     3952.0 (100.00 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1044.7                    Top 25  0.172   5.632     4  0.861 0.886  27 42
Inlet Subcooling: Btu/lbm       -31.59                       24  0.525  16.260     5  0.432 0.477   1 36
Flow: Mlb/hr                   108.29 (105.65 %)            23  0.687  22.550     6  0.420 0.445  53 50
                                                            22  0.779  27.093     9  0.361 0.435  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.834  30.228    10  0.409 0.414  33 60
 1              -- -- -- -- -- -- --              59  :JR  20  0.873  32.185    11  0.418 0.422  29  2
 3           -- -- -- -- -- -- -- -- -- --        55       19  0.912  33.284    14  1.002 1.124  25 48
 5        -- -- -- -- -- -- -- -- -- -- -- --     51       18  0.960  33.765    15  0.968 1.150  21 44
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47       17  1.017  33.840    16  1.027 1.147  23 16
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 43       16  1.092  31.936    17  0.835 1.115  13 18
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39       15  1.159  32.087    18  0.944 1.148  19 42
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35       14  1.283  31.579    19  1.231 1.305  21 46
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31       13  1.324  32.433    20  1.176 1.255  29 12
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27       12  1.341* 33.388    21  1.141 1.248  49 44
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23       11  1.337  34.225
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19       10  1.321  34.827
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15        9  1.295  35.071
25       -- -- -- -- -- -- -- -- -- -- -- --     11        8  1.255  35.601
27          -- -- -- -- -- -- -- -- -- --        7         7  1.207  36.226
29             -- -- -- -- -- -- -- --           3         6  1.163  36.679*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58           5  1.139  36.502
                                                          4  1.132  34.789
Control Rod Density: %              0.00                  3  1.084  30.008
                                                          2  0.860  21.233
k-effective:                   1.00302                Bottom  1  0.247   5.886
Void Fraction:                   0.415
Core Delta-P: psia              26.306              % AXIAL TILT -13.043  -5.864
Core Plate Delta-P: psia        21.737          AVG BOT 8ft/12ft  1.1020  1.0279
Coolant Temp: Deg-F             546.6
In Channel Flow: Mlb/hr          91.90   Active Channel Flow: Mlb/hr        91.90
Total Bypass Flow (%):           15.1   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.305	19	21	46	1.714	0.852	19	21	46	7.96	0.672	21.5	21	27	36	4	7.00	0.799	41.9	15	15	16	15
1.304	19	21	42	1.724	0.847	19	19	44	7.86	0.666	22.0	21	25	34	4	6.82	0.797	44.0	16	47	40	11
1.302	19	23	44	1.725	0.846	19	43	20	6.63	0.660	45.5	18	49	42	11	7.03	0.796	41.3	18	49	42	15
1.301	19	45	40	1.728	0.845	19	21	42	7.49	0.659	26.4	21	49	44	11	7.06	0.795	40.8	18	17	18	15
1.297	19	19	44	1.735	0.841	19	23	44	6.73	0.659	44.0	18	17	18	15	7.11	0.794	40.1	16	15	42	15
1.293	19	17	20	1.735	0.841	19	45	40	6.69	0.657	44.2	17	47	44	11	6.89	0.790	42.3	14	49	24	15
1.291	19	19	40	1.738	0.840	19	23	14	6.60	0.656	45.3	14	49	38	11	6.93	0.790	41.9	18	41	50	15
1.291	19	13	24	1.741	0.839	19	13	38	6.75	0.654	43.1	16	13	22	11	7.07	0.786	39.7	16	41	16	15
1.288	19	23	14	1.743	0.838	19	13	42	7.53	0.654	24.8	19	47	42	12	6.99	0.785	40.6	16	39	48	15
1.286	19	17	38	1.744	0.837	19	17	46	7.51	0.653	25.0	19	15	44	12	6.92	0.785	41.5	15	17	40	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.123 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 18,084.1 MWd/MTU

```
Cycle:                                9                    Core Average Exposure: MWd/MTU    30660.4
Exposure: MWd/MTU (GWd)       19025.4 (2591.10 )
Delta E: MWd/MTU, (GWd)         941.3 ( 128.20 )                  Axial Profile    Edit   Radial Power
Power: MWt                     3354.8 ( 84.89 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1033.1                    Top 25  0.201   5.824     4  0.840 0.868  27 42
Inlet Subcooling: Btu/lbm       -26.42                       24  0.619  16.791     5  0.436 0.479   1 36
Flow: Mlb/hr                   107.63 (105.00 %)            23  0.804  23.245     6  0.424 0.451  53 50
                                                            22  0.901  27.884     9  0.365 0.439  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29            21  0.950  31.076    10  0.410 0.415  33 60
 1              -- -- -- -- -- -- --              59  :JR  20  0.978  33.072    11  0.418 0.423  29  2
 3           -- -- -- -- -- -- -- -- -- --        55       19  1.005  34.211    14  1.001 1.118  25 48
 5        -- -- -- -- -- -- -- -- -- -- --        51       18  1.044  34.740    15  0.956 1.141  21 44
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47       17  1.093  34.873    16  1.030 1.142  23 16
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43       16  1.165  33.000    17  0.843 1.124  13 18
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39       15  1.228  33.217    18  0.951 1.140  19 42
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35       14  1.351  32.718    19  1.223 1.301  21 46
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31       13  1.380  33.609    20  1.183 1.265  51 40
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27       12  1.381* 34.580    21  1.156 1.265  51 42
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23       11  1.357  35.413
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19       10  1.315  36.001
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15        9  1.259  36.223
25       -- -- -- -- -- -- -- -- -- -- --        11        8  1.184  36.718
27          -- -- -- -- -- -- -- -- -- --         7        7  1.098  37.301
29             -- -- -- -- -- -- -- --           3        6  1.016  37.714*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58           5  0.957  37.516
                                                          4  0.924  35.797
Control Rod Density: %            0.00                    3  0.879  30.974
                                                          2  0.707  21.998
k-effective:                   1.00297                Bottom  1  0.204   6.108
Void Fraction:                   0.366
Core Delta-P: psia              25.003            % AXIAL TILT  -3.982  -5.903
Core Plate Delta-P: psia        20.450         AVG BOT 8ft/12ft  1.0527  1.0289
Coolant Temp: Deg-F             545.4
In Channel Flow: Mlb/hr          92.15   Active Channel Flow: Mlb/hr        92.15
Total Bypass Flow (%):           14.4   (of total core flow)
Total Water Rod Flow (%):        -0.0   (of total core flow)
Source Convergence            0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.301	19	21	46	1.963	0.767	19	21	46	6.01	0.597	45.3	18	17	18	15	6.36	0.734	42.9	18	49	42	15
1.296	19	45	40	1.979	0.761	19	19	44	5.96	0.594	45.7	17	47	44	15	6.31	0.733	43.5	15	15	16	15
1.291	19	21	42	1.980	0.760	19	43	20	5.92	0.593	46.1	18	49	42	15	6.26	0.727	43.5	18	41	50	15
1.291	19	19	44	1.981	0.760	19	17	46	5.92	0.591	45.8	17	17	48	15	6.33	0.726	42.3	18	17	18	15
1.290	19	23	44	1.981	0.760	19	13	42	6.64	0.588	27.0	21	49	44	12	6.20	0.724	43.9	14	49	24	15
1.287	19	17	20	1.984	0.759	19	19	48	5.82	0.588	46.7	18	19	12	15	6.36	0.723	41.6	16	15	42	15
1.287	19	13	24	1.989	0.757	19	23	14	6.61	0.583	26.6	21	51	42	12	6.39	0.723	41.2	16	47	40	15
1.286	19	23	14	1.991	0.756	19	15	44	5.97	0.583	43.7	16	13	22	15	6.27	0.718	42.2	16	39	48	15
1.277	19	19	40	1.992	0.756	19	45	40	5.89	0.582	44.9	18	19	42	15	6.05	0.717	45.1	14	23	50	15
1.277	19	15	44	1.997	0.754	19	13	38	5.84	0.581	45.5	14	49	38	12	6.33	0.716	41.3	16	41	16	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.124 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 19,025.4 MWd/MTU

```
Cycle:                              9                    Core Average Exposure: MWd/MTU    31269.7
Exposure: MWd/MTU (GWd)       19634.8 (2674.10 )
Delta E: MWd/MTU, (GWd)         609.4 (  82.99 )                 Axial Profile    Edit   Radial Power
Power: MWt                     2983.1 ( 75.48 %)          N(PRA) Power Exposure  Zone  Avg.  Max.  IR JR
Core Pressure: psia            1025.9                    Top 25  0.222   5.969     4  0.824 0.854  27 42
Inlet Subcooling: Btu/lbm      -23.11                        24  0.689  17.197     5  0.438 0.481   1 36
Flow: Mlb/hr                   107.63 (105.00 %)             23  0.890  23.772     6  0.427 0.454  53 50
                                                             22  0.990  28.477     9  0.368 0.443  23 60
    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29              21  1.032  31.700    10  0.410 0.415  33 60
 1              -- -- -- -- -- -- --              59  :JR    20  1.050  33.716    11  0.418 0.423  29  2
 3           -- -- -- -- -- -- -- -- -- --        55          19  1.066  34.872    14  1.000 1.114  25 14
 5        -- -- -- -- -- -- -- -- -- -- -- --     51          18  1.096  35.427    15  0.948 1.135  21 44
 7     -- -- -- -- -- -- -- -- -- -- -- -- --     47          17  1.139  35.592    16  1.032 1.138  23 16
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- --     43          16  1.206  33.736    17  0.849 1.129  13 18
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  39          15  1.265  33.992    18  0.956 1.139  17 18
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  35          14  1.384  33.495    19  1.217 1.298  21 46
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  31          13  1.405* 34.403    20  1.188 1.275  51 40
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  27          12  1.393  35.374    21  1.167 1.279  51 42
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  23          11  1.354  36.193
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  19          10  1.295  36.757
23    -- -- -- -- -- -- -- -- -- -- -- -- --     15           9  1.220  36.949
25       -- -- -- -- -- -- -- -- -- -- --        11           8  1.125  37.401
27          -- -- -- -- -- -- -- -- -- --         7           7  1.019  37.933
29             -- -- -- -- -- -- --               3           6  0.922  38.299*
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58              5  0.850  38.068
                                                             4  0.811  36.330
Control Rod Density: %              0.00                     3  0.771  31.480
                                                             2  0.626  22.406
k-effective:                     1.00297                Bottom  1  0.181   6.226
Void Fraction:                     0.334
Core Delta-P: psia                24.398            % AXIAL TILT   1.969  -5.750
Core Plate Delta-P: psia          19.853         AVG BOT 8ft/12ft  1.0185  1.0286
Coolant Temp: Deg-F               544.7
In Channel Flow: Mlb/hr           92.65   Active Channel Flow: Mlb/hr        92.65
Total Bypass Flow (%):             13.9   (of total core flow)
Total Water Rod Flow (%):          -0.0   (of total core flow)
Source Convergence              0.00008
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.298	19	21	46	2.175	0.705	19	21	46	5.44	0.551	47.0	18	49	42	15	5.85	0.684	43.9	18	49	42	15
1.292	19	45	40	2.183	0.702	19	17	46	5.48	0.550	46.3	18	17	18	15	5.78	0.680	44.5	15	15	16	15
1.287	19	19	44	2.185	0.702	19	13	42	5.46	0.550	46.6	17	47	44	15	5.74	0.677	44.7	18	41	50	15
1.285	19	23	14	2.187	0.701	19	19	48	5.42	0.547	46.7	17	17	48	15	5.68	0.672	44.9	14	49	24	15
1.284	19	13	24	2.192	0.700	21	41	10	5.34	0.545	47.6	18	19	12	15	5.79	0.672	43.4	18	17	18	15
1.283	19	21	42	2.196	0.698	21	17	50	5.46	0.538	44.6	16	13	22	15	5.84	0.670	42.5	16	47	40	15
1.283	19	17	20	2.196	0.698	19	19	44	5.29	0.536	47.0	14	49	38	15	5.81	0.669	42.7	16	15	42	15
1.282	19	23	44	2.197	0.698	19	15	44	6.04	0.535	27.1	21	49	44	13	5.74	0.665	43.2	16	39	48	15
1.280	19	49	40	2.197	0.698	19	43	20	5.36	0.535	45.8	18	19	42	15	5.53	0.665	46.2	14	23	50	15
1.279	19	47	42	2.202	0.696	19	23	14	5.39	0.535	45.2	16	45	42	15	5.67	0.662	43.9	18	49	16	15

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 3
* Thermal limit file:

Figure A.125 Browns Ferry Unit 1 Cycle 9 Control Rod Pattern and Axial Distributions at 19,634.8 MWd/MTU

Appendix B Elevation Views of the Browns Ferry Unit 1 Cycle 9 Fresh Reload Batch Fuel Assemblies

[

]

Figure B.1 Elevation View for the Browns Ferry Unit 1 Cycle 9 Fresh Fuel Reload Batch BFE1-9 [ ] Fuel Assembly Design

[

]

Figure B.2 Elevation View for the Browns Ferry Unit 1 Cycle 9 Fresh Fuel Reload Batch BFE1-9 [ ] Fuel Assembly Design

[

]

Figure B.3 Elevation View for the Browns Ferry Unit 1 Cycle 9 Fresh Fuel Reload Batch BFE1-9 [ ] Fuel Assembly Design

Appendix C Browns Ferry Unit 1 Cycle 9 Fresh Fuel Locations

Table C.1 Browns Ferry Unit 1 Cycle 9 Reload Fuel Identification and Locations (Core Coordinates)

Assembly Type: ATRIUM-10
Bundle Description: [ ]
Number Loaded: 192

Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.
FAA001	13-50	FAA039	37-30	FAA077	23-40	FAA115	47-24
FAA002	49-48	FAA040	29-24	FAA078	39-38	FAA116	23-14
FAA003	47-12	FAA041	27-44	FAA079	37-22	FAA117	21-54
FAA004	11-14	FAA042	43-34	FAA080	21-24	FAA118	53-40
FAA005	27-40	FAA043	33-18	FAA081	29-38	FAA119	39- 8
FAA006	39-34	FAA044	17-28	FAA082	37-32	FAA120	7-22
FAA007	33-22	FAA045	23-48	FAA083	31-24	FAA121	15-44
FAA008	21-28	FAA046	47-38	FAA084	23-30	FAA122	43-46
FAA009	21-34	FAA047	37-14	FAA085	21-42	FAA123	45-18
FAA010	33-40	FAA048	13-24	FAA086	41-40	FAA124	17-16
FAA011	39-28	FAA049	17-34	FAA087	39-20	FAA125	17-46
FAA012	27-22	FAA050	33-44	FAA088	19-22	FAA126	45-44
FAA013	15-48	FAA051	43-28	FAA089	15-32	FAA127	43-16
FAA014	45-40	FAA052	27-18	FAA090	31-46	FAA128	15-18
FAA015	39-16	FAA053	19-40	FAA091	45-30	FAA129	19-48
FAA016	15-22	FAA054	39-42	FAA092	29-16	FAA130	47-42
FAA017	19-32	FAA055	41-22	FAA093	13-46	FAA131	41-14
FAA018	31-42	FAA056	21-20	FAA094	45-48	FAA132	13-20
FAA019	41-30	FAA057	19-36	FAA095	47-16	FAA133	17-42
FAA020	29-20	FAA058	35-42	FAA096	15-14	FAA134	41-44
FAA021	25-42	FAA059	41-26	FAA097	29-46	FAA135	43-20
FAA022	41-36	FAA060	25-20	FAA098	45-32	FAA136	19-18
FAA023	35-20	FAA061	29-34	FAA099	31-16	FAA137	13-42
FAA024	19-26	FAA062	33-32	FAA100	15-30	FAA138	41-48
FAA025	17-38	FAA063	31-28	FAA101	23-36	FAA139	47-20
FAA026	37-44	FAA064	27-30	FAA102	35-38	FAA140	19-14
FAA027	43-24	FAA065	11-48	FAA103	37-26	FAA141	27-48
FAA028	23-18	FAA066	47-50	FAA104	25-24	FAA142	47-34
FAA029	23-44	FAA067	49-14	FAA105	25-38	FAA143	33-14
FAA030	43-38	FAA068	13-12	FAA106	37-36	FAA144	13-28
FAA031	37-18	FAA069	29-42	FAA107	35-24	FAA145	13-34
FAA032	17-24	FAA070	41-32	FAA108	23-26	FAA146	33-48
FAA033	27-32	FAA071	31-20	FAA109	21-46	FAA147	47-28
FAA034	31-34	FAA072	19-30	FAA110	47-46	FAA148	27-14
FAA035	33-30	FAA073	21-38	FAA111	45-14	FAA149	19-44
FAA036	29-28	FAA074	37-40	FAA112	13-16	FAA150	43-42
FAA037	23-32	FAA075	39-24	FAA113	13-38	FAA151	41-18
FAA038	31-38	FAA076	23-22	FAA114	37-48	FAA152	17-20

Table C.1 Browns Ferry Unit 1 Cycle 9 Reload Fuel Identification and Locations (Core Coordinates) *(Continued)*

Assembly Type: ATRIUM-10
Bundle Description: [ ]
Number Loaded: 192

Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.
FAA153	15-36	FAA163	45-22	FAA173	11-40	FAA183	55-26
FAA154	35-46	FAA164	21-16	FAA174	39-50	FAA184	25- 6
FAA155	45-26	FAA165	7-40	FAA175	49-22	FAA185	23-52
FAA156	25-16	FAA166	39-54	FAA176	21-12	FAA186	51-38
FAA157	25-46	FAA167	53-22	FAA177	25-56	FAA187	37-10
FAA158	45-36	FAA168	21- 8	FAA178	55-36	FAA188	9-24
FAA159	35-16	FAA169	21-50	FAA179	35- 6	FAA189	9-38
FAA160	15-26	FAA170	49-40	FAA180	5-26	FAA190	37-52
FAA161	15-40	FAA171	39-12	FAA181	5-36	FAA191	51-24
FAA162	39-46	FAA172	11-22	FAA182	35-56	FAA192	23-10

Table C.1 Browns Ferry Unit 1 Cycle 9 Reload Fuel Identification and Locations (Core Coordinates) *(Continued)*

Assembly Type: ATRIUM-10
Bundle Description: [ ]
Number Loaded: 40

Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.
FAA193	9-40	FAA203	35-12	FAA213	5-44	FAA223	33-10
FAA194	39-52	FAA204	11-26	FAA214	43-56	FAA224	9-28
FAA195	51-22	FAA205	11-36	FAA215	55-18	FAA225	29-50
FAA196	21-10	FAA206	35-50	FAA216	17- 6	FAA226	49-32
FAA197	21-52	FAA207	49-26	FAA217	9-34	FAA227	31-12
FAA198	51-40	FAA208	25-12	FAA218	33-52	FAA228	11-30
FAA199	39-10	FAA209	17-56	FAA219	51-28	FAA229	11-32
FAA200	9-22	FAA210	55-44	FAA220	27-10	FAA230	31-50
FAA201	25-50	FAA211	43- 6	FAA221	27-52	FAA231	49-30
FAA202	49-36	FAA212	5-18	FAA222	51-34	FAA232	29-12

Table C.1 Browns Ferry Unit 1 Cycle 9 Reload Fuel Identification and Locations (Core Coordinates) *(Continued)*

Assembly Type: ATRIUM-10
Bundle Description: [ ]
Number Loaded: 100

Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.	Fuel ID	Core Coord.
FAA233	19-56	FAA258	31-54	FAA283	51-14	FAA308	9-20
FAA234	55-42	FAA259	53-30	FAA284	13-10	FAA309	19-10
FAA235	41- 6	FAA260	29- 8	FAA285	7-36	FAA310	41-10
FAA236	5-20	FAA261	29-54	FAA286	35-54	FAA311	51-20
FAA237	5-42	FAA262	53-32	FAA287	53-26	FAA312	51-42
FAA238	41-56	FAA263	31- 8	FAA288	25- 8	FAA313	5-34
FAA239	55-20	FAA264	7-30	FAA289	25-54	FAA314	27-56
FAA240	19- 6	FAA265	15-52	FAA290	53-36	FAA315	33-56
FAA241	17-50	FAA266	51-46	FAA291	35- 8	FAA316	55-34
FAA242	49-44	FAA267	45-10	FAA292	7-26	FAA317	55-28
FAA243	43-12	FAA268	9-16	FAA293	7-44	FAA318	33- 6
FAA244	11-18	FAA269	9-46	FAA294	43-54	FAA319	27- 6
FAA245	11-44	FAA270	45-52	FAA295	53-18	FAA320	5-28
FAA246	43-50	FAA271	51-16	FAA296	17- 8	FAA321	5-38
FAA247	49-18	FAA272	15-10	FAA297	27-36	FAA322	23-56
FAA248	17-12	FAA273	13-52	FAA298	35-34	FAA323	37-56
FAA249	5-40	FAA274	51-48	FAA299	33-26	FAA324	55-38
FAA250	39-56	FAA275	47-10	FAA300	25-28	FAA325	55-24
FAA251	55-22	FAA276	9-14	FAA301	25-34	FAA326	37- 6
FAA252	21- 6	FAA277	17-54	FAA302	33-36	FAA327	23- 6
FAA253	21-56	FAA278	53-44	FAA303	35-28	FAA328	5-24
FAA254	55-40	FAA279	43- 8	FAA304	27-26	FAA329	13-48
FAA255	39- 6	FAA280	7-18	FAA305	19-52	FAA330	47-48
FAA256	5-22	FAA281	9-48	FAA306	41-52	FAA331	47-14
FAA257	7-32	FAA282	47-52	FAA307	9-42	FAA332	13-14

Appendix D Browns Ferry Unit 1 Cycle 9 Radial Exposure and Power Distributions

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									27.835	28.875	30.493	29.599	19.136	28.919	26.913
58								26.892	20.326	18.901	18.739	18.071	17.823	16.367	17.096
56						27.982	26.355	19.941	0.000	0.000	0.000	0.000	0.000	0.000	19.715
54						30.169	17.845	17.982	0.000	17.861	0.000	19.711	0.000	18.048	0.000
52					19.447	20.688	0.000	0.000	18.917	0.000	0.000	0.000	20.336	0.000	20.034
50			28.348	30.765	20.017	20.093	0.000	20.127	0.000	20.252	0.000	20.874	0.000	19.755	0.000
48			26.312	17.827	0.000	0.000	0.000	0.000	19.006	0.000	19.162	0.000	18.243	0.000	18.706
46		26.885	19.700	18.122	0.000	20.845	0.000	18.632	0.000	18.271	0.000	18.400	0.000	19.732	0.000
44	28.176	20.126	0.000	0.000	20.384	0.000	19.051	0.000	19.676	0.000	18.894	0.000	18.868	0.000	20.385
42	29.533	18.788	0.000	17.401	0.000	20.160	0.000	18.702	0.000	19.709	0.000	19.768	0.000	11.671	0.000
40	29.950	19.017	0.000	0.000	0.000	0.000	19.371	0.000	19.552	0.000	18.569	0.000	19.632	0.000	11.663
38	28.443	19.588	0.000	19.566	0.000	20.827	0.000	18.533	0.000	19.677	0.000	19.689	0.000	19.363	0.000
36	15.869	18.421	0.000	0.000	20.844	0.000	18.817	0.000	18.993	0.000	18.830	0.000	11.888	0.000	19.140
34	29.066	16.471	0.000	18.172	0.000	20.134	0.000	19.939	0.000	11.872	0.000	18.817	0.000	11.719	0.000
32	27.266	17.322	20.277	0.000	19.867	0.000	18.866	0.000	20.003	0.000	11.728	0.000	18.836	0.000	20.758
30	27.206	17.348	20.290	0.000	19.989	0.000	18.997	0.000	20.041	0.000	11.758	0.000	19.155	0.000	20.658
28	28.454	16.486	0.000	18.172	0.000	20.116	0.000	19.912	0.000	11.855	0.000	20.047	0.000	11.817	0.000
26	20.634	18.439	0.000	0.000	20.804	0.000	18.828	0.000	19.008	0.000	20.449	0.000	11.892	0.000	18.851
24	30.012	19.606	0.000	19.501	0.000	20.831	0.000	18.552	0.000	19.686	0.000	20.129	0.000	18.623	0.000
22	30.478	19.077	0.000	0.000	0.000	0.000	19.473	0.000	18.833	0.000	18.850	0.000	18.910	0.000	11.770
20	29.508	18.559	0.000	17.428	0.000	20.021	0.000	18.668	0.000	19.702	0.000	19.925	0.000	11.827	0.000
18	28.162	20.154	0.000	0.000	20.427	0.000	19.003	0.000	19.763	0.000	19.693	0.000	18.870	0.000	19.719
16		26.872	19.717	18.153	0.000	20.843	0.000	18.826	0.000	18.226	0.000	18.359	0.000	19.573	0.000
14			27.669	17.698	0.000	0.000	0.000	0.000	18.946	0.000	19.105	0.000	18.223	0.000	18.672
12			28.303	30.776	20.764	19.718	0.000	20.210	0.000	20.223	0.000	20.981	0.000	19.794	0.000
10					19.470	19.383	0.000	0.000	18.939	0.000	0.000	0.000	20.260	0.000	20.006
8						31.019	17.749	17.940	0.000	17.713	0.000	19.707	0.000	17.989	0.000
6						28.072	26.340	19.674	0.000	0.000	0.000	0.000	0.000	0.000	19.762
4								26.880	20.356	18.886	18.717	18.114	17.805	16.330	17.082
2									27.809	28.966	30.174	28.365	19.183	28.209	26.899

Figure D.1 Browns Ferry Unit 1 Cycle 9 BOC Exposure Distribution (GWd/MTU)

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	26.932	28.236	19.145	28.319	30.229	28.928	27.852								
58	17.134	16.404	17.835	18.077	18.760	18.925	20.338	26.797							
56	19.742	0.000	0.000	0.000	0.000	0.000	0.000	19.583	26.394	27.942					
54	0.000	18.033	0.000	19.598	0.000	17.894	0.000	18.007	17.901	30.990					
52	20.060	0.000	20.396	0.000	0.000	0.000	18.941	0.000	0.000	19.391	19.437				
50	0.000	19.766	0.000	20.873	0.000	20.282	0.000	20.129	0.000	19.718	20.826	30.758	28.440		
48	18.730	0.000	18.221	0.000	19.413	0.000	19.035	0.000	0.000	0.000	0.000	17.831	26.375		
46	0.000	19.647	0.000	18.438	0.000	18.251	0.000	18.839	0.000	20.843	0.000	18.158	19.807	26.924	
44	19.760	0.000	18.863	0.000	19.725	0.000	19.694	0.000	19.092	0.000	20.384	0.000	0.000	20.156	28.149
42	0.000	11.648	0.000	19.967	0.000	19.703	0.000	18.733	0.000	20.189	0.000	17.601	0.000	18.602	29.563
40	11.659	0.000	18.916	0.000	18.818	0.000	18.842	0.000	19.194	0.000	0.000	0.000	0.000	19.033	30.466
38	0.000	18.626	0.000	20.059	0.000	19.707	0.000	18.574	0.000	20.838	0.000	19.733	0.000	19.601	30.008
36	19.174	0.000	11.872	0.000	20.418	0.000	19.044	0.000	18.858	0.000	20.911	0.000	0.000	18.429	20.617
34	0.000	11.645	0.000	20.061	0.000	11.630	0.000	19.975	0.000	20.156	0.000	18.255	0.000	16.508	28.470
32	20.753	0.000	18.844	0.000	11.625	0.000	20.010	0.000	18.897	0.000	19.897	0.000	20.244	17.336	27.203
30	20.783	0.000	18.861	0.000	11.573	0.000	19.996	0.000	18.864	0.000	19.867	0.000	19.785	17.312	27.175
28	0.000	11.572	0.000	18.844	0.000	11.886	0.000	19.970	0.000	20.145	0.000	18.261	0.000	16.460	29.042
26	19.175	0.000	11.823	0.000	18.821	0.000	19.047	0.000	18.864	0.000	20.876	0.000	0.000	18.438	20.624
24	0.000	19.400	0.000	19.742	0.000	19.699	0.000	18.538	0.000	20.844	0.000	19.601	0.000	19.611	28.462
22	11.557	0.000	19.812	0.000	18.603	0.000	19.566	0.000	19.394	0.000	0.000	0.000	0.000	19.029	30.763
20	0.000	11.560	0.000	19.951	0.000	19.703	0.000	18.721	0.000	20.182	0.000	17.564	0.000	18.797	31.098
18	20.383	0.000	18.875	0.000	18.905	0.000	19.723	0.000	19.075	0.000	20.412	0.000	0.000	20.129	28.135
16	0.000	19.760	0.000	18.435	0.000	18.270	0.000	18.638	0.000	20.864	0.000	18.111	19.728	26.892	
14	18.728	0.000	18.251	0.000	19.192	0.000	19.032	0.000	0.000	0.000	0.000	17.786	27.709		
12	0.000	19.797	0.000	20.980	0.000	20.301	0.000	20.218	0.000	20.101	20.045	31.109	28.448		
10	20.061	0.000	20.370	0.000	0.000	0.000	18.960	0.000	0.000	20.706	19.450				
8	0.000	18.003	0.000	19.729	0.000	17.682	0.000	17.985	17.879	30.204					
6	20.295	0.000	0.000	0.000	0.000	0.000	0.000	19.684	26.408	28.073					
4	17.109	16.394	17.838	18.117	18.754	18.926	20.359	26.884							
2	26.928	28.329	19.205	30.063	30.496	28.920	27.861								

Figure D.1 Browns Ferry Unit 1 Cycle 9 BOC Exposure Distribution (GWd/MTU) *(Continued)*

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									35.564	37.450	39.470	39.298	30.128	38.354	36.827
58								36.443	32.940	33.503	34.020	34.059	34.109	32.750	33.314
56						34.788	36.308	34.137	17.773	19.603	20.239	20.653	20.296	20.764	38.374
54						40.033	32.830	35.846	21.142	38.492	22.186	40.386	22.827	38.702	22.126
52					31.563	35.428	19.327	21.610	40.082	23.780	23.549	23.440	41.606	23.079	40.435
50			35.116	40.611	34.792	37.768	21.108	41.207	23.997	42.321	23.649	42.481	23.463	41.369	22.580
48			36.199	32.743	19.240	21.049	22.638	23.055	40.875	23.310	39.969	22.253	39.395	22.741	40.250
46		36.361	33.825	35.843	21.457	41.717	22.987	40.326	23.335	39.690	21.975	38.646	22.200	40.330	22.790
44	35.796	32.673	17.636	20.962	41.122	23.798	40.767	23.240	41.163	22.647	38.935	21.266	39.052	21.849	40.451
42	37.959	33.226	19.428	37.882	23.500	42.051	23.119	39.994	22.734	40.733	21.450	39.387	21.576	27.327	21.241
40	38.822	34.083	20.038	21.942	23.043	23.162	39.998	22.029	40.081	22.067	39.455	21.987	39.642	21.389	26.602
38	37.590	35.266	20.483	40.079	22.985	42.062	22.050	38.794	21.933	39.943	22.179	40.082	21.806	38.976	20.337
36	26.669	34.558	20.251	22.789	41.925	23.278	39.456	21.887	39.335	21.906	39.152	21.966	27.944	22.223	38.336
34	38.511	32.791	20.810	38.918	23.214	41.758	22.431	40.314	22.097	27.791	21.736	38.731	22.400	27.608	21.008
32	37.104	33.512	38.923	22.367	41.021	23.377	40.543	22.976	40.827	22.122	26.977	20.688	38.608	21.481	40.692
30	37.047	33.532	38.933	22.365	41.146	23.373	40.656	22.969	40.844	22.097	26.985	20.650	38.865	21.481	40.611
28	37.917	32.803	20.805	38.924	23.209	41.719	22.421	40.270	22.065	27.721	21.626	39.673	22.343	27.749	21.012
26	31.350	34.539	20.243	22.785	41.885	23.271	39.471	21.869	39.324	21.828	40.421	21.851	27.891	22.208	38.100
24	39.306	35.271	20.473	40.014	22.977	42.055	22.038	38.799	21.907	39.898	22.084	40.402	21.787	38.348	20.344
22	39.300	34.132	20.023	21.932	23.030	23.150	40.089	22.016	39.422	22.037	39.662	21.945	38.988	21.399	26.720
20	37.908	32.998	19.409	37.871	23.487	41.890	23.103	39.946	22.715	40.668	21.405	39.495	21.569	27.452	21.231
18	35.763	32.674	17.607	20.936	41.160	23.777	40.691	23.213	41.258	22.611	39.592	21.233	39.045	21.843	39.867
16		36.307	33.790	35.827	21.426	41.689	22.960	40.464	23.302	39.621	21.947	38.594	22.188	40.213	22.784
14			37.371	32.569	19.206	21.021	22.608	23.022	40.795	23.289	39.898	22.236	39.369	22.736	40.211
12			35.012	40.574	35.443	37.410	21.076	41.241	23.966	42.310	23.626	42.561	23.449	41.406	22.571
10					31.527	34.226	19.269	21.567	40.074	23.754	23.518	23.411	41.519	23.065	40.394
8						40.552	32.673	35.761	21.110	38.286	22.150	40.343	22.799	38.630	22.115
6						34.824	36.240	33.869	17.734	19.558	20.182	20.596	20.255	20.741	38.390
4								36.387	32.939	33.431	33.915	34.040	34.038	32.696	33.299
2									35.498	37.515	39.126	37.531	30.124	37.745	36.813

Figure D.2 Browns Ferry Unit 1 Cycle 9 EOC Exposure Distribution (19.0 GWd/MTU)

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	36.848	37.782	30.090	37.478	39.171	37.480	35.555								
58	33.358	32.773	34.067	33.992	33.957	33.475	32.923	36.316							
56	38.330	20.746	20.257	20.598	20.182	19.553	17.732	33.796	36.302	34.693					
54	22.120	38.672	22.799	40.243	22.143	38.481	21.101	35.819	32.815	40.540					
52	40.450	23.063	41.641	23.407	23.510	23.739	40.069	21.565	19.271	34.242	31.514				
50	22.576	41.376	23.445	42.453	23.613	42.306	23.959	41.174	21.080	37.418	35.508	40.589	35.212		
48	40.267	22.735	39.371	22.225	40.159	23.276	40.868	23.020	22.610	21.029	19.222	32.735	36.264		
46	22.787	40.268	22.187	38.660	21.940	39.651	23.300	40.468	22.961	41.691	21.439	35.866	33.909	36.392	
44	39.919	21.850	39.039	21.236	39.625	22.613	41.197	23.217	40.795	23.779	41.120	20.944	17.621	32.688	35.756
42	21.246	27.310	21.581	39.545	21.412	40.658	22.723	40.024	23.106	42.054	23.482	38.057	19.413	33.034	37.980
40	26.603	21.417	39.021	21.963	39.651	22.049	39.460	22.028	39.841	23.147	23.027	21.930	20.030	34.092	39.269
38	20.346	38.364	21.814	40.353	22.107	39.926	21.919	38.830	22.038	42.062	22.964	40.284	20.470	35.260	39.299
36	38.373	22.223	27.956	21.891	40.415	21.850	39.361	21.872	39.477	23.259	41.974	22.765	20.230	34.524	31.330
34	21.014	27.558	22.374	39.724	21.678	27.549	22.080	40.334	22.417	41.759	23.194	38.979	20.789	32.806	37.934
32	40.702	21.497	38.619	20.679	26.892	22.143	40.832	22.974	40.569	23.367	41.046	22.353	38.879	33.509	37.022
30	40.724	21.498	38.650	20.706	26.834	22.147	40.820	22.977	40.532	23.366	41.014	22.352	38.483	33.481	36.982
28	21.013	27.460	22.416	38.766	21.748	27.806	22.092	40.335	22.418	41.739	23.191	38.981	20.778	32.747	38.423
26	38.378	22.233	27.935	21.976	39.127	21.900	39.385	21.877	39.488	23.256	41.937	22.749	20.200	34.496	31.281
24	20.337	39.015	21.814	40.130	22.171	39.960	21.923	38.791	22.033	42.055	22.950	40.073	20.414	35.202	37.495
22	26.495	21.382	39.779	21.975	39.482	22.055	40.082	22.013	40.012	23.133	23.002	21.883	19.953	33.984	39.506
20	21.233	27.195	21.564	39.539	21.435	40.709	22.718	39.995	23.097	42.038	23.454	37.973	19.329	33.099	38.952
18	40.431	21.837	39.048	21.250	38.923	22.630	41.199	23.221	40.776	23.766	41.125	20.895	17.544	32.560	35.613
16	22.780	40.338	22.184	38.674	21.958	39.675	23.317	40.309	22.965	41.711	21.412	35.774	33.774	36.282	
14	40.260	22.727	39.393	22.234	39.979	23.294	40.885	23.034	22.615	21.021	19.199	32.639	37.404		
12	22.568	41.400	23.442	42.556	23.629	42.373	23.977	41.264	21.087	37.754	34.792	40.886	35.170		
10	40.444	23.058	41.613	23.415	23.527	23.761	40.103	21.592	19.309	35.422	31.540				
8	22.108	38.634	22.799	40.376	22.162	38.298	21.129	35.823	32.849	40.053					
6	38.856	20.733	20.259	20.611	20.201	19.577	17.755	33.903	36.357	34.881					
4	33.314	32.769	34.083	34.047	33.973	33.486	32.956	36.405							
2	36.842	37.816	30.164	39.462	39.409	37.462	35.567								

Figure D.2 Browns Ferry Unit 1 Cycle 9 EOC Exposure Distribution (19.0 GWd/MTU) *(Continued)*

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									43.827	44.157	47.058	47.018	37.138	46.041	43.654
58								44.652	40.449	39.590	41.046	40.933	40.428	38.970	38.246
56						41.951	45.775	41.566	21.136	24.380	24.367	25.618	23.674	25.009	43.385
54						46.479	40.289	41.199	26.011	43.796	25.827	45.552	27.131	45.468	26.235
52					39.597	41.793	22.775	26.399	45.487	27.570	25.949	26.601	47.453	25.908	46.305
50			42.204	47.154	41.933	43.585	24.194	46.762	28.729	47.637	26.922	47.980	26.692	46.503	26.184
48			45.380	40.009	22.914	24.165	26.156	26.868	46.843	26.722	46.930	26.572	45.807	26.375	45.903
46		44.620	40.651	41.209	26.244	47.062	26.576	46.348	26.781	45.207	25.983	44.402	25.586	46.438	26.044
44	44.048	40.466	21.136	25.824	47.037	27.706	46.105	26.766	46.352	26.131	44.824	25.282	44.297	25.358	45.544
42	44.272	39.576	24.179	43.976	28.017	47.554	26.543	46.096	26.391	45.982	25.477	45.815	25.023	31.171	26.029
40	45.243	41.676	24.180	25.758	25.919	26.585	46.381	26.234	46.327	25.664	44.409	25.453	45.570	26.120	30.884
38	44.233	41.246	25.020	45.730	26.318	47.224	26.138	44.724	25.580	45.683	25.640	46.193	26.645	44.278	24.094
36	33.381	39.778	23.225	27.102	47.459	26.233	45.252	25.578	44.645	25.252	45.167	26.677	31.899	26.160	44.731
34	46.725	39.025	25.133	46.997	26.402	47.589	26.400	46.712	25.706	31.786	26.496	44.713	26.727	31.071	26.279
32	44.217	38.448	44.544	27.530	47.411	26.504	46.884	26.367	46.628	26.608	31.307	24.587	44.610	26.354	45.964
30	44.221	38.461	43.901	26.685	46.920	26.504	46.402	26.204	46.101	26.534	31.225	24.322	44.387	26.362	45.278
28	45.096	39.518	25.137	45.794	26.147	46.902	26.376	45.998	25.511	31.254	26.373	45.490	26.319	31.354	26.290
26	37.819	39.813	23.214	27.951	48.707	26.230	45.270	25.717	45.329	25.159	45.488	26.735	31.177	26.229	43.769
24	45.120	41.275	25.019	45.789	26.566	47.240	26.126	45.989	25.702	45.672	25.538	46.628	26.756	43.873	24.077
22	46.279	41.156	24.171	25.545	25.568	26.571	46.492	26.063	44.873	25.655	44.587	25.291	44.257	26.104	31.024
20	44.215	38.604	24.177	43.678	27.207	47.286	26.523	45.993	26.211	46.371	25.395	45.344	24.852	31.347	26.021
18	43.994	39.762	21.115	26.522	46.682	27.699	46.026	26.897	48.025	26.104	45.886	25.401	44.979	25.349	45.373
16		44.526	40.432	42.263	26.935	46.476	26.549	46.491	26.894	45.810	25.949	45.588	25.707	46.236	26.039
14			46.124	39.441	22.692	24.137	26.118	26.632	46.111	26.699	46.202	26.391	45.096	26.373	45.883
12			42.111	46.420	41.799	43.218	24.167	46.177	27.885	47.563	26.895	47.418	26.481	46.565	26.171
10					40.190	41.855	22.713	27.094	46.012	27.540	25.917	26.834	48.693	25.890	46.264
8						47.101	39.480	42.154	26.712	43.920	25.797	46.202	27.965	45.444	26.233
6						42.075	45.404	40.765	21.244	24.357	24.328	25.101	23.155	25.016	43.414
4								44.720	40.086	40.110	40.958	40.405	39.334	39.374	38.224
2									43.723	43.745	45.486	45.768	37.072	46.087	44.126

Figure D.3 Browns Ferry Unit 1 Cycle 9 EOC Assembly Peak Rod Exposure Distribution (19.0 GWd/MTU)

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	43.714	46.097	37.056	45.874	45.872	44.079	44.608								
58	39.228	39.510	39.373	40.906	41.461	40.030	40.783	44.549							
56	43.835	25.661	23.157	25.112	24.621	24.549	21.238	40.844	46.037	41.818					
54	26.232	45.465	27.123	45.560	25.785	44.377	25.981	41.170	39.664	46.845					
52	46.961	25.893	47.473	26.561	25.908	27.534	45.445	26.370	22.721	41.162	39.559				
50	26.336	47.217	26.477	47.929	27.028	47.941	27.881	46.110	24.821	43.771	41.848	46.912	42.222		
48	46.602	26.526	45.732	26.374	47.362	26.834	46.665	26.634	26.907	24.774	22.700	39.643	45.395		
46	26.041	46.449	25.564	44.416	25.951	45.212	26.736	45.831	26.554	46.469	26.229	41.221	41.228	44.568	
44	45.416	25.352	44.938	25.251	45.308	26.106	46.637	26.739	46.639	27.699	47.034	25.808	21.123	39.778	44.828
42	26.186	30.719	24.861	46.097	25.559	46.454	26.220	45.460	26.671	47.619	27.207	44.109	24.375	39.110	44.672
40	30.554	26.274	44.286	25.303	44.976	25.812	44.914	26.078	46.937	26.719	25.568	25.543	24.462	41.541	46.332
38	24.076	43.904	26.658	45.946	25.557	46.431	25.566	44.746	26.105	47.915	26.292	45.592	24.990	41.779	45.450
36	44.104	26.287	31.304	26.638	46.122	25.178	45.352	25.572	45.896	26.212	47.507	27.081	23.193	39.786	37.787
34	26.423	30.687	26.390	44.862	26.603	30.745	25.524	46.074	26.545	47.608	26.129	45.857	25.717	39.561	44.345
32	45.973	26.531	44.077	24.356	30.608	26.751	46.093	26.212	46.952	26.654	47.496	26.672	44.374	39.393	43.749
30	45.352	26.370	44.750	24.436	30.741	26.655	46.743	26.214	46.235	26.496	46.757	26.654	45.033	38.403	43.683
28	26.277	31.240	26.357	44.854	26.541	31.330	25.550	46.735	26.373	46.903	26.125	45.838	25.112	38.990	46.742
26	44.693	26.546	31.642	26.740	45.086	25.402	44.688	25.569	46.027	26.379	47.455	27.070	23.514	40.796	37.686
24	24.249	44.903	26.711	45.551	25.785	46.381	25.570	44.711	26.283	47.873	26.287	45.180	25.416	41.703	44.483
22	30.783	26.121	44.947	25.302	44.476	25.648	45.699	26.049	47.044	26.553	25.534	25.504	24.102	41.002	45.608
20	26.034	30.972	24.868	45.372	25.452	45.964	26.219	45.427	26.515	47.439	27.178	43.427	24.095	38.956	45.026
18	46.156	25.495	44.300	25.251	45.972	26.315	46.380	26.747	46.791	28.498	47.058	25.755	20.917	39.997	43.850
16	26.219	46.423	25.560	44.431	26.139	45.872	26.763	45.625	26.762	47.083	26.192	41.138	40.967	44.346	
14	46.523	26.352	45.087	26.384	46.301	26.706	46.224	26.656	26.133	24.141	22.693	40.129	46.463		
12	26.164	47.196	26.484	47.381	26.906	47.956	27.889	46.742	24.171	44.287	41.526	46.339	42.164		
10	47.019	26.068	47.440	26.572	26.280	28.354	45.501	26.381	22.942	42.852	39.556				
8	27.080	46.660	27.104	46.094	26.040	44.275	25.996	41.175	40.082	46.401					
6	44.679	24.992	23.166	25.110	24.341	24.359	21.265	40.764	45.493	42.159					
4	38.200	38.976	39.372	40.421	41.576	39.580	40.091	44.760							
2	44.061	46.191	37.800	46.497	46.959	43.686	43.816								

Figure D.3 Browns Ferry Unit 1 Cycle 9 EOC Assembly Peak Rod Exposure Distribution (19.0 GWd/MTU)
(Continued)

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									54.394	54.329	57.130	59.616	44.327	54.345	53.849
58								53.946	49.770	51.398	52.620	52.035	51.256	49.731	48.217
56						51.789	55.039	51.585	30.243	32.713	32.519	33.250	30.663	31.892	54.227
54						58.099	48.887	54.493	35.857	54.087	34.922	57.811	34.612	54.150	33.764
52					48.290	51.810	30.758	36.006	58.175	36.738	35.086	34.522	58.058	33.245	56.664
50			52.803	59.612	51.589	55.488	33.363	60.572	37.625	59.666	35.269	59.081	33.834	56.409	32.834
48			54.754	48.642	31.084	33.266	35.182	35.588	59.539	34.861	57.939	33.757	54.192	33.037	55.904
46		54.174	50.419	54.301	35.560	61.248	35.144	55.959	34.639	54.010	33.023	55.295	31.987	54.979	31.733
44	54.860	49.699	30.298	35.467	59.900	36.183	58.607	34.685	57.642	33.287	54.511	31.646	53.015	30.865	54.678
42	55.472	51.546	32.425	54.092	37.288	59.925	34.648	54.974	33.515	56.391	31.928	54.083	30.544	38.641	31.133
40	53.938	53.182	32.238	34.768	34.774	34.744	57.197	33.242	55.312	32.070	54.433	31.054	54.227	31.493	38.166
38	52.964	53.435	32.277	58.178	34.227	57.883	33.150	55.503	31.813	54.659	31.269	55.045	31.705	52.424	29.625
36	41.232	50.726	29.963	34.851	58.292	33.294	54.174	31.707	52.925	30.807	52.799	31.767	39.594	31.288	53.783
34	55.969	49.763	32.255	56.081	34.038	57.215	32.997	54.874	31.246	39.374	32.113	53.349	31.946	38.443	31.392
32	54.426	48.491	56.631	35.356	58.010	33.454	57.221	32.111	54.758	31.733	38.676	29.983	52.329	31.268	54.072
30	54.415	48.493	55.733	34.468	57.608	33.413	56.655	31.901	54.928	31.690	38.602	29.685	52.930	31.307	53.475
28	53.846	50.319	32.249	54.692	33.834	56.352	32.963	55.011	31.000	38.724	31.951	54.329	31.558	39.003	31.459
26	47.559	50.740	29.925	35.930	59.739	33.287	54.160	31.867	53.717	30.608	54.503	32.228	38.381	31.416	51.792
24	54.126	53.419	32.270	58.166	34.391	57.881	33.136	56.999	31.956	54.422	31.065	55.138	32.032	51.602	29.612
22	57.072	52.499	32.190	34.553	34.559	34.730	57.452	33.049	54.556	32.016	54.719	30.849	52.516	31.478	38.349
20	55.422	50.615	32.376	53.075	36.269	58.852	34.632	54.894	33.313	57.071	31.748	54.282	30.327	38.926	31.148
18	54.819	48.778	30.265	36.378	60.915	36.202	58.504	34.827	59.597	33.196	55.193	31.733	52.724	30.861	54.333
16		54.007	50.435	55.563	36.458	60.506	35.128	55.757	34.763	54.703	32.935	56.609	32.110	54.196	31.739
14			56.423	47.812	30.505	33.206	35.114	35.322	58.617	34.821	56.901	33.515	53.796	33.039	55.919
12			52.641	58.751	51.654	55.311	33.303	60.372	36.568	59.651	35.233	58.772	33.608	56.608	32.829
10					49.112	51.998	30.717	36.918	59.817	36.740	35.083	34.682	59.526	33.268	56.668
8						59.586	47.900	55.612	36.828	53.585	34.925	58.660	35.734	54.146	33.781
6						51.949	54.768	51.162	30.509	32.720	32.520	32.328	29.908	31.927	54.570
4								53.931	49.371	52.243	52.635	51.775	50.093	50.315	48.253
2									54.361	54.674	54.834	54.560	44.711	54.857	54.460

Figure D.4 Browns Ferry Unit 1 Cycle 9 EOC Assembly Peak Pellet Exposure Distribution (19.0 GWd/MTU)

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	53.930	54.690	44.424	54.702	55.376	54.515	55.102								
58	49.334	50.370	50.057	52.222	53.156	51.942	50.210	53.863							
56	55.418	32.780	29.903	32.324	33.352	33.485	30.499	50.519	55.325	51.764					
54	33.706	54.055	34.597	57.874	34.878	54.831	35.852	54.480	48.223	59.443					
52	57.511	33.199	58.184	34.476	35.038	36.695	58.180	35.999	30.748	51.078	48.144				
50	33.019	57.168	33.575	59.125	35.366	60.343	36.560	59.879	33.526	55.369	51.793	59.455	52.916		
48	56.684	33.196	54.215	33.478	58.301	34.955	59.428	35.349	36.225	33.424	30.546	48.295	54.834		
46	31.707	55.087	31.898	55.217	32.918	54.044	34.579	55.798	35.162	60.436	35.588	54.325	51.589	54.129	
44	54.298	30.830	52.734	31.519	55.514	33.190	57.678	34.653	59.345	36.227	59.821	35.490	30.310	48.832	55.406
42	31.565	37.944	30.326	54.406	31.937	56.853	33.329	54.290	34.848	59.903	36.311	54.381	33.258	51.240	55.520
40	37.864	31.892	52.562	30.850	55.295	32.198	54.660	33.074	57.783	34.954	34.649	34.655	33.155	52.874	57.180
38	29.614	51.526	31.694	54.515	31.071	54.654	31.781	55.511	33.144	58.658	34.309	57.565	32.353	54.102	54.658
36	53.077	31.485	38.917	31.773	54.475	30.604	53.746	31.687	54.886	33.304	58.490	34.875	30.009	50.715	47.476
34	32.009	37.959	31.675	53.766	32.486	38.167	31.011	55.158	33.210	57.085	33.885	54.756	33.171	50.382	52.882
32	53.972	31.878	52.193	29.847	38.015	32.191	54.788	31.920	57.094	33.667	58.273	34.535	56.111	49.543	53.947
30	53.654	31.286	52.443	29.864	38.002	31.753	54.668	31.944	56.285	33.468	57.272	34.527	57.143	48.450	53.761
28	31.398	38.668	31.599	53.623	32.135	38.654	31.079	54.938	32.994	56.341	33.877	54.772	32.322	49.642	56.098
26	53.728	31.722	39.369	31.873	52.684	30.971	53.024	31.704	54.997	33.480	58.318	34.834	30.698	51.912	47.476
24	29.622	53.107	31.765	54.240	31.414	54.456	31.802	55.434	33.348	58.542	34.187	57.520	33.142	53.854	53.433
22	38.100	31.446	54.150	30.850	55.161	32.021	55.557	33.008	58.095	34.695	34.499	34.484	32.122	52.195	55.612
20	31.106	38.415	30.336	54.384	31.851	56.265	33.293	54.176	34.600	59.155	36.194	53.481	32.298	50.666	55.137
18	54.381	31.015	52.983	31.564	54.344	33.423	57.772	34.617	59.359	37.151	59.881	35.341	29.928	49.019	54.663
16	31.889	54.884	31.919	55.344	33.176	54.742	34.563	55.861	35.274	61.056	35.463	54.095	50.793	54.148	
14	56.874	32.990	53.901	33.478	57.080	34.778	58.737	35.297	35.086	33.187	30.497	48.676	56.636		
12	32.798	57.398	33.562	58.679	35.184	60.490	36.501	61.052	33.270	55.735	51.044	58.905	52.807		
10	57.560	33.404	58.064	34.445	35.217	37.701	58.321	35.906	31.247	53.120	48.190				
8	34.412	55.518	34.552	58.464	35.055	54.562	35.800	54.484	48.641	57.947					
6	56.025	31.893	29.869	32.276	32.462	32.660	30.486	51.110	54.861	52.061					
4	48.277	49.796	50.085	51.691	53.425	51.477	49.274	53.960							
2	54.367	54.763	45.633	55.408	57.036	54.531	54.428								

Figure D.4 Browns Ferry Unit 1 Cycle 9 EOC Assembly Peak Pellet Exposure Distribution (19.0 GWd/MTU)
(Continued)

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.452	0.493	0.523	0.573	0.651	0.594	0.636
58								0.549	0.688	0.781	0.824	0.885	0.924	0.957	0.981
56						0.399	0.574	0.774	0.881	0.945	0.985	1.028	1.046	1.112	1.121
54						0.562	0.806	0.951	1.018	1.052	1.064	1.104	1.172	1.188	1.226
52					0.691	0.805	0.947	1.045	1.097	1.122	1.135	1.159	1.210	1.268	1.258
50			0.397	0.563	0.806	0.941	1.021	1.106	1.157	1.135	1.110	1.138	1.228	1.262	1.276
48			0.572	0.805	0.945	1.019	1.108	1.146	1.192	1.129	0.896	0.911	1.170	1.214	1.140
46		0.546	0.772	0.948	1.042	1.099	1.145	1.190	1.189	1.143	0.905	0.901	1.143	1.185	1.117
44	0.446	0.686	0.878	1.015	1.084	1.154	1.189	1.188	1.201	1.163	1.120	1.110	1.140	1.169	1.156
42	0.486	0.774	0.941	1.049	1.118	1.133	1.127	1.139	1.163	1.163	1.108	1.101	1.127	0.915	1.131
40	0.520	0.818	0.981	1.061	1.132	1.108	0.894	0.904	1.119	1.107	0.900	0.891	1.084	1.111	0.789
38	0.547	0.874	1.024	1.102	1.156	1.139	0.910	0.901	1.110	1.103	0.891	0.881	1.085	1.092	0.978
36	0.647	0.920	1.043	1.170	1.203	1.226	1.164	1.142	1.139	1.126	1.085	1.085	0.885	1.152	1.138
34	0.594	0.953	1.109	1.183	1.266	1.258	1.213	1.183	1.167	0.913	1.111	1.094	1.151	0.931	1.198
32	0.630	0.977	1.117	1.225	1.261	1.275	1.138	1.115	1.157	1.129	0.788	0.977	1.139	1.198	1.215
30	0.630	0.977	1.118	1.224	1.261	1.275	1.138	1.115	1.157	1.128	0.789	0.977	1.137	1.199	1.216
28	0.596	0.953	1.109	1.184	1.266	1.259	1.212	1.183	1.166	0.911	1.109	1.085	1.151	0.940	1.199
26	0.640	0.918	1.042	1.169	1.202	1.226	1.163	1.142	1.137	1.125	1.075	1.083	0.884	1.151	1.139
24	0.554	0.872	1.023	1.101	1.156	1.138	0.909	0.901	1.109	1.101	0.889	0.880	1.084	1.094	0.977
22	0.516	0.817	0.980	1.060	1.131	1.107	0.894	0.904	1.118	1.107	0.898	0.890	1.084	1.111	0.790
20	0.484	0.772	0.939	1.046	1.117	1.131	1.126	1.138	1.162	1.157	1.106	1.098	1.126	0.912	1.129
18	0.445	0.683	0.875	1.013	1.084	1.152	1.188	1.187	1.204	1.162	1.116	1.109	1.139	1.168	1.159
16		0.543	0.769	0.945	1.040	1.098	1.144	1.188	1.188	1.142	0.904	0.902	1.143	1.188	1.117
14			0.559	0.801	0.943	1.017	1.105	1.145	1.191	1.128	0.895	0.910	1.169	1.214	1.140
12			0.393	0.559	0.801	0.938	1.018	1.102	1.155	1.134	1.109	1.137	1.227	1.262	1.276
10					0.686	0.806	0.942	1.041	1.094	1.120	1.133	1.157	1.209	1.267	1.258
8						0.543	0.801	0.947	1.015	1.047	1.062	1.103	1.171	1.185	1.226
6						0.394	0.569	0.772	0.878	0.942	0.982	1.025	1.044	1.111	1.120
4								0.545	0.685	0.777	0.819	0.881	0.922	0.956	0.980
2									0.449	0.490	0.521	0.544	0.649	0.600	0.636

Figure D.5 Browns Ferry Unit 1 Cycle 9 Radial Power Distribution at 0.0 MWd/MTU

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	0.636	0.601	0.649	0.543	0.521	0.491	0.450								
58	0.981	0.957	0.923	0.882	0.820	0.778	0.686	0.547							
56	1.117	1.111	1.044	1.025	0.983	0.943	0.879	0.774	0.571	0.395					
54	1.226	1.186	1.171	1.103	1.062	1.050	1.016	0.948	0.803	0.545					
52	1.258	1.268	1.209	1.158	1.133	1.121	1.095	1.043	0.944	0.807	0.689				
50	1.276	1.262	1.228	1.138	1.110	1.133	1.156	1.105	1.019	0.940	0.803	0.563	0.398		
48	1.141	1.214	1.169	0.911	0.896	1.128	1.191	1.146	1.107	1.019	0.945	0.805	0.573		
46	1.117	1.188	1.144	0.901	0.905	1.144	1.189	1.189	1.145	1.099	1.042	0.949	0.773	0.548	
44	1.160	1.169	1.140	1.110	1.117	1.163	1.205	1.189	1.189	1.154	1.086	1.015	0.878	0.685	0.446
42	1.131	0.914	1.128	1.100	1.108	1.159	1.164	1.140	1.128	1.133	1.119	1.051	0.942	0.775	0.487
40	0.790	1.113	1.086	0.892	0.900	1.108	1.120	0.905	0.895	1.109	1.133	1.062	0.982	0.818	0.516
38	0.978	1.096	1.087	0.882	0.891	1.103	1.111	0.902	0.911	1.140	1.157	1.105	1.025	0.873	0.555
36	1.138	1.153	0.893	1.087	1.078	1.127	1.139	1.143	1.165	1.227	1.204	1.170	1.043	0.918	0.641
34	1.199	0.937	1.153	1.088	1.114	0.917	1.169	1.184	1.214	1.259	1.267	1.184	1.109	0.953	0.597
32	1.217	1.200	1.141	0.979	0.794	1.133	1.159	1.117	1.139	1.276	1.262	1.225	1.118	0.977	0.630
30	1.215	1.199	1.140	0.979	0.789	1.132	1.159	1.117	1.138	1.276	1.261	1.225	1.118	0.976	0.629
28	1.198	0.932	1.153	1.095	1.113	0.916	1.168	1.185	1.213	1.260	1.266	1.184	1.108	0.952	0.590
26	1.138	1.153	0.893	1.087	1.086	1.127	1.140	1.143	1.165	1.226	1.202	1.168	1.041	0.916	0.637
24	0.978	1.092	1.086	0.882	0.892	1.103	1.110	0.902	0.910	1.139	1.156	1.100	1.021	0.869	0.539
22	0.788	1.111	1.082	0.891	0.899	1.108	1.120	0.904	0.895	1.108	1.131	1.058	0.977	0.811	0.514
20	1.130	0.911	1.127	1.099	1.108	1.163	1.163	1.139	1.127	1.132	1.117	1.047	0.937	0.767	0.455
18	1.155	1.168	1.139	1.110	1.119	1.163	1.200	1.188	1.189	1.153	1.084	1.012	0.873	0.679	0.438
16	1.116	1.184	1.143	0.901	0.904	1.142	1.188	1.189	1.144	1.099	1.040	0.945	0.768	0.540	
14	1.139	1.213	1.168	0.910	0.895	1.128	1.191	1.146	1.107	1.018	0.943	0.801	0.560		
12	1.276	1.261	1.227	1.137	1.109	1.134	1.156	1.104	1.020	0.940	0.805	0.558	0.394		
10	1.257	1.267	1.209	1.157	1.133	1.121	1.096	1.044	0.946	0.804	0.689				
8	1.226	1.185	1.171	1.102	1.062	1.050	1.017	0.950	0.806	0.561					
6	1.120	1.111	1.044	1.026	0.983	0.943	0.879	0.774	0.573	0.399					
4	0.981	0.957	0.923	0.882	0.821	0.778	0.686	0.546							
2	0.636	0.597	0.650	0.557	0.519	0.491	0.449								

Figure D.5 Browns Ferry Unit 1 Cycle 9 Radial Power Distribution at 0.0 MWd/MTU *(Continued)*

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									0.335	0.381	0.399	0.430	0.485	0.406	0.419
58								0.419	0.581	0.687	0.723	0.757	0.762	0.756	0.735
56							0.290	0.433	0.650	0.903	1.019	1.070	1.091	1.064	1.080	0.901
54							0.440	0.691	0.842	1.082	1.008	1.167	1.026	1.205	1.024	1.189
52						0.528	0.682	0.992	1.108	1.020	1.232	1.234	1.228	1.065	1.225	1.071
50				0.291	0.440	0.685	0.848	1.100	1.031	1.241	1.090	1.259	1.093	1.259	1.104	1.262
48				0.434	0.693	0.992	1.100	1.224	1.232	1.111	1.272	1.138	1.298	1.132	1.270	1.108
46			0.422	0.653	0.843	1.109	1.027	1.232	1.106	1.278	1.141	1.316	1.155	1.291	1.106	1.251
44		0.333	0.584	0.906	1.086	1.011	1.244	1.114	1.280	1.146	1.308	1.160	1.317	1.117	1.257	1.069
42		0.378	0.687	1.023	1.016	1.239	1.095	1.277	1.137	1.305	1.158	1.319	1.134	1.266	0.894	1.222
40		0.396	0.719	1.073	1.174	1.246	1.270	1.139	1.312	1.142	1.307	1.146	1.270	1.081	1.227	0.868
38		0.403	0.742	1.091	1.030	1.238	1.103	1.300	1.150	1.300	1.121	1.265	1.089	1.227	1.050	1.204
36		0.472	0.753	1.059	1.202	1.061	1.259	1.130	1.290	1.107	1.254	1.078	1.222	0.867	1.228	1.047
34		0.402	0.748	1.071	1.013	1.215	1.093	1.268	1.101	1.242	0.886	1.213	1.046	1.223	0.850	1.187
32		0.411	0.724	0.888	1.174	1.051	1.238	1.095	1.236	1.052	1.195	0.860	1.192	1.037	1.177	0.988
30		0.411	0.724	0.889	1.174	1.050	1.238	1.094	1.236	1.051	1.194	0.859	1.190	1.033	1.177	0.989
28		0.403	0.748	1.071	1.014	1.215	1.095	1.268	1.101	1.241	0.883	1.208	1.032	1.220	0.850	1.187
26		0.471	0.753	1.060	1.203	1.060	1.259	1.129	1.290	1.106	1.251	1.061	1.216	0.863	1.228	1.049
24		0.413	0.742	1.091	1.031	1.238	1.103	1.300	1.150	1.300	1.118	1.261	1.083	1.227	1.056	1.205
22		0.395	0.719	1.073	1.174	1.246	1.270	1.139	1.312	1.147	1.306	1.141	1.269	1.087	1.228	0.869
20		0.377	0.688	1.023	1.015	1.239	1.096	1.277	1.137	1.305	1.156	1.318	1.130	1.266	0.893	1.222
18		0.333	0.584	0.906	1.085	1.012	1.244	1.114	1.280	1.146	1.307	1.152	1.316	1.116	1.257	1.075
16			0.421	0.652	0.842	1.109	1.027	1.232	1.103	1.278	1.141	1.315	1.156	1.291	1.107	1.251
14				0.427	0.691	0.992	1.100	1.224	1.232	1.112	1.272	1.138	1.297	1.132	1.271	1.108
12				0.289	0.438	0.682	0.850	1.100	1.031	1.241	1.091	1.259	1.093	1.259	1.105	1.262
10						0.526	0.688	0.991	1.107	1.020	1.232	1.233	1.228	1.066	1.225	1.071
8							0.422	0.690	0.843	1.081	1.007	1.166	1.027	1.205	1.023	1.189
6							0.288	0.432	0.652	0.902	1.018	1.069	1.090	1.064	1.080	0.901
4									0.419	0.581	0.686	0.721	0.754	0.762	0.756	0.734
2										0.334	0.380	0.398	0.405	0.483	0.411	0.419

Figure D.6 Browns Ferry Unit 1 Cycle 9 Radial Power Distribution at 17,677.8 MWd/MTU (EOFP)

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	0.419	0.411	0.483	0.405	0.398	0.380	0.334								
58	0.735	0.756	0.762	0.754	0.720	0.686	0.581	0.419							
56	0.899	1.079	1.063	1.090	1.069	1.018	0.901	0.651	0.432	0.288					
54	1.188	1.023	1.204	1.026	1.166	1.007	1.081	0.841	0.689	0.423					
52	1.071	1.225	1.064	1.227	1.233	1.231	1.018	1.107	0.990	0.688	0.527				
50	1.262	1.104	1.259	1.092	1.257	1.089	1.240	1.031	1.100	0.850	0.682	0.440	0.291		
48	1.108	1.270	1.130	1.296	1.135	1.271	1.110	1.231	1.223	1.100	0.992	0.692	0.435		
46	1.250	1.106	1.290	1.153	1.314	1.140	1.277	1.103	1.232	1.027	1.109	0.843	0.653	0.422	
44	1.074	1.256	1.116	1.315	1.151	1.306	1.146	1.280	1.113	1.244	1.012	1.085	0.906	0.584	0.333
42	1.222	0.894	1.266	1.130	1.317	1.156	1.304	1.137	1.277	1.095	1.239	1.015	1.023	0.689	0.379
40	0.868	1.228	1.086	1.268	1.141	1.305	1.146	1.312	1.140	1.270	1.246	1.174	1.073	0.719	0.395
38	1.204	1.056	1.226	1.082	1.260	1.118	1.299	1.148	1.299	1.103	1.238	1.030	1.091	0.742	0.413
36	1.046	1.227	0.865	1.215	1.060	1.249	1.104	1.289	1.130	1.259	1.060	1.202	1.060	0.753	0.471
34	1.187	0.849	1.219	1.031	1.207	0.883	1.240	1.100	1.267	1.093	1.215	1.014	1.071	0.748	0.404
32	0.988	1.176	1.035	1.189	0.857	1.193	1.050	1.235	1.094	1.238	1.051	1.175	0.890	0.725	0.411
30	0.988	1.176	1.036	1.191	0.859	1.194	1.051	1.235	1.094	1.238	1.051	1.175	0.891	0.725	0.411
28	1.187	0.850	1.222	1.044	1.212	0.884	1.241	1.101	1.267	1.095	1.215	1.014	1.071	0.748	0.401
26	1.046	1.228	0.867	1.220	1.077	1.252	1.106	1.289	1.130	1.259	1.060	1.202	1.059	0.752	0.469
24	1.204	1.049	1.226	1.087	1.263	1.119	1.299	1.149	1.299	1.103	1.238	1.029	1.089	0.740	0.400
22	0.868	1.226	1.080	1.268	1.143	1.306	1.141	1.311	1.138	1.270	1.245	1.173	1.070	0.715	0.392
20	1.222	0.893	1.265	1.130	1.318	1.157	1.304	1.137	1.276	1.095	1.238	1.014	1.020	0.682	0.350
18	1.068	1.256	1.115	1.316	1.158	1.307	1.145	1.279	1.112	1.243	1.011	1.084	0.903	0.580	0.328
16	1.250	1.105	1.290	1.154	1.315	1.139	1.277	1.105	1.232	1.026	1.108	0.842	0.651	0.418	
14	1.108	1.270	1.130	1.297	1.137	1.271	1.111	1.231	1.223	1.099	0.991	0.690	0.427		
12	1.262	1.104	1.258	1.092	1.258	1.089	1.240	1.030	1.099	0.847	0.685	0.437	0.289		
10	1.070	1.224	1.064	1.227	1.233	1.231	1.019	1.107	0.991	0.682	0.527				
8	1.188	1.023	1.204	1.025	1.166	1.008	1.081	0.843	0.691	0.439					
6	0.898	1.079	1.063	1.090	1.069	1.018	0.902	0.652	0.433	0.290					
4	0.734	0.756	0.762	0.755	0.721	0.686	0.581	0.419							
2	0.419	0.408	0.484	0.417	0.397	0.380	0.334								

Figure D.6 Browns Ferry Unit 1 Cycle 9 Radial Power Distribution at 17,677.8 MWd/MTU (EOFP) *(Continued)*

Appendix E Browns Ferry Unit 1 Cycle 8 EOC Projection Control Rod Patterns and Core Average Axial Power and Exposure Distributions

```
Cycle:                              8
Exposure: MWd/MTU (GWd)       15913.0 (2169.50 )
Delta E: MWd/MTU, (GWd)         122.4 (  16.69 )
Power: MWt                     3952.0 (114.29 %)
Core Pressure: psia            1050.7
Inlet Subcooling: Btu/lbm      -28.91
Flow: Mlb/hr                   106.21 (103.62 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- --           55
 5        -- -- -- -- -- -- -- -- -- -- --        51
 7     -- -- -- 18 -- 10 -- 10 -- 18 -- -- --     47
 9 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --  43
11 -- -- 18 -- 10 -- 16 -- 16 -- 10 -- 18 -- -- 39
13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 35
15 -- -- -- -- 16 -- 12 -- 12 -- 16 -- -- -- -- 31
17 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27
19 -- -- 18 -- 10 -- 16 -- 16 -- 10 -- 18 -- -- 23
21 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 19
23    -- -- -- 18 -- 10 -- 10 -- 18 -- -- --     15
25       -- -- -- -- -- -- -- -- -- -- --        11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          9.10

k-effective:                 0.99736
Void Fraction:                 0.425
Core Delta-P: psia            25.879
Core Plate Delta-P: psia      21.326
Coolant Temp: Deg-F           548.0
In Channel Flow: Mlb/hr        89.47
Total Bypass Flow (%):          15.8
Total Water Rod Flow (%):       -0.0
Source Convergence           0.00030
```

Core Average Exposure: MWd/MTU 23192.9

	Axial Profile		Edit	Radial Power			
N(PRA)	Power	Exposure	Zone	Avg.	Max.	IR	JR
Top 25	0.177	4.748	3	0.394	0.573	51	50
24	0.572	12.473	4	0.797	0.862	37	34
23	0.801	17.624	5	1.085	1.240	47	30
22	0.978	21.053	6	1.010	1.157	11	20
21	1.095	23.661	7	1.033	1.114	13	22
20	1.159	25.366	9	0.842	0.876	35	58
19	1.175	26.272	10	0.977	1.176	15	28
18	1.178	26.183	11	0.959	1.160	37	20
17	1.159	26.132	12	0.398	0.507	43	58
16	1.092	25.319	13	1.050	1.136	37	50
15	1.032	25.424	14	1.213	1.394	49	30
14	1.067	24.135	15	1.183	1.362	47	28
13	1.036	24.891	16	1.198	1.354	9	28
12	1.021	25.748	17	1.130	1.189	55	28
11	1.017	26.501	18	1.237	1.334	45	30
10	1.026	27.037					
9	1.052	27.130					
8	1.087	27.686					
7	1.129	28.450					
6	1.180	29.070*					
5	1.237	28.957					
4	1.283*	27.161					
3	1.229	22.604					
2	0.943	15.300					
Bottom 1	0.274	4.184					
% AXIAL TILT	-4.133	-4.761					
AVG BOT 8ft/12ft	1.0094	1.0251					

Active Channel Flow: Mlb/hr 89.47
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR							LHGR						
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.394	14	49	30	1.530	0.941	14	49	32	9.59	0.760	22.9	18	25	8	4	10.63	0.904	30.5	18	25	8	4
1.362	15	47	28	1.540	0.935	15	47	34	9.53	0.759	23.5	18	27	8	4	10.46	0.888	30.2	18	33	8	4
1.354	16	9	28	1.566	0.919	16	9	34	9.48	0.753	23.1	18	23	54	4	10.45	0.886	30.1	16	33	10	4
1.334	18	45	30	1.597	0.902	18	15	32	9.18	0.742	25.2	18	29	8	4	10.32	0.877	30.4	16	39	8	4
1.324	18	37	52	1.605	0.897	18	37	10	9.23	0.737	23.8	18	23	10	4	10.37	0.876	29.7	18	23	8	4
1.319	14	11	26	1.612	0.894	14	49	26	9.16	0.733	23.9	16	27	10	4	10.36	0.873	29.5	18	23	10	4
1.314	18	53	30	1.617	0.891	15	15	26	9.12	0.724	23.1	16	21	54	4	9.97	0.871	33.2	18	31	8	4
1.305	16	33	10	1.622	0.888	18	7	32	7.78	0.713	38.0	13	11	24	18	10.32	0.849	26.9	17	33	6	4
1.305	18	35	8	1.633	0.882	15	47	42	7.85	0.709	36.4	13	35	22	19	10.21	0.847	27.9	18	51	24	17
1.305	18	7	28	1.636	0.880	15	17	34	7.61	0.704	38.9	5	35	10	4	10.30	0.840	26.0	18	33	30	20

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 0
* Thermal limit file:

Figure E.1 Browns Ferry Unit 1 Cycle 8 Control Rod Pattern and Axial Distributions at 15,913.0 MWd/MTU

```
Cycle:                              8
Exposure: MWd/MTU (GWd)       16927.6 (2307.80 )
Delta E: MWd/MTU, (GWd)         172.4 (  23.51 )
Power: MWt                     3952.0 (114.29 %)
Core Pressure: psia            1050.4
Inlet Subcooling: Btu/lbm      -29.32
Flow: Mlb/hr                   104.56 (102.01 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 18 -- -- -- -- --       51
 7     -- -- -- -- -- -- -- -- -- -- -- --       47
 9 -- -- -- -- -- 10 -- 10 -- 10 -- -- -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- -- -- 16 -- -- -- 10 -- -- -- 16 -- -- -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- -- -- 16 -- -- -- 10 -- -- -- 16 -- -- -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- -- -- -- 10 -- 10 -- 10 -- -- -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- --    15
25       -- -- -- -- -- 18 -- -- -- -- --       11
27          -- -- -- -- -- -- -- -- --           7
29             -- -- -- -- -- -- --              3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %          5.54

k-effective:                 0.99840
Void Fraction:                 0.454
Core Delta-P: psia            25.826
Core Plate Delta-P: psia      21.273
Coolant Temp: Deg-F           548.3
In Channel Flow: Mlb/hr        87.64
Total Bypass Flow (%):          16.2
Total Water Rod Flow (%):       -0.0
Source Convergence           0.00039
```

Core Average Exposure: MWd/MTU 24207.4

N(PRA)	Axial Profile Power	Axial Profile Exposure	Edit Zone	Radial Power Avg.	Radial Power Max.	IR	JR
Top 25	0.143	4.986	3	0.373	0.555	51	50
24	0.462	13.048	4	0.873	0.936	37	28
23	0.645	18.430	5	1.062	1.175	9	22
22	0.785	22.040	6	1.005	1.210	11	20
21	0.879	24.767	7	1.059	1.172	13	22
20	0.936	26.542	9	0.804	0.835	57	38
19	0.963	27.482	10	0.965	1.174	41	34
18	0.993	27.385	11	0.925	1.215	41	38
17	1.013	27.327	12	0.377	0.487	3	18
16	1.003	26.462	13	1.122	1.164	45	42
15	1.002	26.530	14	1.218	1.324	39	34
14	1.082	25.146	15	1.204	1.336	13	20
13	1.086	25.887	16	1.255	1.337	11	22
12	1.096	26.739	17	1.107	1.157	49	48
11	1.109	27.496	18	1.221	1.329	9	24
10	1.131	28.046					
9	1.163	28.169					
8	1.200	28.758					
7	1.242	29.562					
6	1.297	30.230*					
5	1.372	30.179					
4	1.456*	28.443					
3	1.448	23.855					
2	1.154	16.280					
Bottom 1	0.342	4.467					
% AXIAL TILT	-17.161	-4.635					
AVG BOT 8ft/12ft	1.0972	1.0241					

Active Channel Flow: Mlb/hr 87.64
(of total core flow)
(of total core flow)

Top Ten Thermal Limits Summary - Sorted by Margin

Power Value	FT	IR	JR	MCPR Value	Margin	FT	IR	JR	APLHGR Value	Margin	Exp.	FT	IR	JR	K	LHGR Value	Margin	Exp.	FT	IR	JR	K
1.337	16	11	22	1.636	0.880	15	47	42	9.68	0.755	20.8	15	41	30	4	11.24	0.910	25.3	14	23	32	4
1.336	15	13	20	1.645	0.876	15	41	32	9.66	0.753	18.4	14	37	30	4	11.04	0.904	26.5	15	41	32	4
1.333	15	41	30	1.646	0.875	15	15	40	9.59	0.748	20.2	14	21	28	4	10.94	0.899	26.8	14	39	34	4
1.329	18	9	24	1.646	0.875	18	9	24	9.04	0.735	25.6	18	23	52	4	11.01	0.888	24.8	14	25	34	4
1.329	15	45	40	1.647	0.874	15	41	26	9.11	0.734	24.7	14	9	20	4	10.58	0.875	27.5	15	41	26	4
1.328	15	41	36	1.652	0.872	16	11	22	9.15	0.734	24.1	14	19	52	4	10.14	0.874	31.8	14	41	10	4
1.325	16	45	44	1.666	0.864	15	41	48	9.06	0.734	25.2	16	11	18	4	10.08	0.872	32.2	16	17	50	4
1.324	14	39	34	1.669	0.863	15	17	24	9.10	0.732	24.5	16	17	50	4	9.29	0.871	40.0	10	39	32	4
1.316	15	43	38	1.675	0.859	16	45	44	8.94	0.732	26.4	18	15	48	4	10.13	0.870	31.5	14	9	42	4
1.315	16	43	46	1.676	0.859	18	37	10	9.34	0.732	21.6	15	19	26	4	9.99	0.868	32.6	16	39	8	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 0
* Thermal limit file:

Figure E.2 Browns Ferry Unit 1 Cycle 8 Control Rod Pattern and Axial Distributions at 16,927.6 MWd/MTU

```
Cycle:                              8
Exposure: MWd/MTU (GWd)       17333.4 (2363.20 )
Delta E: MWd/MTU, (GWd)         405.8 (  55.33 )
Power: MWt                     3952.0 (114.29 %)
Core Pressure: psia            1050.4
Inlet Subcooling: Btu/lbm      -29.32
Flow: Mlb/hr                   104.56 (102.01 %)

    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29
 1              -- -- -- -- -- -- --              59  :JR
 3           -- -- -- -- -- -- -- -- -- --        55
 5        -- -- -- -- -- 18 -- -- -- -- --        51
 7     -- -- -- -- -- -- -- -- -- -- -- --        47
 9 -- -- -- -- -- 10 -- 10 -- 10 -- -- -- -- -- 43
11 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 39
13 -- -- -- 16 -- -- -- 10 -- -- -- 16 -- -- -- 35
15 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 31
17 -- -- -- 16 -- -- -- 10 -- -- -- 16 -- -- -- 27
19 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- 23
21 -- -- -- -- -- 10 -- 10 -- 10 -- -- -- -- -- 19
23    -- -- -- -- -- -- -- -- -- -- -- -- -- --    15
25       -- -- -- -- -- -- 18 -- -- -- -- -- --       11
27          -- -- -- -- -- -- -- -- -- --             7
29             -- -- -- -- -- -- -- --                3
IR: 2  6 10 14 18 22 26 30 34 38 42 46 50 54 58

Control Rod Density: %            5.54

k-effective:                   0.99676
Void Fraction:                   0.451
Core Delta-P: psia              25.778
Core Plate Delta-P: psia        21.225
Coolant Temp: Deg-F             548.2
In Channel Flow: Mlb/hr          87.67
Total Bypass Flow (%):           16.2
Total Water Rod Flow (%):        -0.0
Source Convergence             0.00043
```

```
Core Average Exposure: MWd/MTU    24613.2

                 Axial Profile     Edit   Radial Power
N(PRA)  Power  Exposure           Zone   Avg.   Max.   IR JR
Top 25  0.146    5.071             3   0.373 0.555   49 52
    24  0.472   13.251             4   0.874 0.935   37 28
    23  0.656   18.714             5   1.060 1.174    9 22
    22  0.797   22.387             6   1.004 1.208   11 20
    21  0.890   25.156             7   1.058 1.168   13 22
    20  0.946   26.956             9   0.804 0.834   57 38
    19  0.972   27.908            10   0.964 1.169   41 34
    18  1.001   27.817            11   0.925 1.210   41 38
    17  1.022   27.768            12   0.377 0.487    3 18
    16  1.013   26.898            13   1.119 1.161   15 20
    15  1.013   26.966            14   1.220 1.324   39 34
    14  1.095   25.554            15   1.203 1.334   13 20
    13  1.098   26.296            16   1.256 1.336   11 22
    12  1.108   27.153            17   1.109 1.157   49 48
    11  1.120   27.914            18   1.223 1.330    9 24
    10  1.139   28.472
     9  1.167   28.608
     8  1.197   29.211
     7  1.230   30.031
     6  1.275   30.720*
     5  1.340   30.697
     4  1.417*  28.993
     3  1.414   24.403
     2  1.136   16.717
Bottom  1  0.337   4.594

% AXIAL TILT -16.128  -4.713
AVG BOT 8ft/12ft  1.0922  1.0246

Active Channel Flow: Mlb/hr        87.67
(of total core flow)
(of total core flow)
```

Top Ten Thermal Limits Summary - Sorted by Margin

Power				MCPR					APLHGR						LHGR					
Value	FT	IR	JR	Value	Margin	FT	IR	JR	Value	Margin	Exp.	FT	IR	JR	K	Value	Margin	Exp.	FT	IR	JR	K
1.336	16	11	22	1.636	0.880	15	47	42	9.55	0.745	19.2	14	37	30	4	11.04	0:903	26.2	14	23	32	4
1.334	15	13	20	1.644	0.876	18	9	24	9.47	0.742	21.6	15	41	30	4	10.74	0.888	27.4	15	41	32	4
1.330	15	41	30	1.646	0.875	15	41	32	9.42	0.735	21.1	14	21	28	4	10.67	0.884	27.7	14	39	34	4
1.330	18	9	24	1.646	0.875	15	15	40	8.80	0.720	26.4	18	23	52	4	10.84	0.882	25.7	14	25	34	4
1.325	15	41	36	1.648	0.874	15	41	26	8.92	0.720	24.9	14	19	52	4	10.29	0.858	28.4	15	41	26	4
1.325	15	45	40	1.649	0.873	16	11	22	9.11	0.719	22.4	15	19	26	4	9.07	0.857	40.8	10	39	32	4
1.324	14	39	34	1.664	0.866	15	41	48	8.85	0.718	25.5	14	9	20	4	10.33	0.856	27.8	16	23	26	4
1.323	16	45	44	1.670	0.862	15	17	24	8.85	0.717	25.3	16	17	50	4	9.84	0.855	32.7	14	41	10	4
1.314	16	43	46	1.670	0.862	18	37	10	8.79	0.717	26.0	16	11	18	4	9.76	0.852	33.1	16	17	50	4
1.312	15	41	14	1.674	0.860	16	45	44	8.67	0.715	27.2	18	15	48	4	9.80	0.850	32.4	14	9	42	4

* LHGR calculated with pin-power reconstruction
* CPR calculated with pin-power reconstruction & CPR limit type 0
* Thermal limit file:

Figure E.3 Browns Ferry Unit 1 Cycle 8 Control Rod Pattern and Axial Distributions at 17,333.4 MWd/MTU

Distribution

Controlled Distribution

Richland

JM Haun, 34
G Touvannas, 34

E-Mail Notification

DE Garber
ME Garrett
DP Jordheim
DB McBurney
AB Meginnis
MS Stricker
RS Schnepp
SA Tylinski