Attachment 1

GEH Report 0000-0105-6621-SRLR, Revision 0
Hope Creek Cycle 17
Supplemental Reload Licensing Report (SRLR)

Global Nuclear Fuel

A Joint Venture of GE, Toshiba, & Hitachi

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Supplemental Reload Licensing Report

for

Hope Creek Unit 1

Reload 16 Cycle 17

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Acknowledgement

The engineering and reload licensing analyses, which form the technical basis of this Supplemental Reload Licensing Report, were performed by GNF-A/GEH Nuclear Analysis personnel. The Supplemental Reload Licensing Report was prepared by J. Su. This document has been verified by George Baka.

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The basis for this report is *General Electric Standard Application for Reactor Fuel*, NEDE-24011-P-A-16, October 2007; and the U.S. Supplement, NEDE-24011-P-A-16-US, October 2007.

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2. Reload Fuel Bundles

Fuel Type	Cycle Loaded	Number
Irradiated:		
GE14-P10CNAB402-5G6.0/14G4.0-100T-150-T6-2758 (GE14C)	13	4
GE14-P10CNAB393-18G4.0-100T-150-T6-2885 (GE14C)	14	80
GE14-P10CNAB393-18GZ-100T-150-T6-2884 (GE14C)	14	16
GE14-P10CNAB396-17GZ-100T-150-T6-3007 (GE14C)	15	48
GE14-P10CNAB405-15GZ-100T-150-T6-3009 (GE14C)	15	56
GE14-P10CNAB398-17GZ-100T-150-T6-3008 (GE14C)	15	96
GE14-P10CNAB400-14GZ-100T-150-T6-3006 (GE14C)	15	28
GE14-P10CNAB400-9G6.0/6G4.0-100T-150-T6-3176 (GE14C)	16	176
GE14-P10CNAB400-14GZ-100T-150-T6-3006 (GE14C)	16	52
New:		
GE14I-P10CCOB379-13GZ-100T-150-T6-3309 (GE14I)	17	12
GE14-P10CNAB405-6G6.0/11G4.0-100T-150-T6-3313 (GE14C)	17	72
GE14-P10CNAB402-12G6.0/2G4.0-100T-150-T6-3312 (GE14C)	17	124
Total:		**764**

3. Reference Core Loading Pattern

	Core Average Exposure	Cycle Exposure
Nominal previous end-of-cycle exposure:	33432 MWd/MT (30329 MWd/ST)	14467 MWd/MT (13124 MWd/ST)
Minimum previous end-of-cycle exposure (for cold shutdown considerations):	33101 MWd/MT (30029 MWd/ST)	14136 MWd/MT (12824 MWd/ST)
Assumed reload beginning-of-cycle exposure:	20404 MWd/MT (18510 MWd/ST)	0 MWd/MT (0 MWd/ST)
Assumed reload end-of-cycle exposure (rated conditions):	33069 MWd/MT (30000 MWd/ST)	12666 MWd/MT (11490 MWd/ST)
Reference core loading pattern:	Figure 1	

4. Core Reactivity and Control System Worth - No Voids, 20°C

Beginning of Cycle, $k_{effective}$	
Uncontrolled	1.112
Fully controlled	0.954
Strongest control rod out	0.989
R, Maximum increase in strongest rod out reactivity during the cycle (Δk)	0.001
Cycle exposure at which R occurs	11574 MWd/MT (10500 MWd/ST)

5. Standby Liquid Control System Shutdown Capability

Boron (ppm) (at 20°C)	Shutdown Margin (Δk) (at 160°C, Xenon Free)	
	Analytical Requirement	Achieved
660	≥0.010	0.021

6. Reload Unique GETAB AOO Analysis - Initial Condition Parameters [1]

Operating domain: ICF (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.42	1.27	1.040	6.939	104.0	1.35

Operating domain: ICF (HBB)
Exposure range : MOC to EOC (Application Condition: 1, 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.34	1.34	1.040	6.560	108.5	1.37

Operating domain: ICF (UB)
Exposure range : MOC to EOC (Application Condition: 1, 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.42	1.28	1.040	6.964	103.8	1.35

Operating domain: MELLLA (UB)
Exposure range : MOC to EOC (Application Condition: 1, 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.39	1.27	1.040	6.805	93.5	1.34

[1] Exposure range designation is defined in Table 7-1. Application condition number is defined in Section 11.

Operating domain: ICF & FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.52	1.31	1.040	7.422	100.2	1.30

Operating domain: ICF & FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.44	1.33	1.040	7.026	105.9	1.32

Operating domain: ICF & FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.49	1.31	1.040	7.297	101.8	1.33

Operating domain: MELLLA & FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.47	1.29	1.040	7.150	91.4	1.31

Operating domain: ICF with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.39	1.27	1.040	6.809	104.8	1.38

Operating domain: ICF with RPTOOS (HBB) Exposure range : MOC to EOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.32	1.34	1.040	6.483	108.9	1.39

Operating domain: ICF with RPTOOS (UB) Exposure range : MOC to EOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.40	1.28	1.040	6.840	104.6	1.38

Operating domain: MELLLA with RPTOOS (UB) Exposure range : MOC to EOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.37	1.27	1.040	6.715	94.0	1.36

Operating domain: ICF & FWTR with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.50	1.31	1.040	7.330	100.9	1.32

Operating domain: ICF & FWTR with RPTOOS (HBB)
Exposure range : MOC to EOC (Application Condition: 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.42	1.33	1.040	6.921	106.6	1.35

Operating domain: ICF & FWTR with RPTOOS (UB)
Exposure range : MOC to EOC (Application Condition: 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.48	1.31	1.040	7.202	102.5	1.35

Operating domain: MELLLA & FWTR with RPTOOS (UB)
Exposure range : MOC to EOC (Application Condition: 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.45	1.29	1.040	7.050	92.1	1.33

Operating domain: MELLLA (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.37	1.26	1.040	6.727	94.2	1.34

Operating domain: MELLLA (HBB)
Exposure range : MOC to EOC (Application Condition: 1, 2)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.31	1.33	1.040	6.399	97.8	1.36

Operating domain: MELLLA & FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.48	1.30	1.040	7.241	90.4	1.29

Operating domain: MELLLA & FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.40	1.32	1.040	6.855	95.4	1.31

Operating domain: MELLLA with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.36	1.26	1.040	6.638	94.7	1.37

Operating domain: MELLLA with RPTOOS (HBB) Exposure range : MOC to EOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.29	1.33	1.040	6.339	98.2	1.38

Operating domain: MELLLA & FWTR with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.46	1.30	1.040	7.126	91.1	1.31

Operating domain: MELLLA & FWTR with RPTOOS (HBB) Exposure range : MOC to EOC (Application Condition: 2)							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.39	1.32	1.040	6.765	96.0	1.34

7. Selected Margin Improvement Options [2]

Recirculation pump trip:	Yes
Rod withdrawal limiter:	No
Thermal power monitor:	Yes
Improved scram time:	Yes (ODYN Option B)
Measured scram time:	No
Exposure dependent limits:	Yes
Exposure points analyzed:	2

[2] Refer to the GESTAR basis document identified at the beginning of this report for the margin improvement options currently supported therein.

Table 7-1 Cycle Exposure Range Designation

Name	Exposure Range [3]
BOC to MOC	BOC17 to EOR17-3216 MWd/MT (2917 MWd/ST)
MOC to EOC	EOR17-3216 MWd/MT (2917 MWd/ST) to EOC17
BOC to EOC	BOC17 to EOC17

8. Operating Flexibility Options [4]

The following information presents the operational domains and flexibility options which are supported by the reload licensing analysis.

Extended Operating Domain (EOD):	Yes
EOD type: Maximum Extended Load Line Limit (MELLLA)	
Minimum core flow at rated power:	94.8 %
Increased Core Flow:	Yes
Flow point analyzed throughout cycle:	105.0 %
Feedwater Temperature Reduction:	Yes
Feedwater temperature reduction during cycle:	60.0°F
Final feedwater temperature reduction:	102.0°F
ARTS Program:	Yes
Single Loop Operation:	Yes
Equipment Out of Service:	
Safety/relief valves Out of Service: (credit taken for 13 valves)	Yes
RPTOOS	Yes

[3] End of Rated (EOR) is defined as the cycle exposure corresponding to all rods out, 100% power/100% flow, and normal feedwater temperature. For plants without mid-cycle OLMCPR points, EOR is not applicable.
[4] Refer to the GESTAR basis document identified at the beginning of this report for the operating flexibility options currently supported therein.

9. Core-wide AOO Analysis Results [5]

Methods used: GEMINI, GEXL-PLUS

Operating domain: ICF (HBB) **Exposure range : BOC to MOC (Application Condition: 1, 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	210	110	0.20	2
Load Rejection w/o Bypass	319	115	0.27	3
Turbine Trip w/o Bypass	292	112	0.26	4

Operating domain: ICF (HBB) **Exposure range : MOC to EOC (Application Condition: 1, 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	307	119	0.23	5
Load Rejection w/o Bypass	442	123	0.28	6
Turbine Trip w/o Bypass	397	120	0.28	7

Operating domain: ICF (UB) **Exposure range : MOC to EOC (Application Condition: 1, 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	218	111	0.21	8
Load Rejection w/o Bypass	332	115	0.27	9
Turbine Trip w/o Bypass	307	113	0.26	10

[5] Exposure range designation is defined in Table 7-1. Application condition number is defined in Section 11.

Operating domain: MELLLA (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	192	108	0.19	11
Load Rejection w/o Bypass	273	112	0.26	12
Turbine Trip w/o Bypass	263	110	0.24	13

Operating domain: ICF & FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	214	114	0.22	14

Operating domain: ICF & FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	321	123	0.24	15

Operating domain: ICF & FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	249	117	0.24	16

Operating domain: MELLLA & FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	224	114	0.22	17

Operating domain: ICF with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	238	113	0.24	18
Load Rejection w/o Bypass	351	118	0.30	19
Turbine Trip w/o Bypass	335	116	0.29	20

Operating domain: ICF with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	338	121	0.26	21
Load Rejection w/o Bypass	479	125	0.30	22
Turbine Trip w/o Bypass	440	124	0.30	23

Operating domain: ICF with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	250	114	0.24	24
Load Rejection w/o Bypass	365	118	0.30	25
Turbine Trip w/o Bypass	352	116	0.29	26

Operating domain: MELLLA with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	210	111	0.22	27
Load Rejection w/o Bypass	291	115	0.28	28
Turbine Trip w/o Bypass	295	113	0.27	29

Operating domain: ICF & FWTR with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	241	117	0.25	30

Operating domain: ICF & FWTR with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	351	126	0.27	31

Operating domain: ICF & FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	278	120	0.27	32

Operating domain: MELLLA & FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	244	116	0.24	33

Operating domain: MELLLA (HBB) **Exposure range : BOC to MOC (Application Condition: 1, 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	194	109	0.20	34
Load Rejection w/o Bypass	280	112	0.26	35
Turbine Trip w/o Bypass	264	110	0.25	36

Operating domain: MELLLA (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	281	117	0.23	37
Load Rejection w/o Bypass	402	120	0.28	38
Turbine Trip w/o Bypass	357	118	0.27	39

Operating domain: MELLLA & FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	198	112	0.21	40

Operating domain: MELLLA & FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	304	121	0.24	41

Operating domain: MELLLA with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	212	112	0.22	42
Load Rejection w/o Bypass	299	115	0.28	43
Turbine Trip w/o Bypass	295	113	0.27	44

Operating domain: MELLLA with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	300	119	0.25	45
Load Rejection w/o Bypass	429	123	0.30	46
Turbine Trip w/o Bypass	387	121	0.29	47

Operating domain: MELLLA & FWTR with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	217	114	0.23	48

Operating domain: MELLLA & FWTR with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR	
Event	**Flux (% rated)**	**Q/A (% rated)**	**GE14C**	**Fig.**
FW Controller Failure	326	123	0.25	49

10. Rod Withdrawal Error AOO Summary

The ARTS based rod withdrawal error is an unblocked basis. The unblocked rod withdrawal error results are summarized below.

RWE Results:

RBM Setpoint (%)	**ΔCPR**
Unblocked	0.19

11. Cycle SLMCPR and OLMCPR Summary [6 7 8 9]

Two Loop Operation (TLO) safety limit:	1.08
Single Loop Operation (SLO) safety limit:	1.10
Stability MCPR Design Basis:	See Section 15
ECCS MCPR Design Basis:	See Section 16 (Initial MCPR)

Non-pressurization Events:

Exposure range: BOC to EOC	
	All Fuel Types
Rod Withdrawal Error (Unblocked)	1.27
Loss of Feedwater Heating	1.23
Fuel Loading Error (Mislocated)	Not Limiting
Fuel Loading Error (Misoriented)	1.24
Rated Equivalent SLO Pump Seizure [10]	1.29

[6] Exposure range designation is defined in Table 7-1.
[7] For SLO, the MCPR operating limit is 0.02 greater than the two loop value.
[8] The safety limit values presented include a 0.02 adder in accordance with extended operating domain licensing commitments.
[9] The OLMCPR values presented in the Limiting Pressurization Events summary table have been adjusted to include a 0.01 adder in accordance with extended operating domain licensing commitments. OLMCPR values presented in the detailed Pressurization Event tables do NOT include this adjustment.
[10] The cycle-independent OLMCPR for the recirculation pump seizure event for GE14C is 1.48 based on the cycle-specific SLO SLMCPR. When adjusted for the off-rated power/flow conditions of SLO, this limit corresponds to a rated OLMCPR of 1.29. This limit does not require an adjustment for the SLO SLMCPR.

Limiting Pressurization Events OLMCPR Summary Table: [11]

Appl. Cond.	Exposure Range	Option A	Option B
		GE14C	GE14C
1	**Equipment In Service**		
	BOC to MOC	1.49	1.38
	MOC to EOC	1.60	1.43
2	**RPTOOS**		
	BOC to MOC	1.51	1.40
	MOC to EOC	1.62	1.45

Pressurization Events: [12]

Operating domain: ICF (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.41	1.30
Load Rejection w/o Bypass	1.48	1.37
Turbine Trip w/o Bypass	1.47	1.36

Operating domain: ICF (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.53	1.36
Load Rejection w/o Bypass	1.59	1.42
Turbine Trip w/o Bypass	1.58	1.41

[11] Each application condition (Appl. Cond.) covers the entire range of licensed flow and feedwater temperature unless specified otherwise. The OLMCPR values presented apply to rated power operation based on the two loop operation safety limit MCPR.
[12] Application condition numbers shown for each of the following pressurization events represent the application conditions for which this event contributed in the determination of the limiting OLMCPR value.

Operating domain: ICF (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.51	1.34
Load Rejection w/o Bypass	1.58	1.41
Turbine Trip w/o Bypass	1.57	1.40

Operating domain: MELLLA (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.49	1.32
Load Rejection w/o Bypass	1.56	1.39
Turbine Trip w/o Bypass	1.55	1.38

Operating domain: ICF & FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.43	1.32

Operating domain: ICF & FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.55	1.38

Operating domain: ICF & FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2)		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.55	1.38

Operating domain: MELLLA & FWTR (UB) **Exposure range : MOC to EOC (Application Condition: 1, 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.53	1.36

Operating domain: ICF with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.44	1.33
Load Rejection w/o Bypass	1.50	1.39
Turbine Trip w/o Bypass	1.50	1.39

Operating domain: ICF with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.56	1.39
Load Rejection w/o Bypass	1.61	1.44
Turbine Trip w/o Bypass	1.61	1.44

Operating domain: ICF with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.55	1.38
Load Rejection w/o Bypass	1.61	1.44
Turbine Trip w/o Bypass	1.60	1.43

Operating domain: MELLLA with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.52	1.35
Load Rejection w/o Bypass	1.59	1.42
Turbine Trip w/o Bypass	1.58	1.41

Operating domain: ICF & FWTR with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.46	1.35

Operating domain: ICF & FWTR with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.57	1.40

Operating domain: ICF & FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.57	1.40

Operating domain: MELLLA & FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.55	1.38

Operating domain: MELLLA (HBB) **Exposure range : BOC to MOC (Application Condition: 1, 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.40	1.29
Load Rejection w/o Bypass	1.47	1.36
Turbine Trip w/o Bypass	1.46	1.35

Operating domain: MELLLA (HBB) **Exposure range : MOC to EOC (Application Condition: 1, 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.53	1.36
Load Rejection w/o Bypass	1.58	1.41
Turbine Trip w/o Bypass	1.58	1.41

Operating domain: MELLLA & FWTR (HBB) **Exposure range : BOC to MOC (Application Condition: 1, 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.42	1.31

Operating domain: MELLLA & FWTR (HBB) **Exposure range : MOC to EOC (Application Condition: 1, 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.54	1.37

Operating domain: MELLLA with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.43	1.32
Load Rejection w/o Bypass	1.49	1.38
Turbine Trip w/o Bypass	1.48	1.37

Operating domain: MELLLA with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.55	1.38
Load Rejection w/o Bypass	1.60	1.43
Turbine Trip w/o Bypass	1.60	1.43

Operating domain: MELLLA & FWTR with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.44	1.33

Operating domain: MELLLA & FWTR with RPTOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GE14C	**GE14C**
FW Controller Failure	1.55	1.38

12. Overpressurization Analysis Summary

Event	Psl (psig)	Pdome (psig)	Pv (psig)	Plant Response
MSIV Closure (Flux Scram) - ICF (HBB)	1261	1267	1288	Figure 50
MSIV Closure (Flux Scram) - MELLLA (HBB)	1263	1268	1288	Figure 51

13. Fuel Loading Error Results

Variable water gap misoriented bundle analysis: Yes [13]

Misoriented Fuel Bundle	ΔCPR
GE14-P10CNAB400-9G6.0/6G4.0-100T-150-T6-3176 (GE14C)	0.14
GE14-P10CNAB400-14GZ-100T-150-T6-3006 (GE14C)	0.15
GE14-P10CNAB402-12G6.0/2G4.0-100T-150-T6-3312 (GE14C)	0.14
GE14-P10CNAB405-6G6.0/11G4.0-100T-150-T6-3313 (GE14C)	0.16
GE14I-P10CCOB379-13GZ-100T-150-T6-3309 (GE14I)	0.11

[13] Includes a 0.02 penalty due to variable water gap R-factor uncertainty.

14. Control Rod Drop Analysis Results

Banked Position Withdrawal Sequence is utilized at Hope Creek Generating Station Unit 1; therefore, the control rod drop accident analysis is not required. NRC approval is documented in NEDE-24011-P-A-US.

15. Stability Analysis Results

15.1 Stability Option III Solution

Hope Creek has implemented BWROG Long Term Stability Solution Option III using the Oscillation Power Range Monitor (OPRM) as described in Reference 1 in Section 15.4. The plant specific Hot Channel Oscillation Magnitude (HCOM) (Reference 2 in Section 15.4) and other cycle specific stability parameters are used in the Cycle 17 Option III stability evaluation. Backup Stability Protection (BSP) regions are used by the plant in the event that the Option III OPRM system is declared inoperable.

The following Option III OPRM stability setpoint determination described in Section 15.2 and the implementation of the associated BSP Regions described in Section 15.3 provide the stability licensing bases for Hope Creek Cycle 17.

15.2 Detect and Suppress Evaluation

A reload Option III evaluation has been performed in accordance with the licensing methodology described in Reference 3 in Section 15.4. The stability based OLMCPR is determined for two conditions as a function of OPRM amplitude setpoint. The two conditions evaluated are: (1) a postulated oscillation at 45% rated core flow quasi steady-state operation (SS), and (2) a postulated oscillation following a two recirculation pump trip (2PT) from the limiting rated power operation state point.

The OPRM-setpoint-dependent OLMCPR(SS) and OLMCPR(2PT) values are calculated for Cycle 17 in accordance with the BWROG regional mode DIVOM guidelines described in Reference 4 in Section 15.4. The Cycle 17 Option III evaluation provides adequate protection against violation of the SLMCPR for the two postulated reactor instability events as long as the plant OLMCPR is equal to or greater than OLMCPR(SS) and OLMCPR(2PT) for the selected OPRM setpoint in Table 15-2.

The relationship between the OPRM Successive Confirmation Count Setpoint and the OPRM Amplitude Setpoint is provided in Reference 3 in Section 15.4 and Table 15-1. For intermediate OPRM Amplitude Setpoints, the corresponding OPRM Successive Confirmation Count Setpoints have been obtained by using linear interpolation.

The OPRM setpoints for TLO are conservative relative to SLO and are, therefore, bounding.

Table 15-1 Relationship between OPRM Successive Confirmation Count Setpoint and OPRM Amplitude Setpoint

Successive Confirmation Count Setpoint	OPRM Amplitude Setpoint
6	≥1.04
8	≥1.05
9	≥1.06
10	≥1.07
11	≥1.08
12	≥1.09
13	≥1.10
14	≥1.11
15	≥1.13
16	≥1.14
17	≥1.16
18	≥1.18
19	≥1.21
20	≥1.24

Table 15-2 OPRM Setpoint Versus OLMCPR[14]

OPRM Amplitude Setpoint	OLMCPR(SS)	OLMCPR(2PT)
1.05	1.281	1.235
1.06	1.307	1.261
1.07	1.337	1.290
1.08	1.369	1.321
1.09	1.394	1.345
1.10	1.410	1.360
1.11	1.427	1.376
1.12	1.444	1.393
1.13	1.461	1.410
1.14	1.479	1.427
OLMCPR Acceptance Criteria	**Off-rated OLMCPR @45% flow**	**Rated Power OLMCPR (see Section 11)**

15.3 Backup Stability Protection

The BSP region boundaries were calculated for Hope Creek Cycle 17 for normal and reduced feedwater temperature operation. The endpoints of the regions are defined in Table 15-3. The region boundaries, shown in Figure 52, are defined using the Generic Shape Function (GSF). See Reference 5 in Section 15.4.

[14] The OLMCPR values presented in the OPRM Setpoint Versus OLMCPR table have been adjusted to include a 0.01 adder in accordance with extended operating domain licensing commitments in Reference 6 (in Section 15.4) to prevent a setpoint credit as described by MFN08-693.

Table 15-3 BSP Region Intercepts for Normal Feedwater Temperature

Region Boundary Intercept	Power (%)	Flow (%)	Core DR	Highest Channel DR
A1	58.2	40.0	< 0.799	< 0.437
B1	44.7	35.0	< 0.798	< 0.447
A2	66.4	50.0	< 0.799	< 0.404
B2	32.2	36.3	< 0.790	< 0.391

Appendix H contains the BSP region boundaries for reduced feedwater temperature operation. Appendix I contains the calculated BSP region end points and decay ratios for Nominal Feedwater Temperature.

The OPRM Trip-Enabled Region for Nominal Feedwater Temperature and FWHOOS is confirmed to be less than or equal to 60% rated core flow and greater than or equal to 26.1% rated power. Also, the OPRM Trip-Enabled region for up to 88°F FFWTR is confirmed to be less than or equal to 60% rated core flow and greater than or equal to 26.1% rated power.

15.4 References

1. *BWR Owners' Group Long-term Stability Solutions Licensing Methodology*, NEDO-31960-A, November 1995 (including Supplement 1).

2. *Reactor Long-Term Stability Solution Option III: Licensing Basis Hot Channel Oscillation Magnitude for Hope Creek*, GENE-A13-00381-04, R1, September 2004.

3. *Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, Licensing Topical Report*, NEDO-32465-A, August 1996.

4. *Plant-Specific Regional Mode DIVOM Procedure Guideline*, GE-NE-0000-0028-9714-R1, June 2005.

5. *Backup Stability Protection (BSP) for Inoperable Option III Solution*, OG-02-0119-260, July 2002.

6. *Final Safety Evaluation by the Office of Nuclear Reactor Regulation, Licensing Topical Report NEDC-33173P, Applicability of GE Methods to Expanded Operating Domains*, July 2009.

16. Loss-of-Coolant Accident Results

16.1 10CFR50.46 Licensing Results

The ECCS-LOCA analysis is based on the SAFER/GESTR-LOCA methodology. The licensing results applicable to each fuel type in the new cycle are summarized in the following table.

Table 16.1-1 Licensing Results

Fuel Type	Licensing Basis PCT (°F)	Local Oxidation (%)	Core-Wide Metal-Water Reaction (%)
GE14C	1380	< 1.00	< 0.10
GE14I	1380	< 1.00	< 0.10

The SAFER/GESTR-LOCA analysis results are documented in Section 5 of Reference 1 for GE14C in Section 16.4.

This core contains GE14I Isotope Test Assemblies (ITAs), and the GE14C Licensing Results are applicable to these ITAs as described in the Technical Evaluation documented by Reference 1 for GE14I in Section 16.4.

16.2 10CFR50.46 Error Evaluation

The 10CFR50.46 errors applicable to the Licensing Basis PCT are shown in the following table.

Table 16.2-1 Impact on Licensing Basis Peak Cladding Temperature for GE14C

10CFR50.46 Error Notifications		
Number	**Subject**	**PCT Impact (°F)**
2006-01	Impact of Top Peaked Power Shape on Small Break LOCA Analysis	0
	Total PCT Adder (°F)	0

The GE14C Licensing Basis PCT remains below the 10CFR50.46 limit of 2200 °F.

The GE14C 10CFR50.46 errors are applicable to the GE14I ITAs as described in the Technical Evaluation documented by Reference 1 for GE14I in Section 16.4, and the GE14I Licensing Basis PCT remains below 2200 °F.

16.3 ECCS-LOCA Operating Limits

The ECCS-LOCA MAPLHGR operating limits for the fuel bundles in this cycle are shown in the tables below.

Table 16.3-1 MAPLHGR Limits

Bundle Type(s): GE14-P10CNAB400-9G6.0/6G4.0-100T-150-T6-3176 (GE14C)
GE14-P10CNAB400-14GZ-100T-150-T6-3006 (GE14C)
GE14-P10CNAB402-12G6.0/2G4.0-100T-150-T6-3312 (GE14C)
GE14-P10CNAB405-6G6.0/11G4.0-100T-150-T6-3313 (GE14C)
GE14I-P10CCOB379-13GZ-100T-150-T6-3309 (GE14I)
GE14-P10CNAB402-5G6.0/14G4.0-100T-150-T6-2758 (GE14C)
GE14-P10CNAB396-17GZ-100T-150-T6-3007 (GE14C)
GE14-P10CNAB393-18G4.0-100T-150-T6-2885 (GE14C)
GE14-P10CNAB405-15GZ-100T-150-T6-3009 (GE14C)
GE14-P10CNAB393-18GZ-100T-150-T6-2884 (GE14C)
GE14-P10CNAB398-17GZ-100T-150-T6-3008 (GE14C)

Average Planar Exposure		MAPLHGR Limit
GWd/MT	GWd/ST	kW/ft
0.00	0.00	12.82
16.00	14.51	12.82
21.09	19.13	12.82
63.50	57.61	8.00
70.00	63.50	5.00

The single loop operation multiplier on LHGR and MAPLHGR, and the ECCS-LOCA analytical initial MCPR value, applicable to each fuel type in the new cycle core are shown in the table below.

Table 16.3-2 Initial MCPR and Single Loop Operation Multiplier on LHGR and MAPLHGR

Fuel Type	Initial MCPR	Single Loop Operation Multiplier on LHGR and MAPLHGR
GE14C	1.250	0.80
GE14I	1.250	0.80

The ECCS-LOCA MAPLHGR limits bound a feedwater temperature reduction of 102 °F for both the GE14C and GE14I fuel types.

The GE14C 10CFR50.46 initial MCPR and single loop operation multiplier on LHGR and MAPLHGR are applicable to the GE14I ITAs as described in the Technical Evaluation documented by Reference 1 for GE14I in Section 16.4.

16.4 References

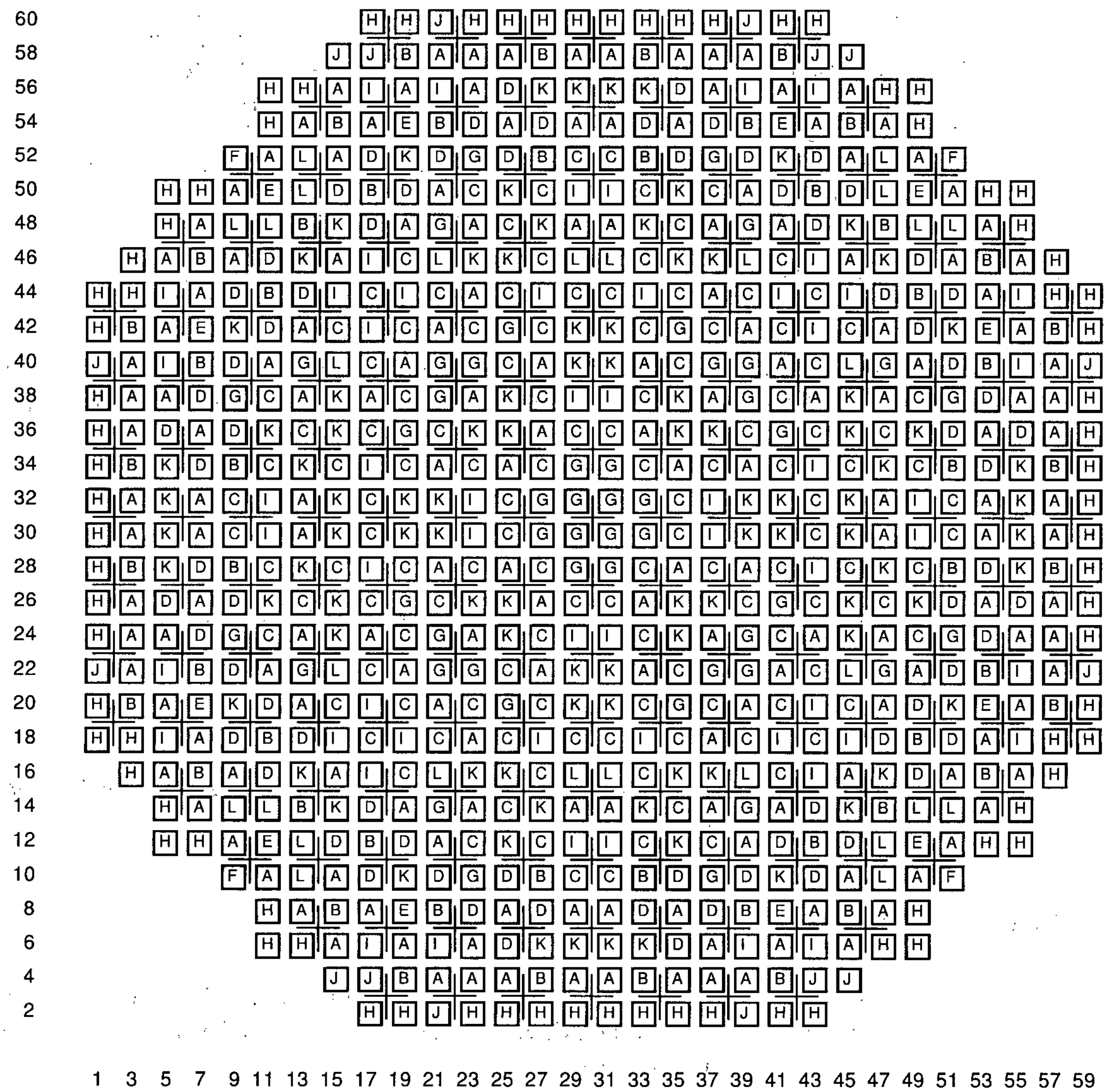
The SAFER/GESTR-LOCA analysis base reports applicable to the new cycle core are listed below.

References for GE14C

1. *SAFER/GESTR-LOCA Loss of Coolant Accident Analysis for Hope Creek Generating Station at Power Uprate* NEDC-33172P, Revision 0, March 2005.

References for GE14I

1. *Safety Analysis Report to Support Introduction of GE14i Isotope Test Assemblies (ITAs) in Hope Creek Generating Station*, NEDC-33529P, Rev. 0, December 2009; and *Errata and Addenda Number 1*, June 10, 2010.



Fuel Type	
A=GE14-P10CNAB400-9G6.0/6G4.0-100T-150-T6-3176 (Cycle 16)	G=GE14-P10CNAB396-17GZ-100T-150-T6-3007 (Cycle 15)
B=GE14-P10CNAB400-14GZ-100T-150-T6-3006 (Cycle 16)	H=GE14-P10CNAB393-18G4.0-100T-150-T6-2885 (Cycle 14)
C=GE14-P10CNAB402-12G6.0/2G4.0-100T-150-T6-3312 (Cycle 17)	I=GE14-P10CNAB405-15GZ-100T-150-T6-3009 (Cycle 15)
D=GE14-P10CNAB405-6G6.0/11G4.0-100T-150-T6-3313 (Cycle 17)	J=GE14-P10CNAB393-18GZ-100T-150-T6-2884 (Cycle 14)
E=GE14I-P10CCOB379-13GZ-100T-150-T6-3309 (Cycle 17)	K=GE14-P10CNAB398-17GZ-100T-150-T6-3008 (Cycle 15)
F=GE14-P10CNAB402-5G6.0/14G4.0-100T-150-T6-2758 (Cycle 13)	L=GE14-P10CNAB400-14GZ-100T-150-T6-3006 (Cycle 15)

Figure 1 Reference Core Loading Pattern

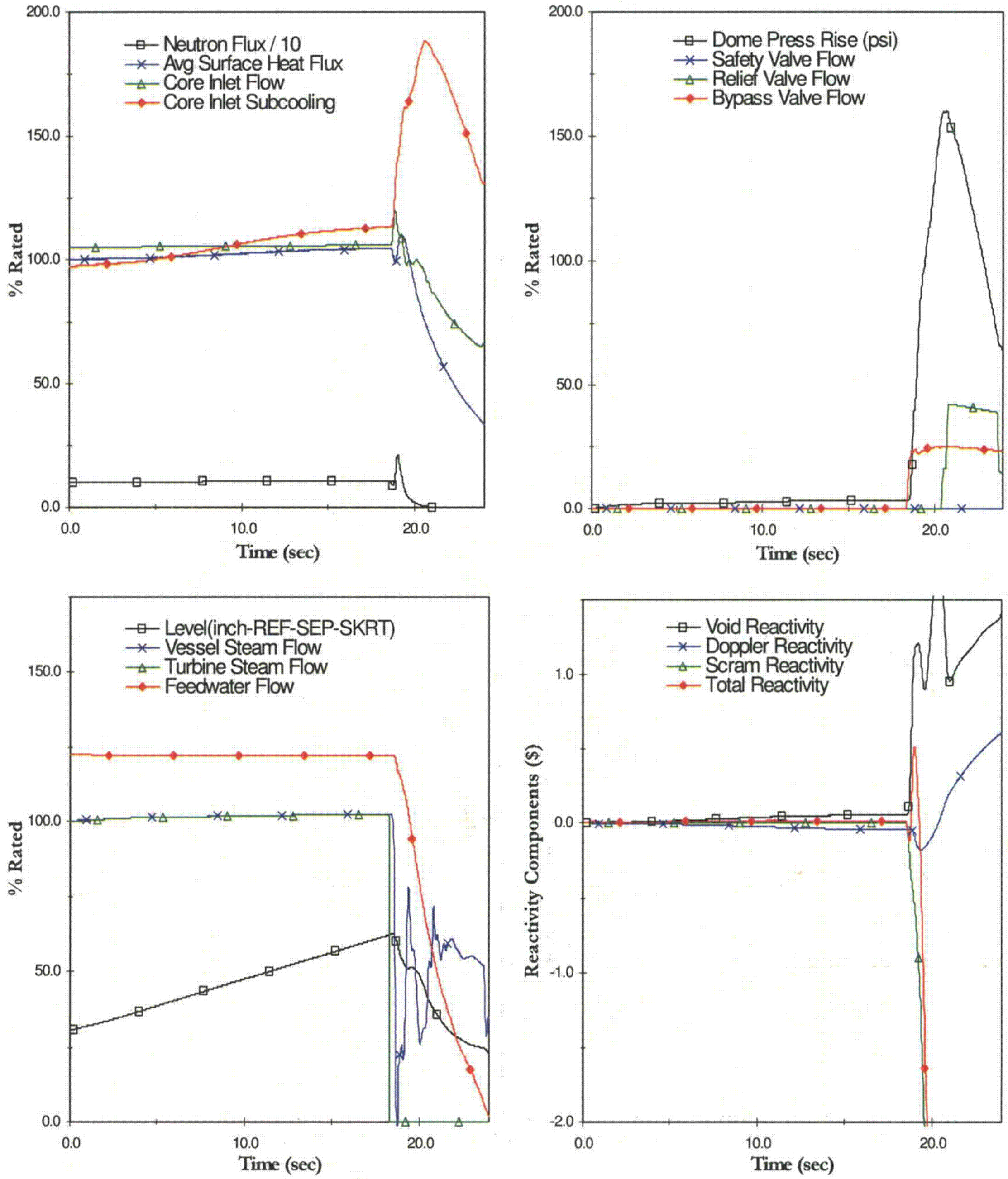


Figure 2 Plant Response to FW Controller Failure
(MOC ICF (HBB))

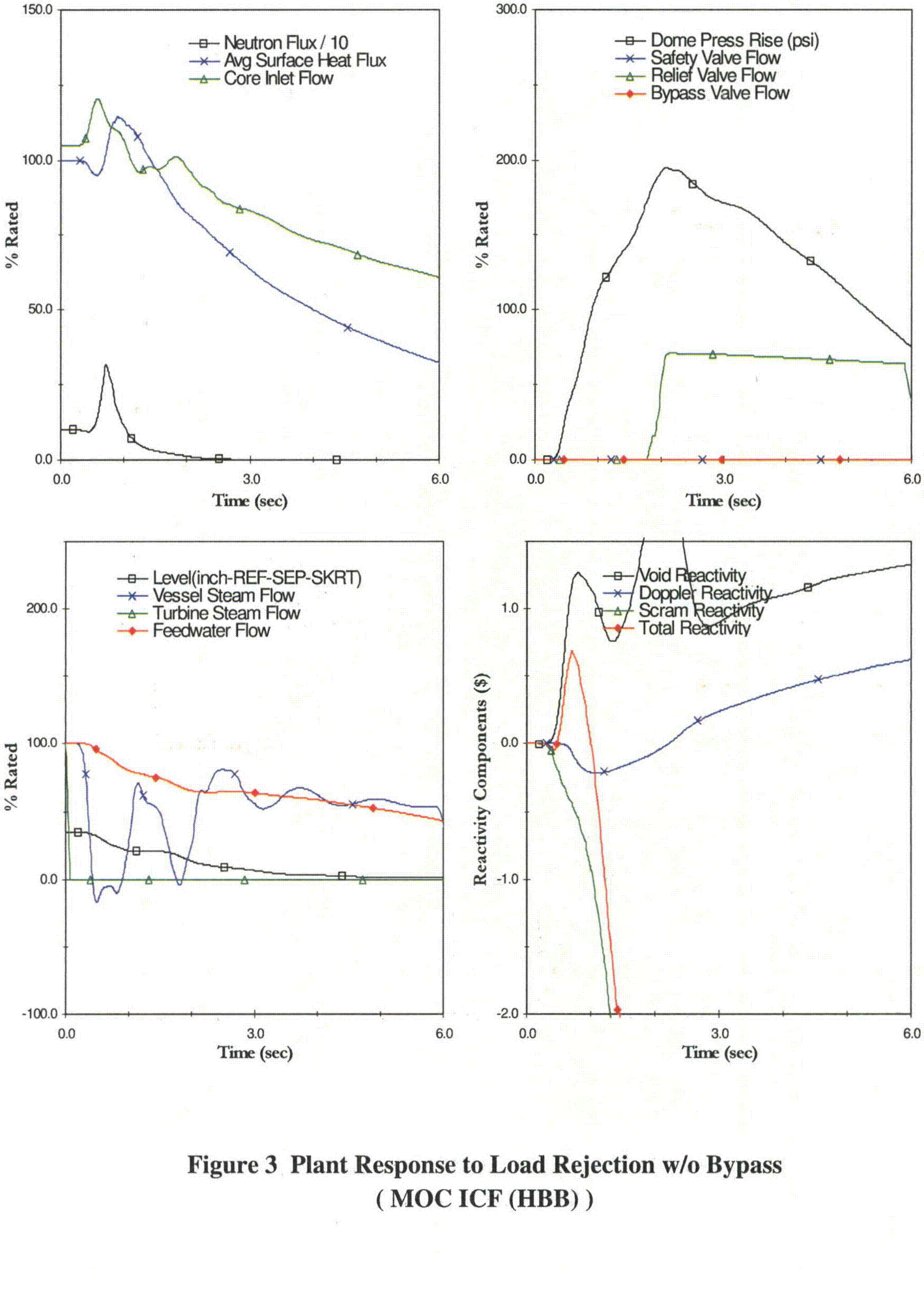


Figure 3 Plant Response to Load Rejection w/o Bypass (MOC ICF (HBB))

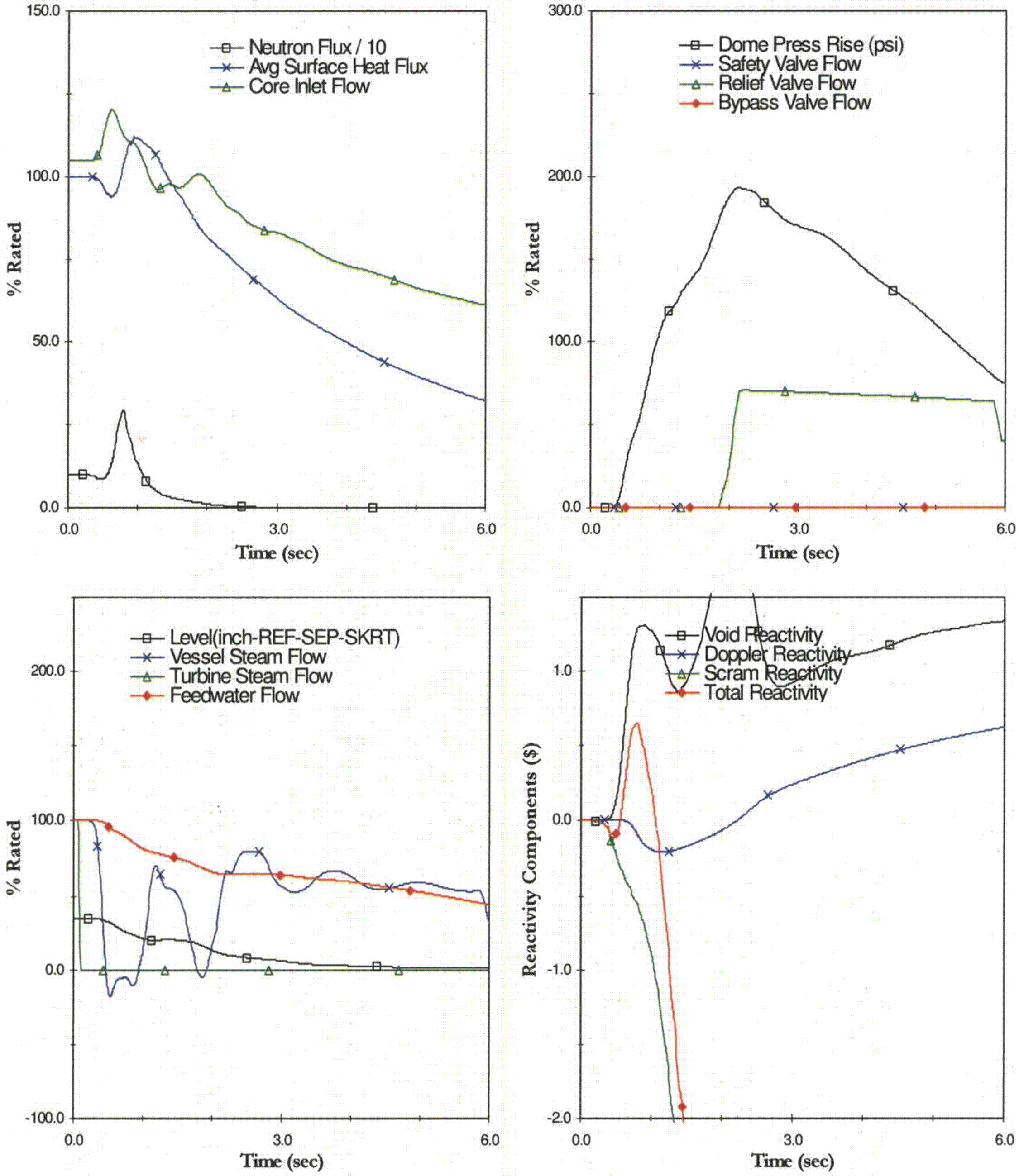


Figure 4 Plant Response to Turbine Trip w/o Bypass
(MOC ICF (HBB))

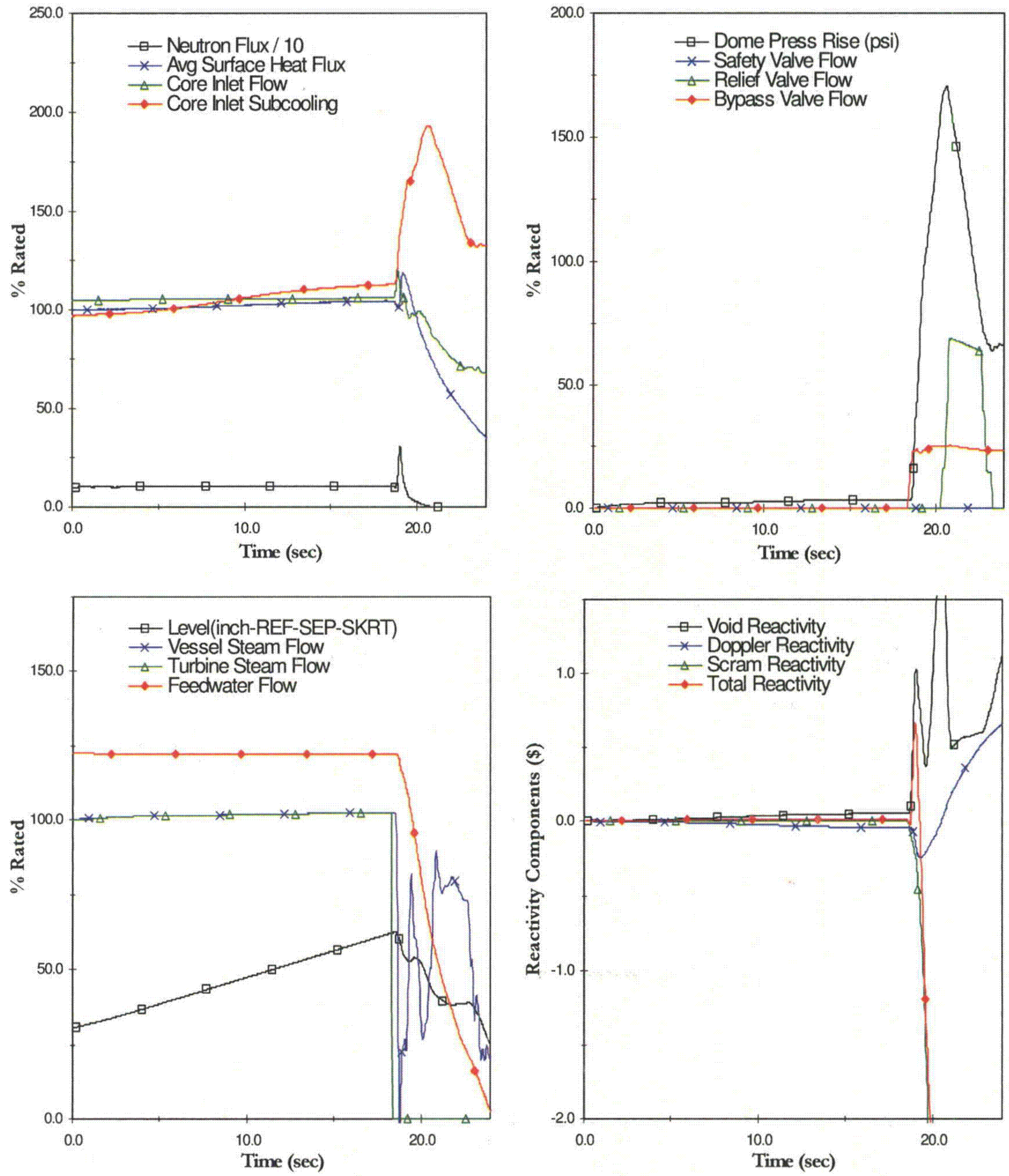


Figure 5 Plant Response to FW Controller Failure
(EOC ICF (HBB))

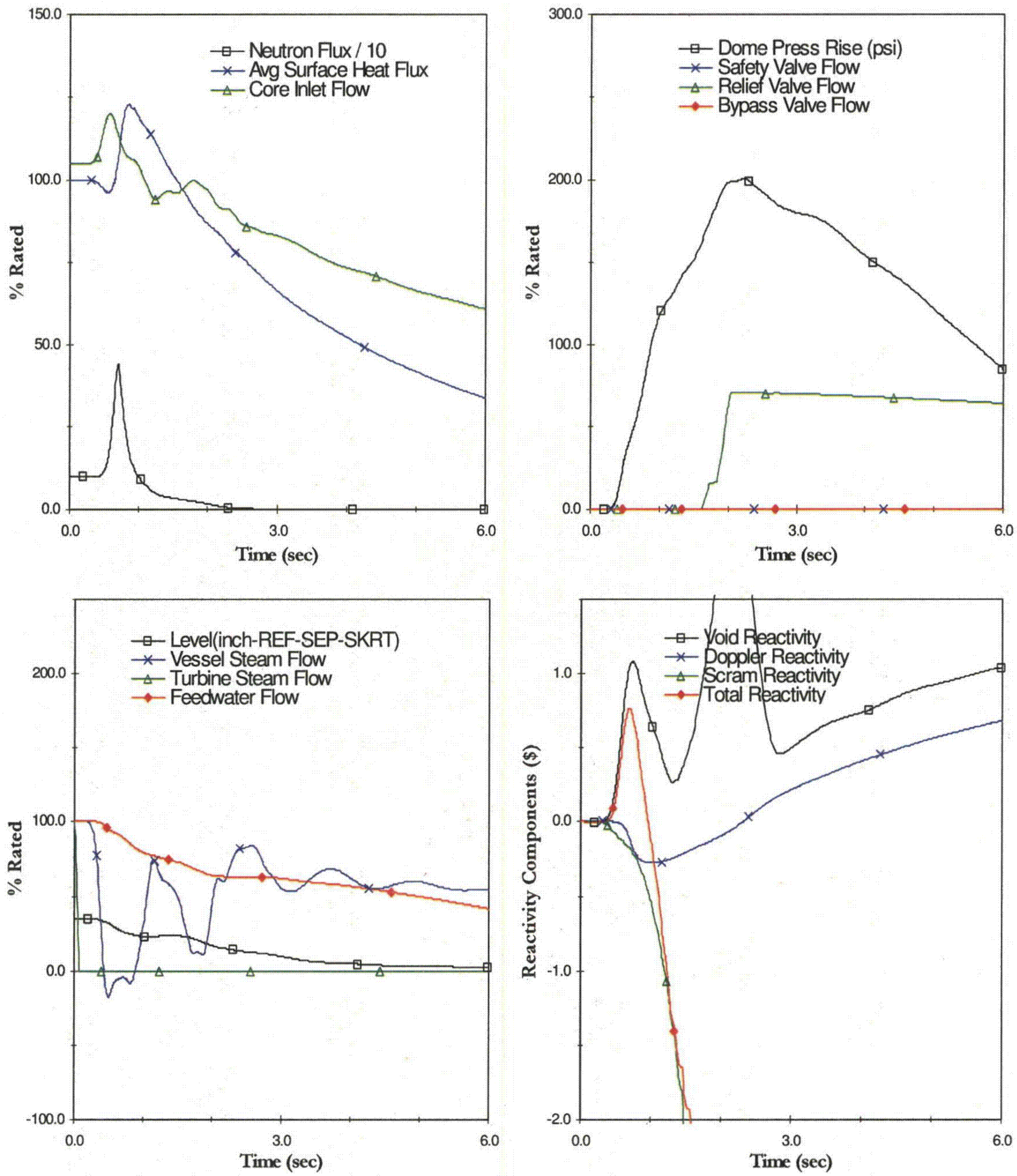


Figure 6 Plant Response to Load Rejection w/o Bypass
(EOC ICF (HBB))

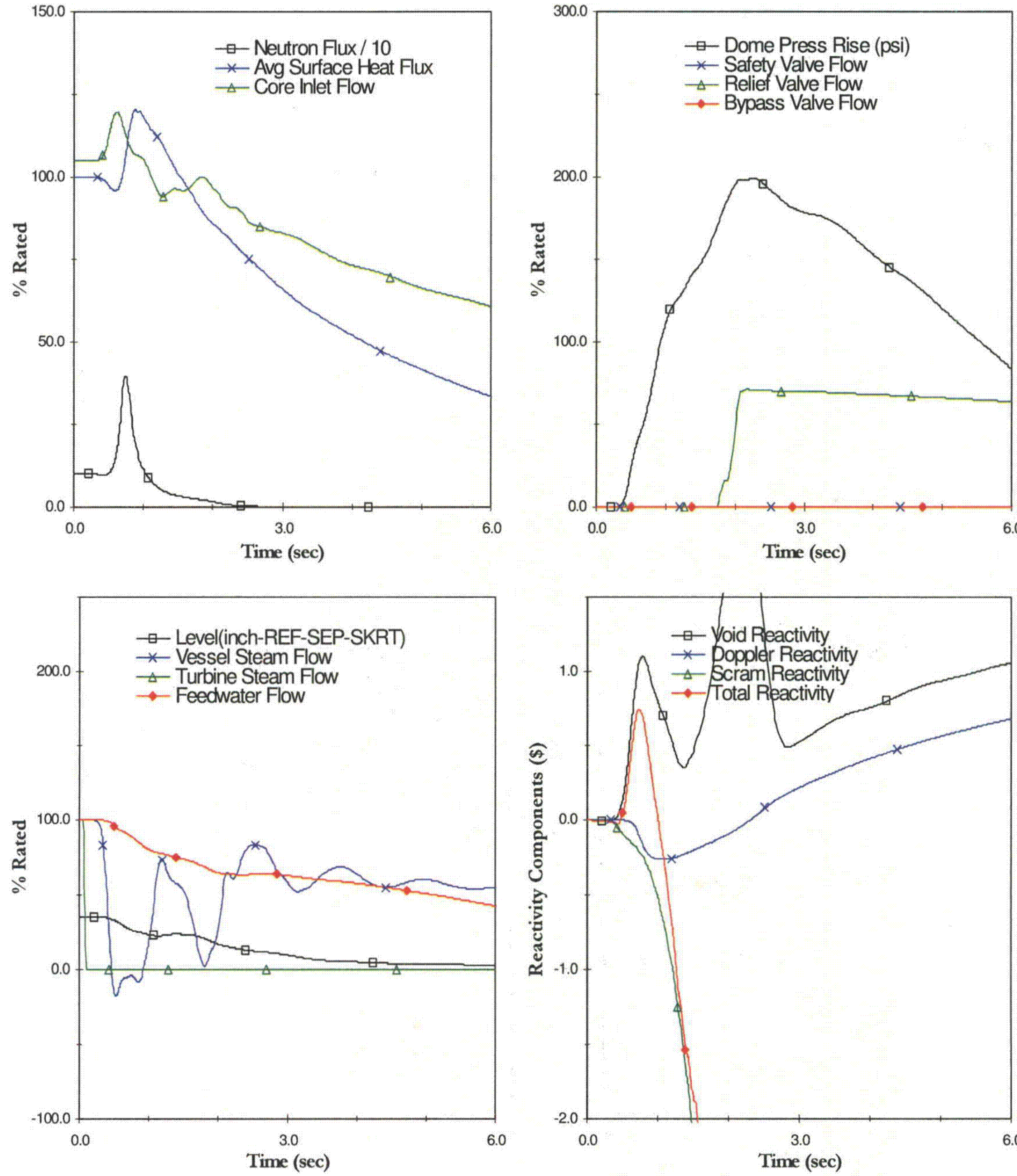


Figure 7 Plant Response to Turbine Trip w/o Bypass
(EOC ICF (HBB))

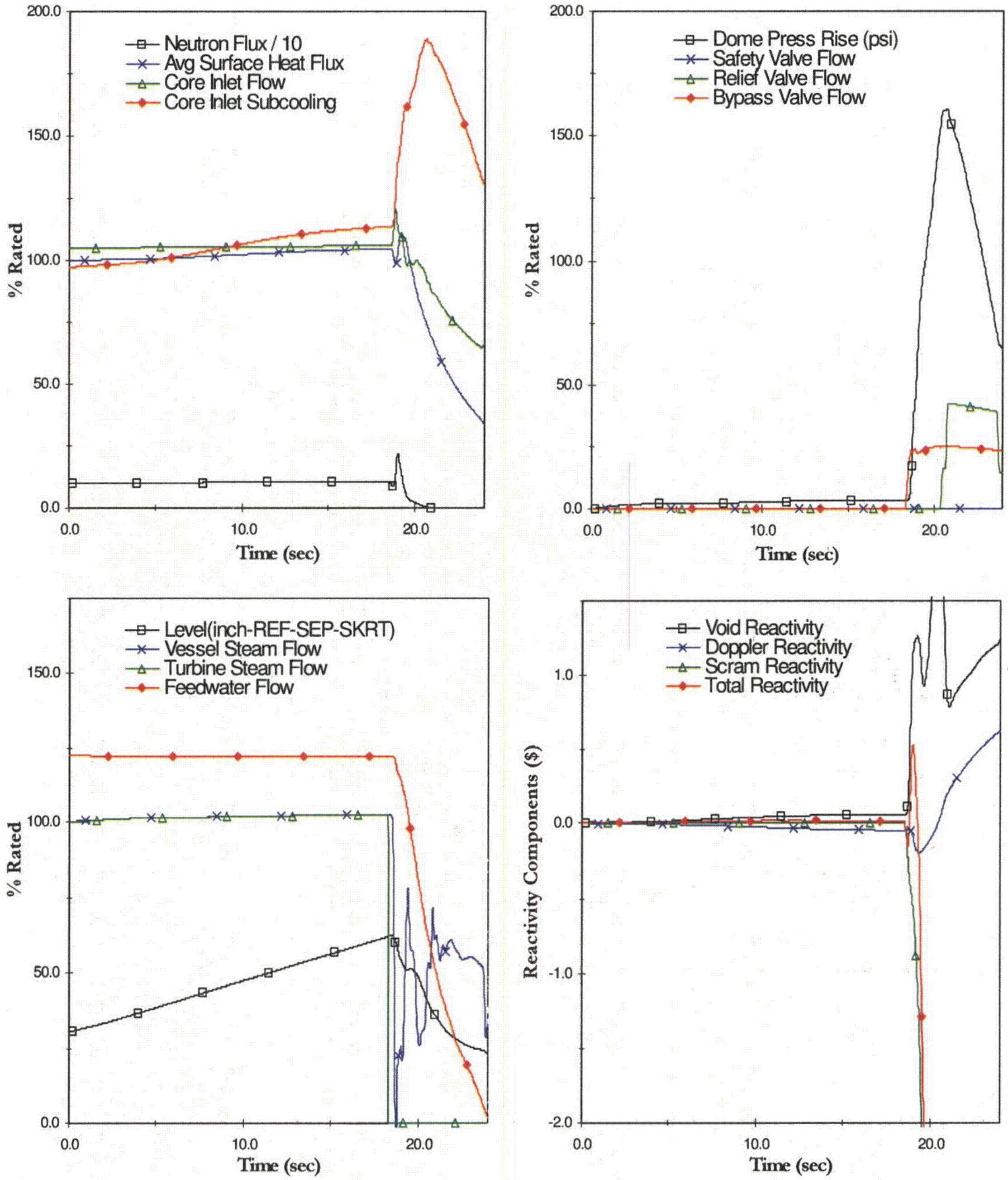


Figure 8 Plant Response to FW Controller Failure
(EOC ICF (UB))

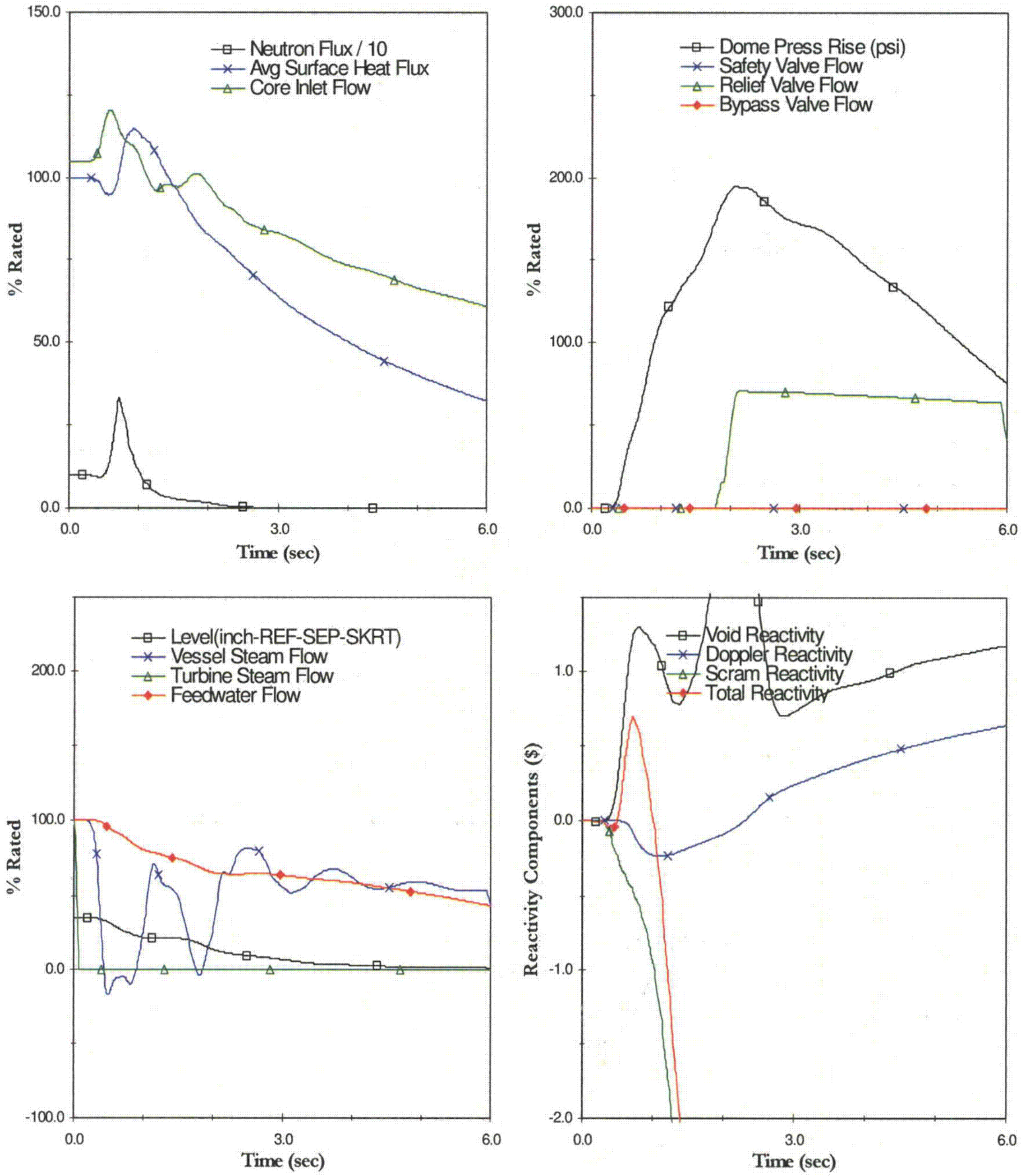


Figure 9 Plant Response to Load Rejection w/o Bypass
(EOC ICF (UB))

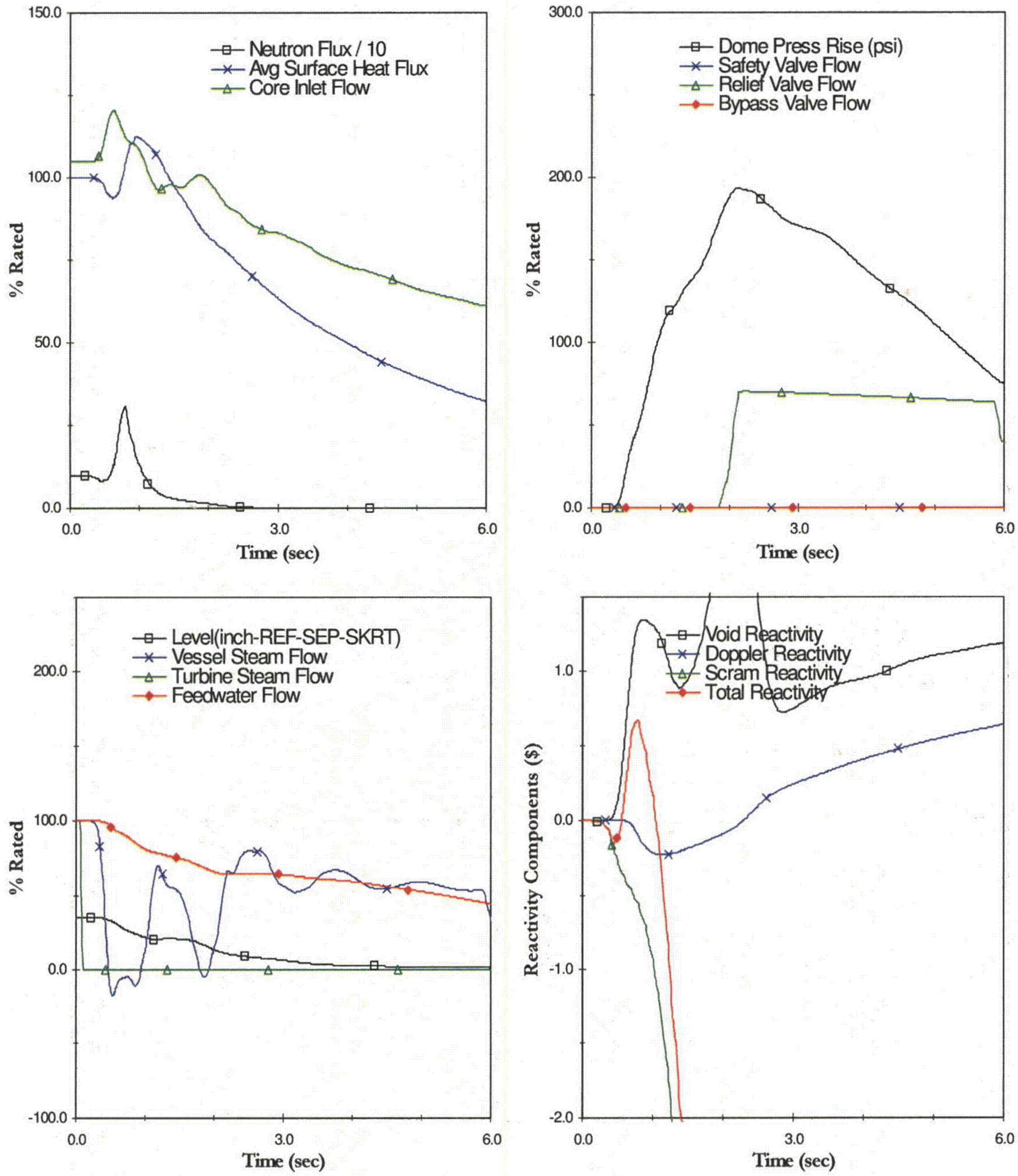


Figure 10 Plant Response to Turbine Trip w/o Bypass
(EOC ICF (UB))

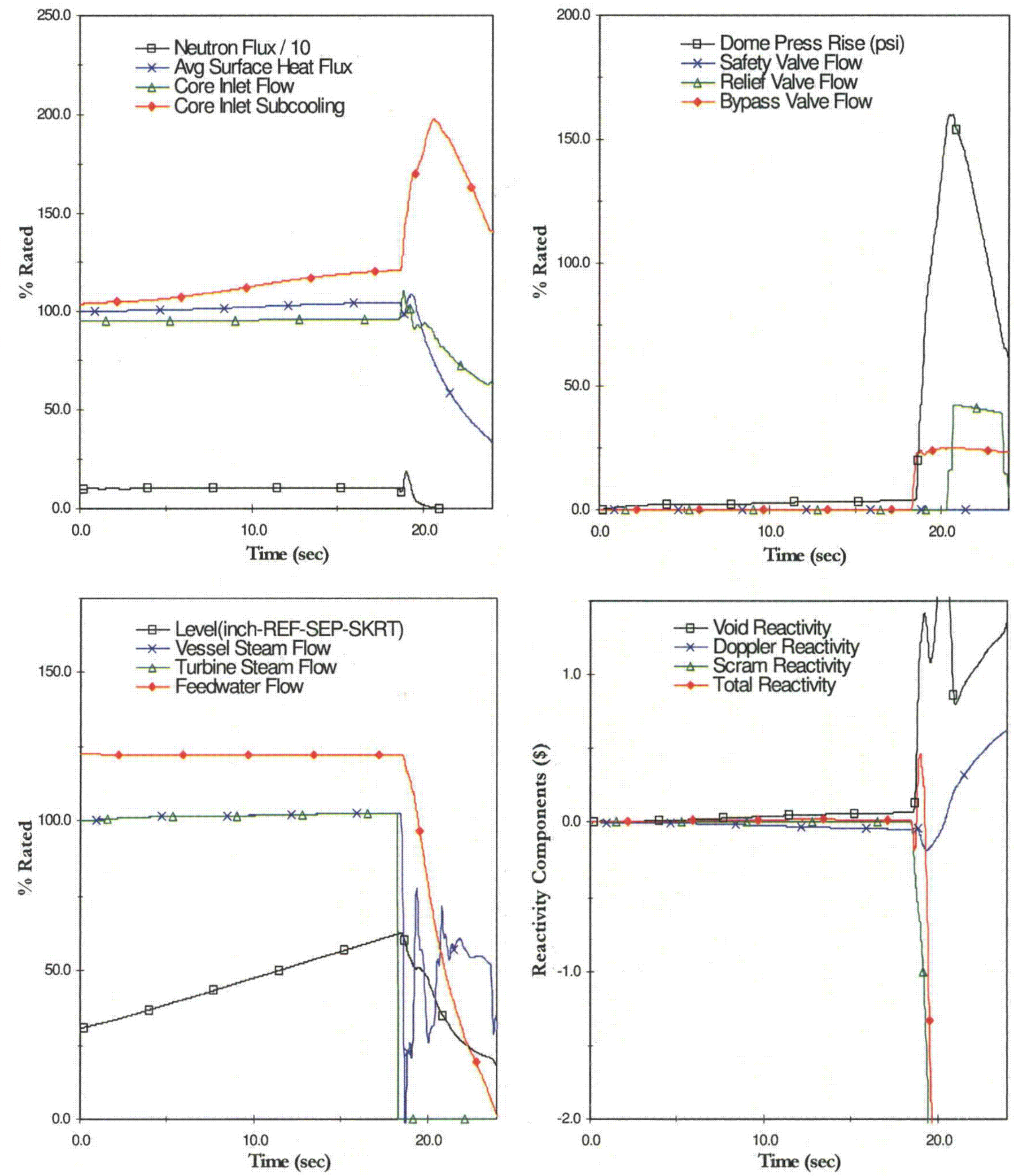


Figure 11 Plant Response to FW Controller Failure
(EOC MELLLA (UB))

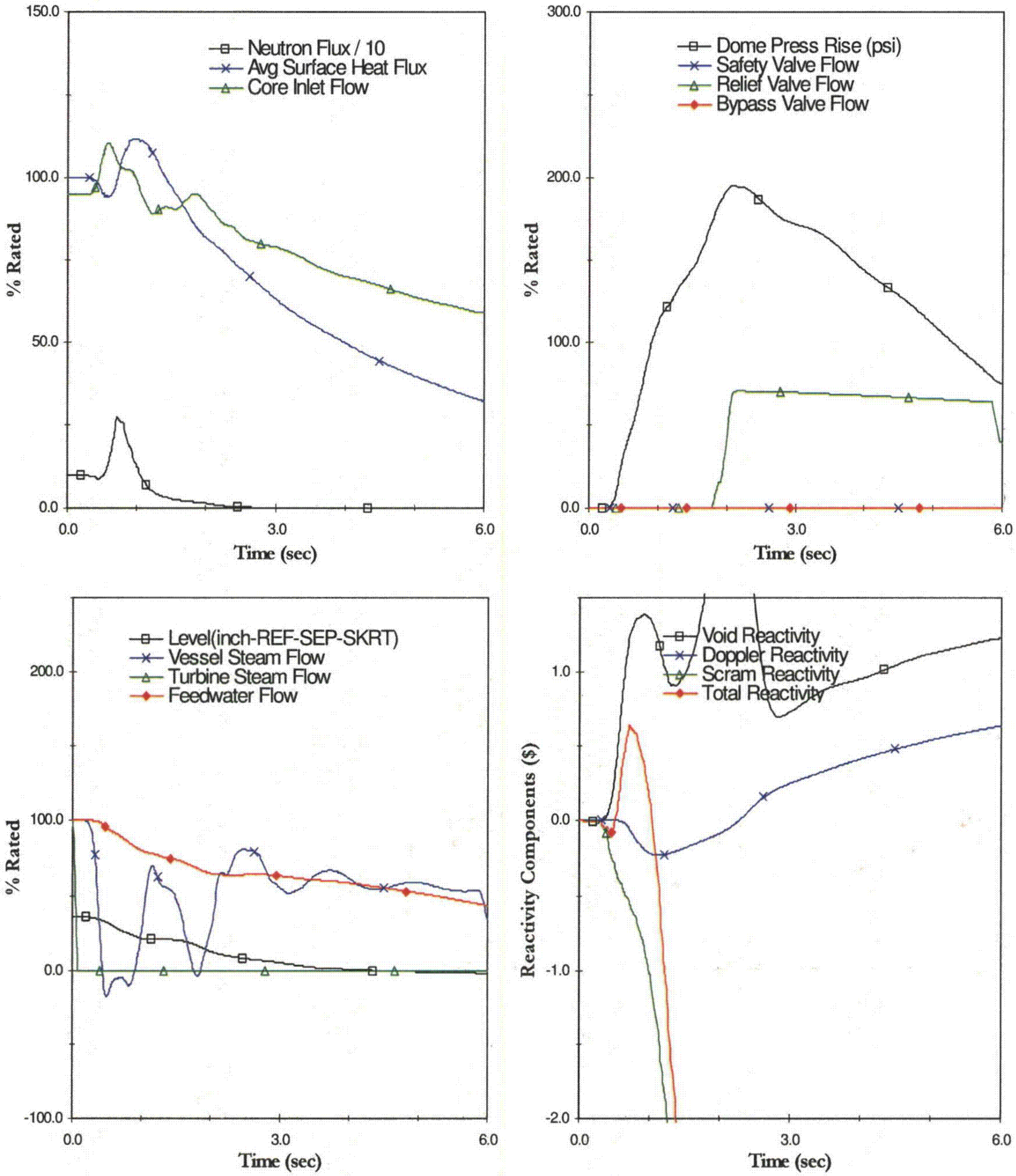


Figure 12 Plant Response to Load Rejection w/o Bypass
(EOC MELLLA (UB))

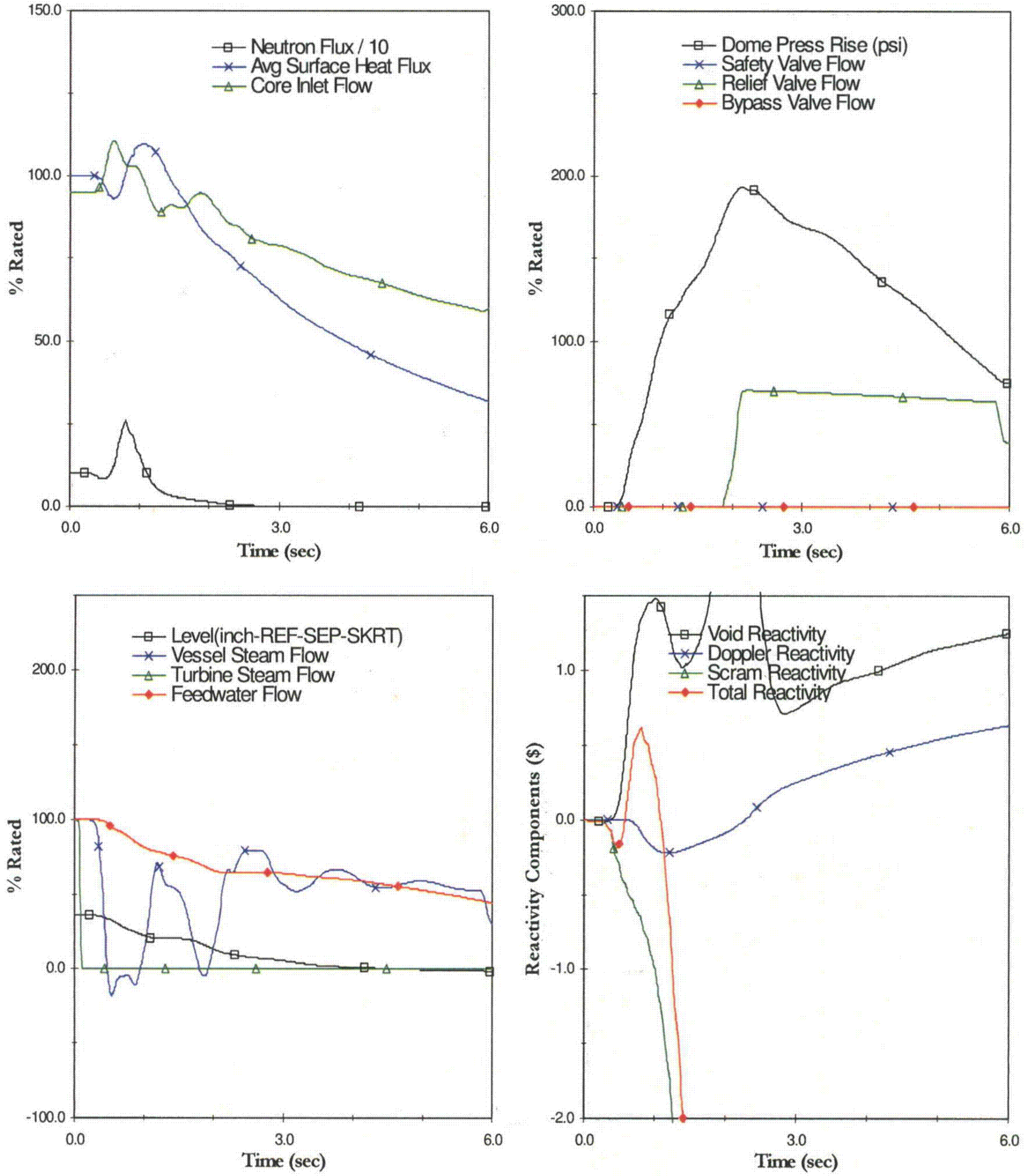


Figure 13 Plant Response to Turbine Trip w/o Bypass
(EOC MELLLA (UB))

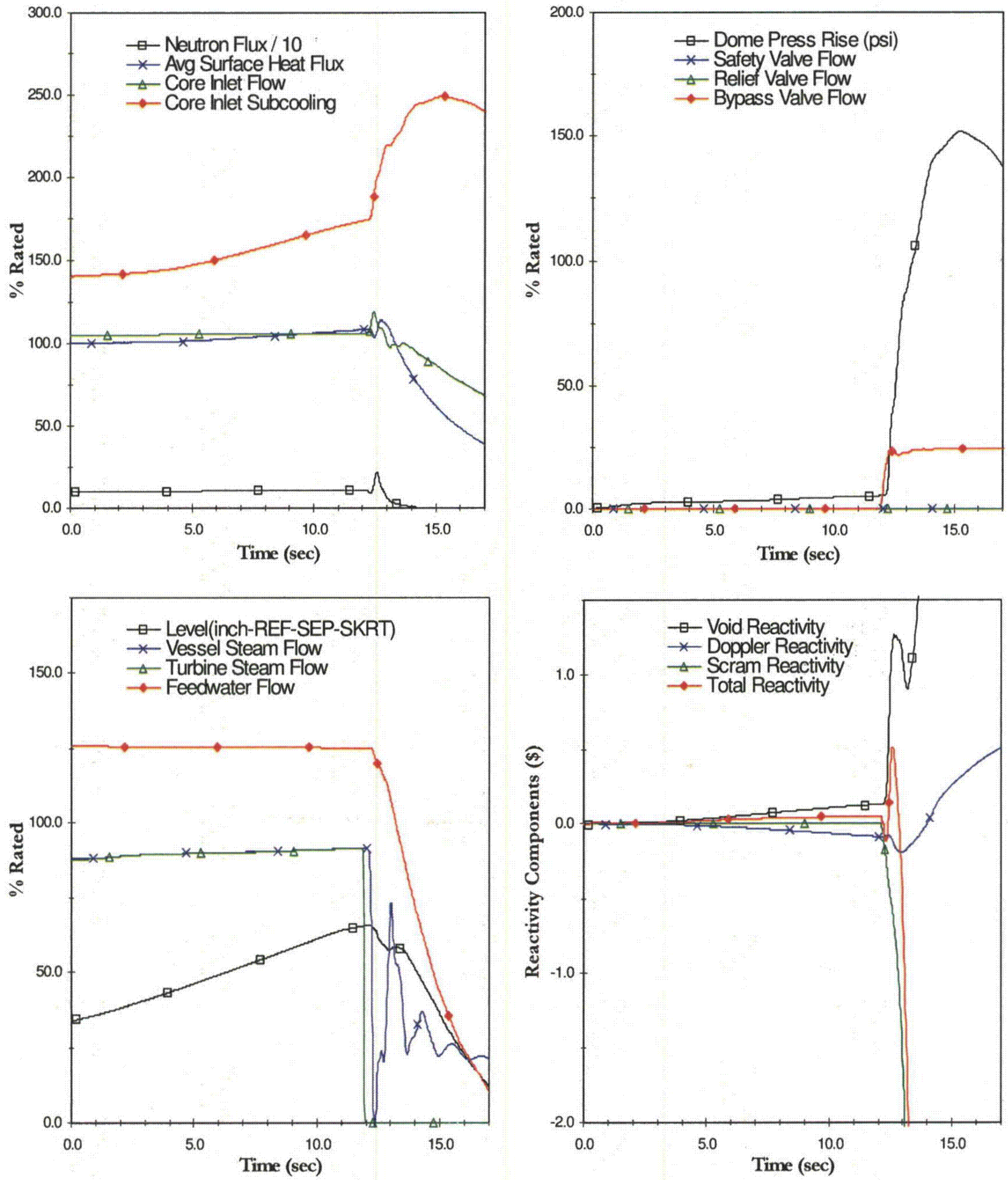


Figure 14 Plant Response to FW Controller Failure (MOC ICF & FWTR (HBB))

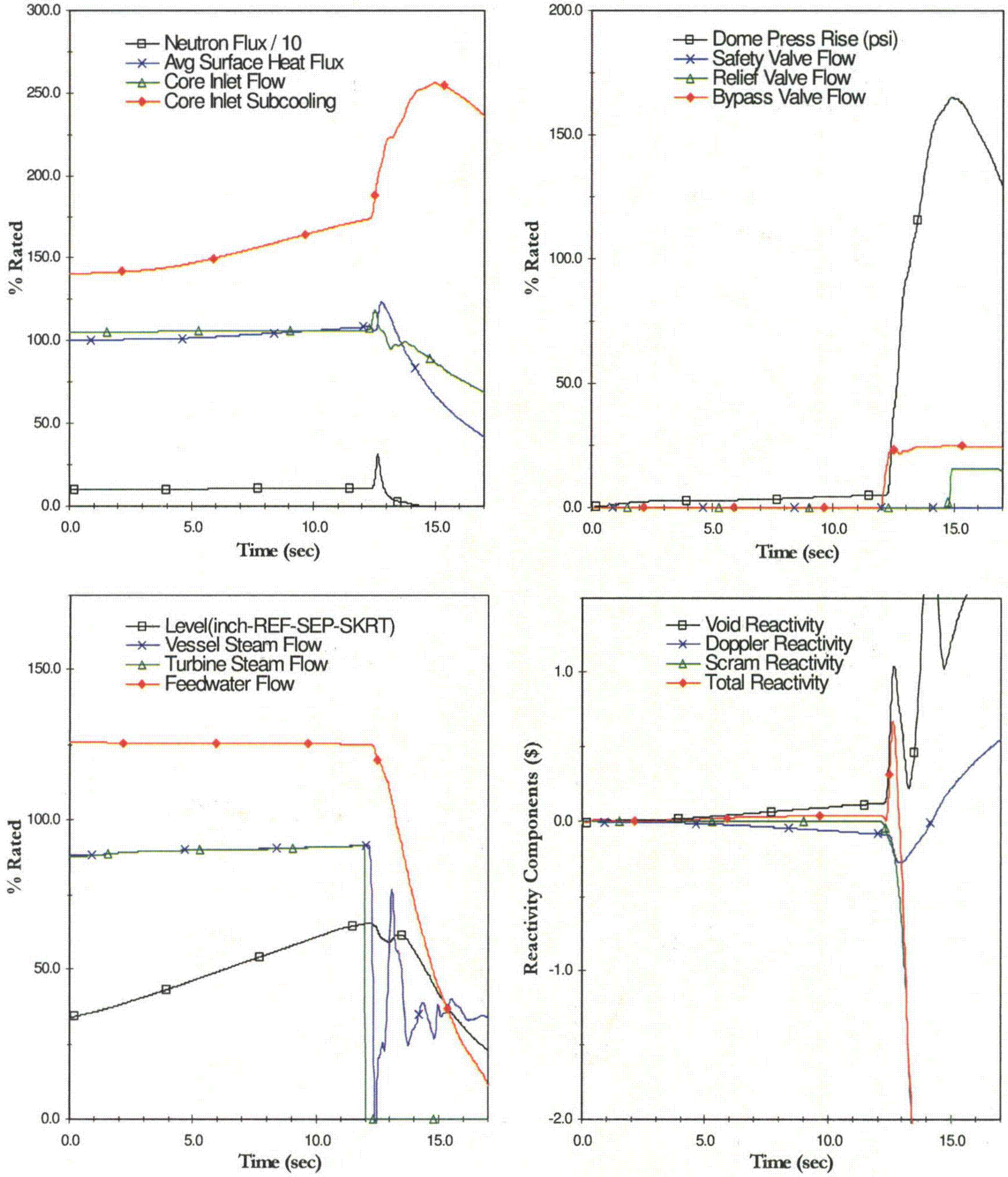


Figure 15 Plant Response to FW Controller Failure
(EOC ICF & FWTR (HBB))

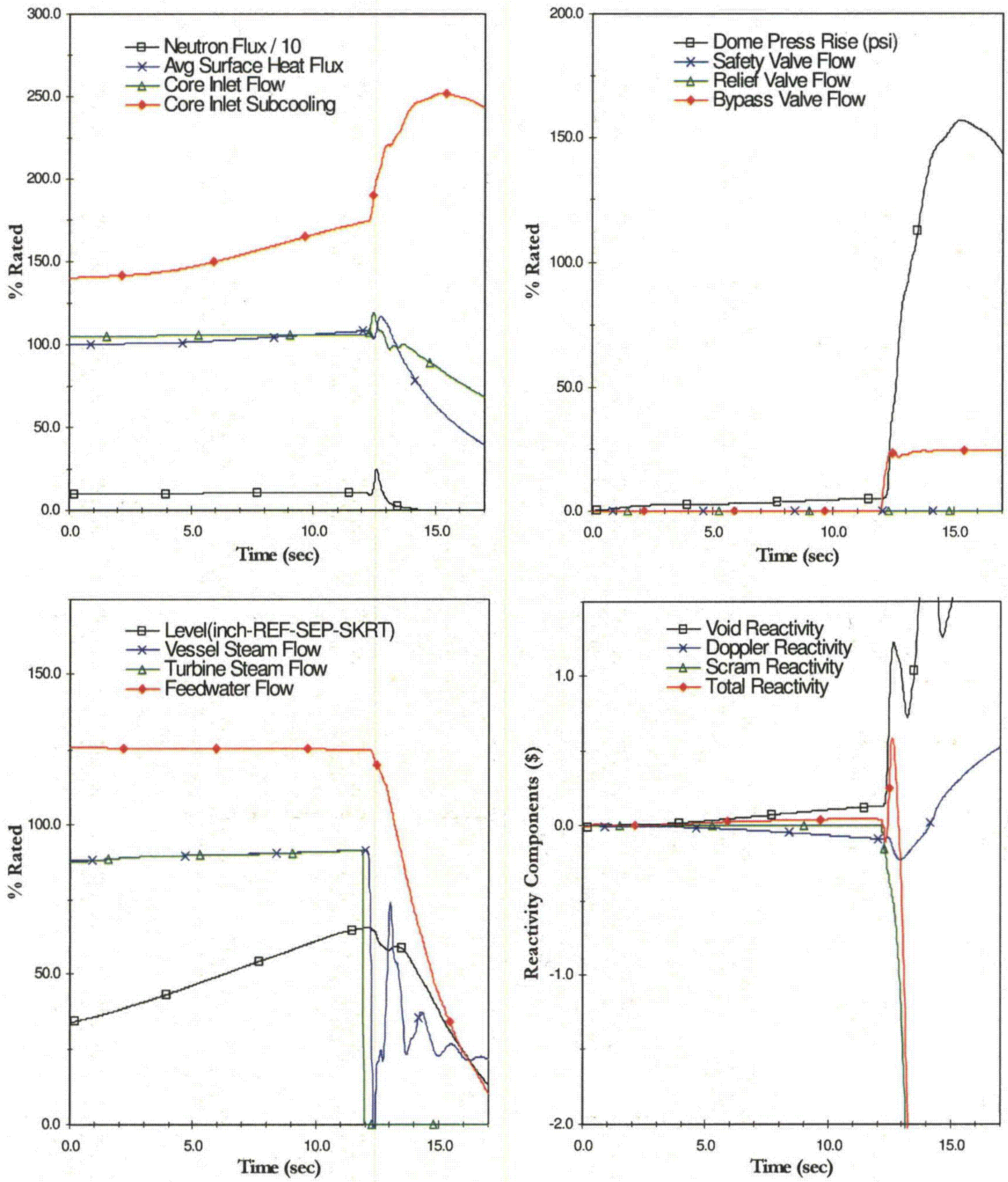


Figure 16 Plant Response to FW Controller Failure
(EOC ICF & FWTR (UB))

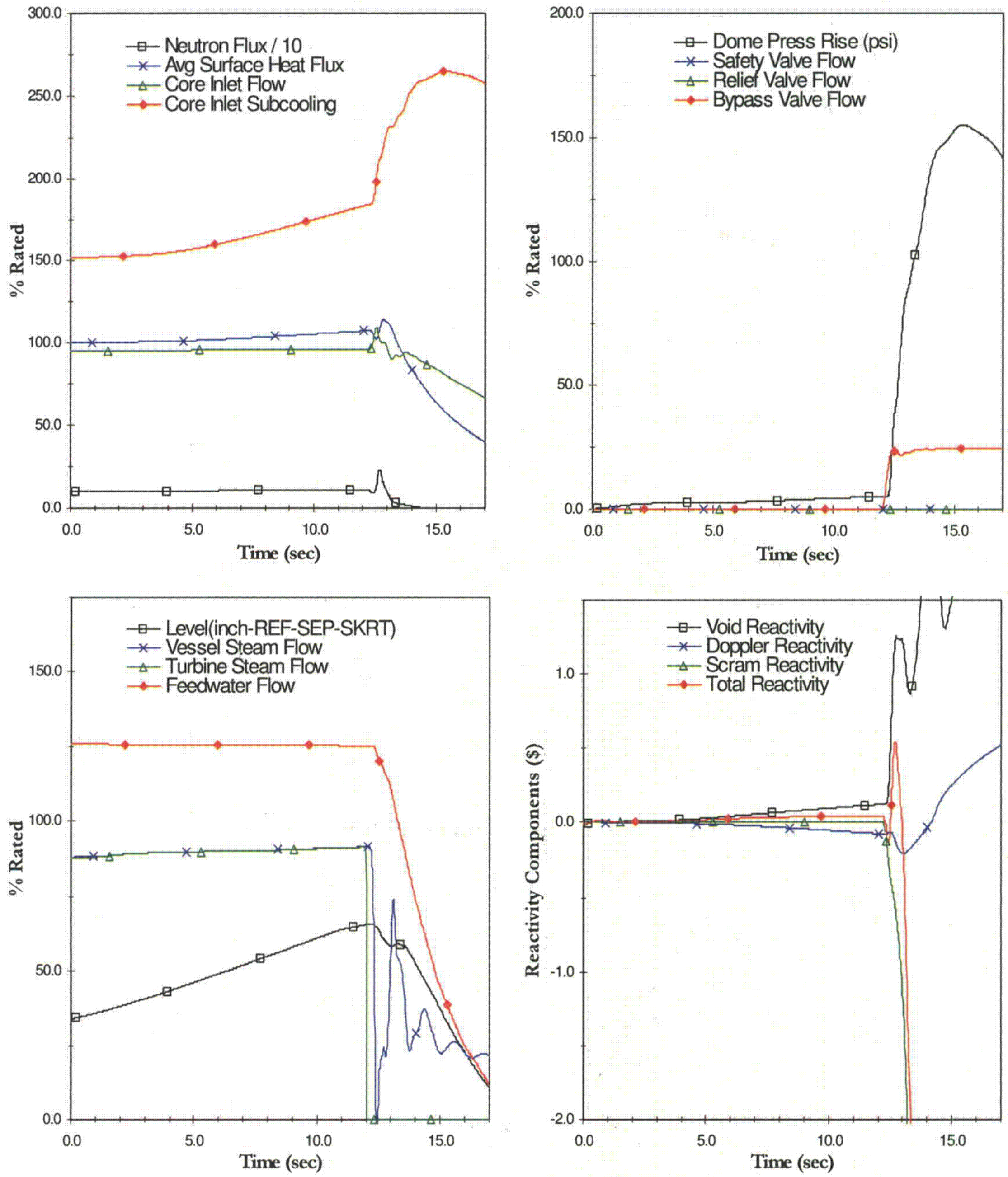


Figure 17 Plant Response to FW Controller Failure
(EOC MELLLA & FWTR (UB))

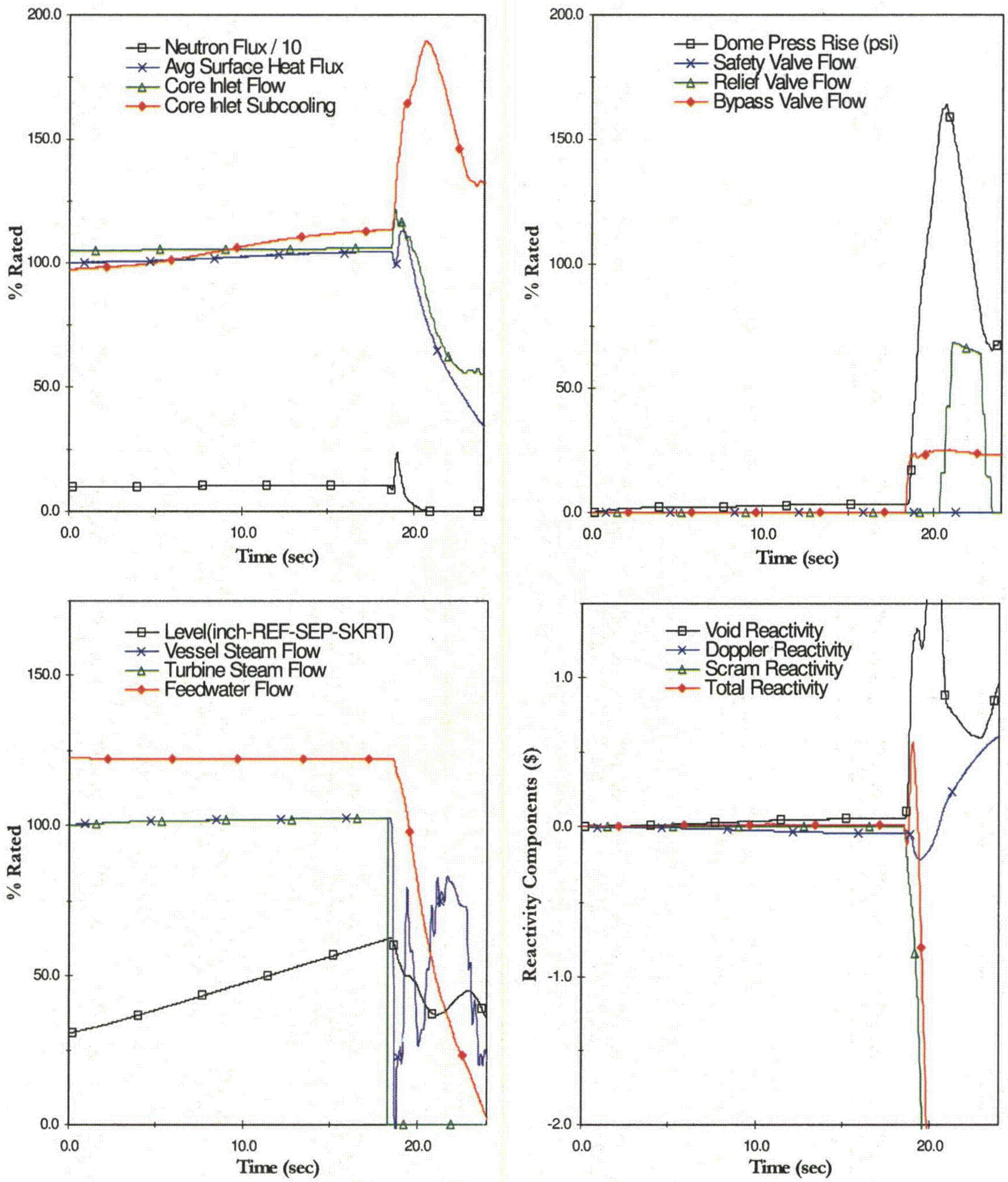


Figure 18 Plant Response to FW Controller Failure
(MOC ICF with RPTOOS (HBB))

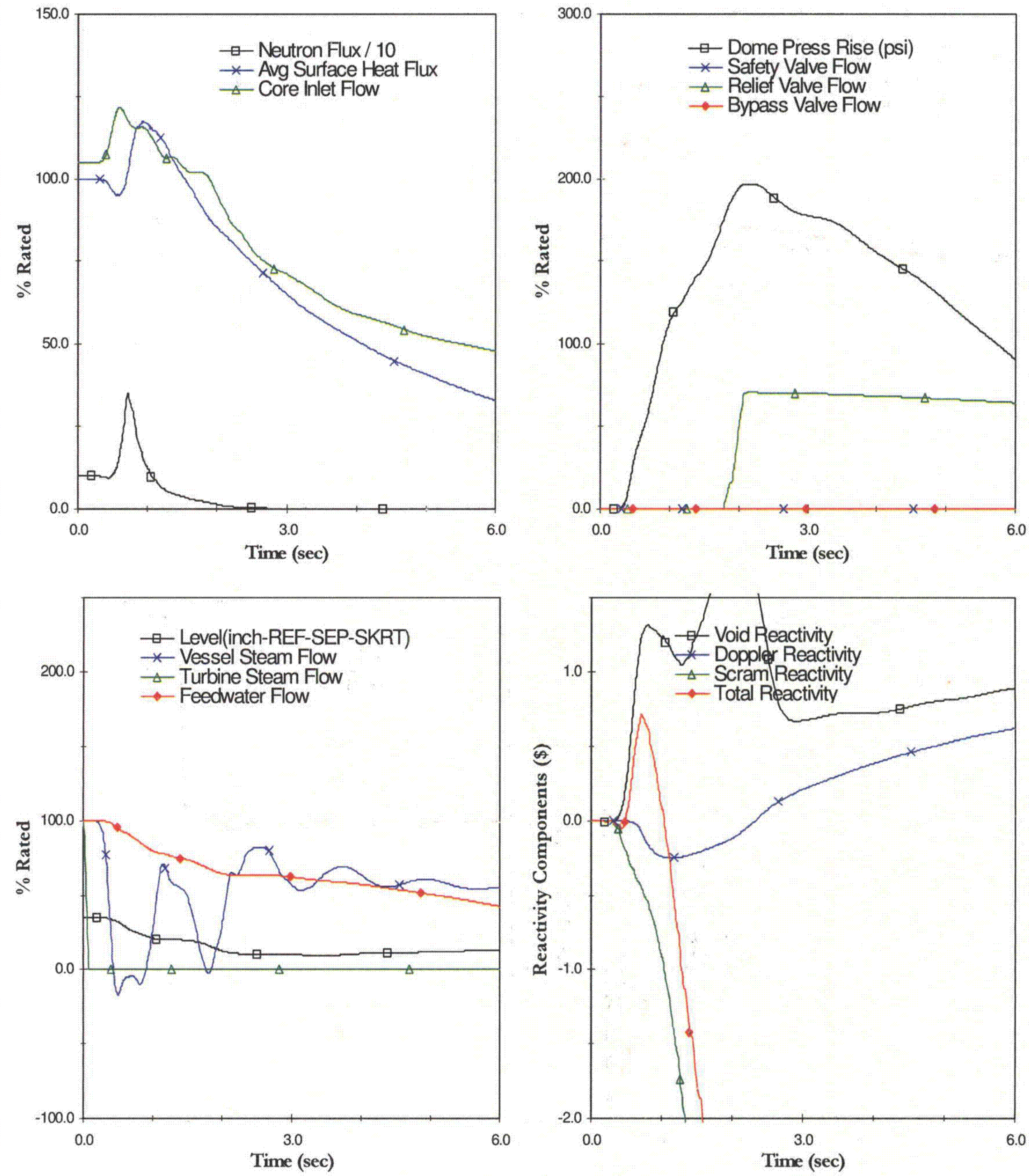


Figure 19 Plant Response to Load Rejection w/o Bypass
(MOC ICF with RPTOOS (HBB))

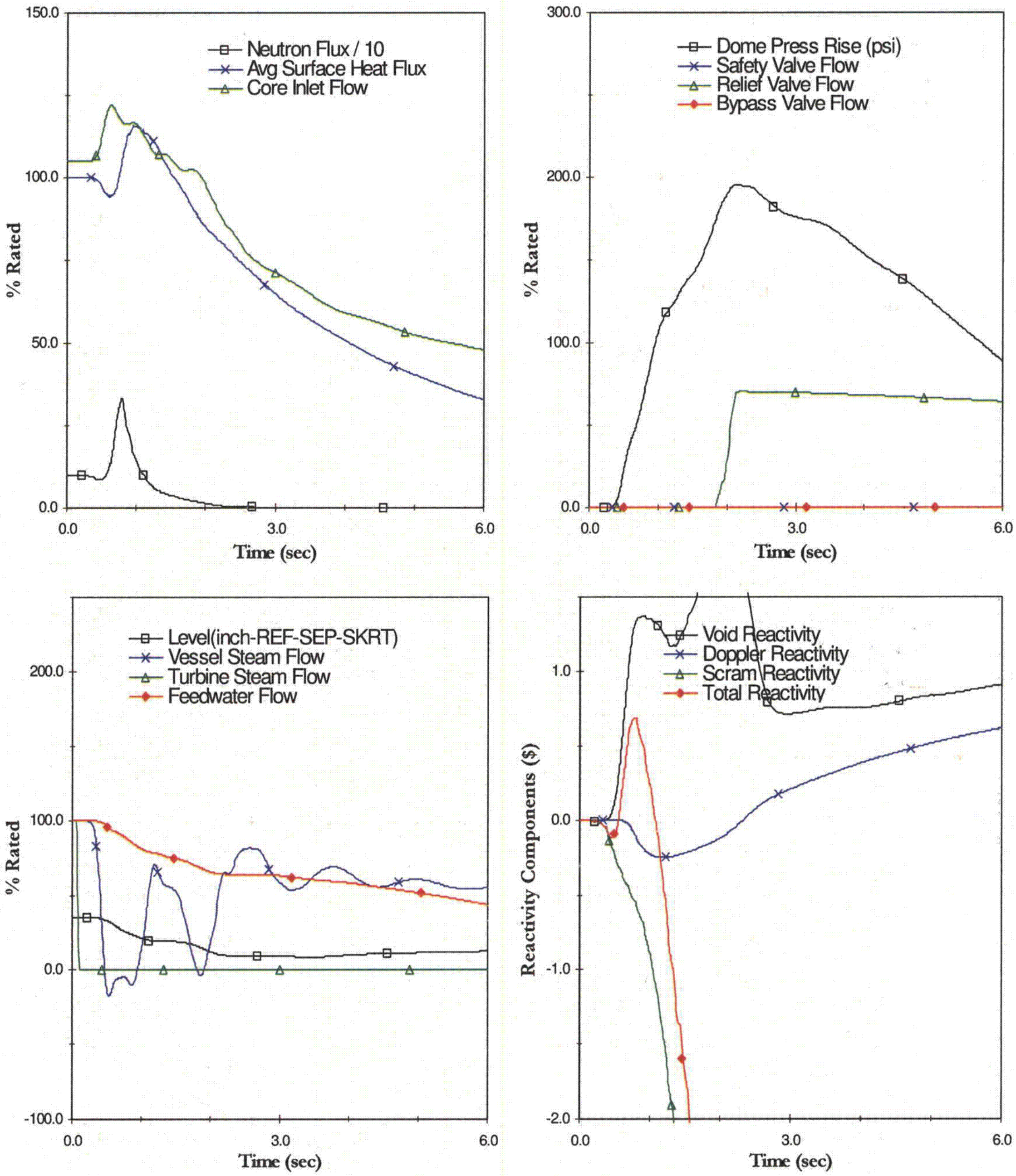


Figure 20 Plant Response to Turbine Trip w/o Bypass (MOC ICF with RPTOOS (HBB))

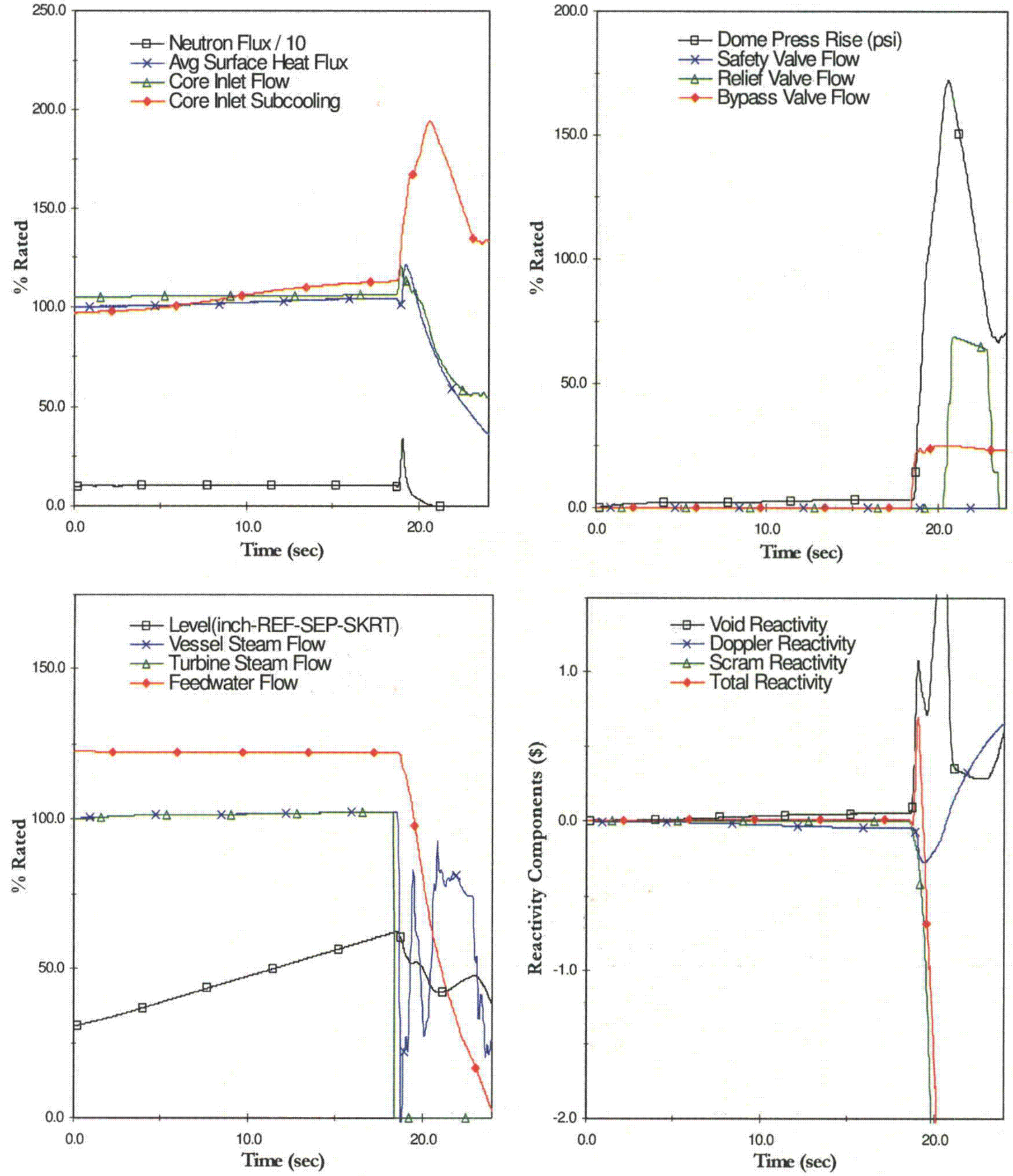


Figure 21 Plant Response to FW Controller Failure
(EOC ICF with RPTOOS (HBB))

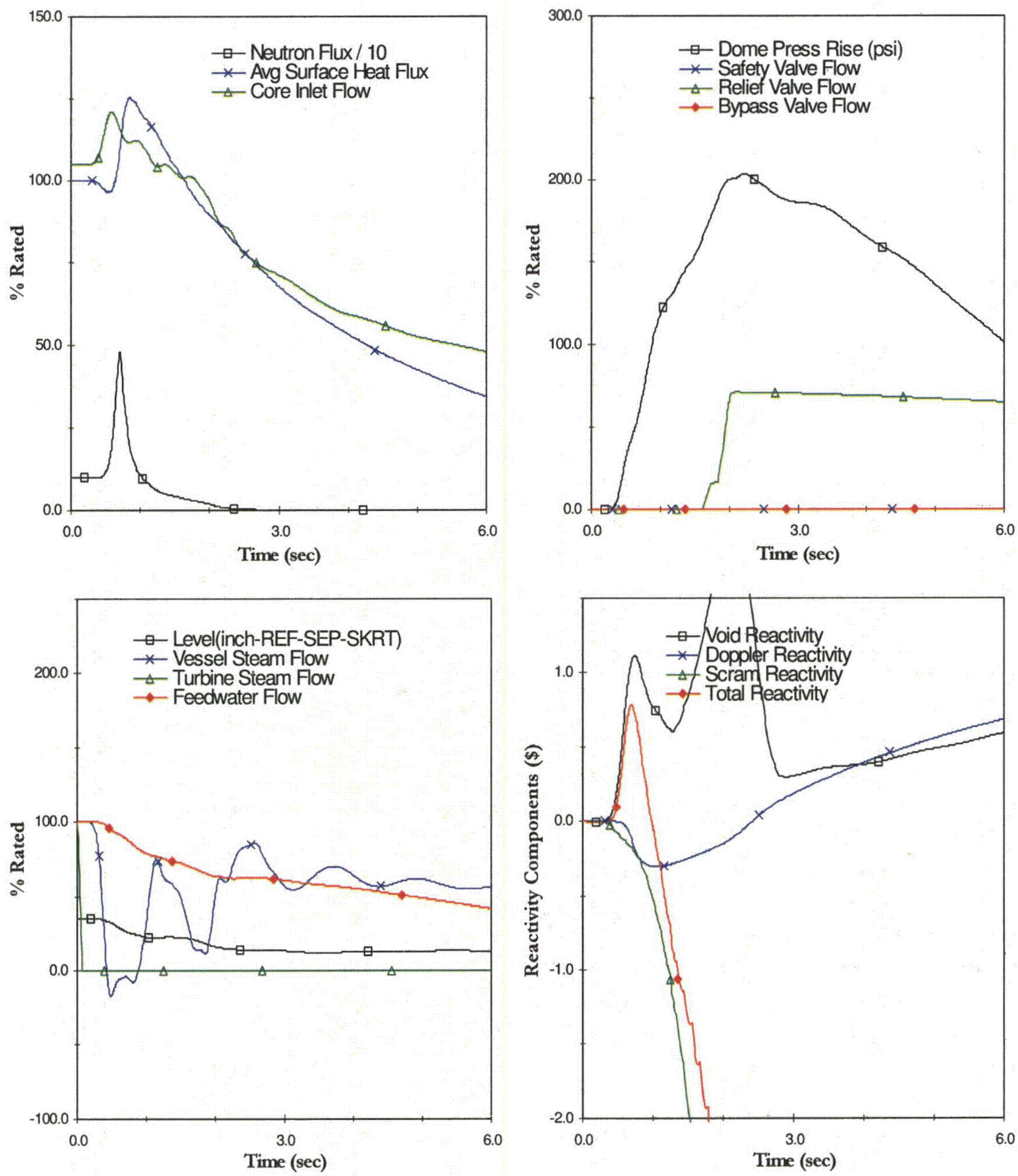


Figure 22 Plant Response to Load Rejection w/o Bypass (EOC ICF with RPTOOS (HBB))

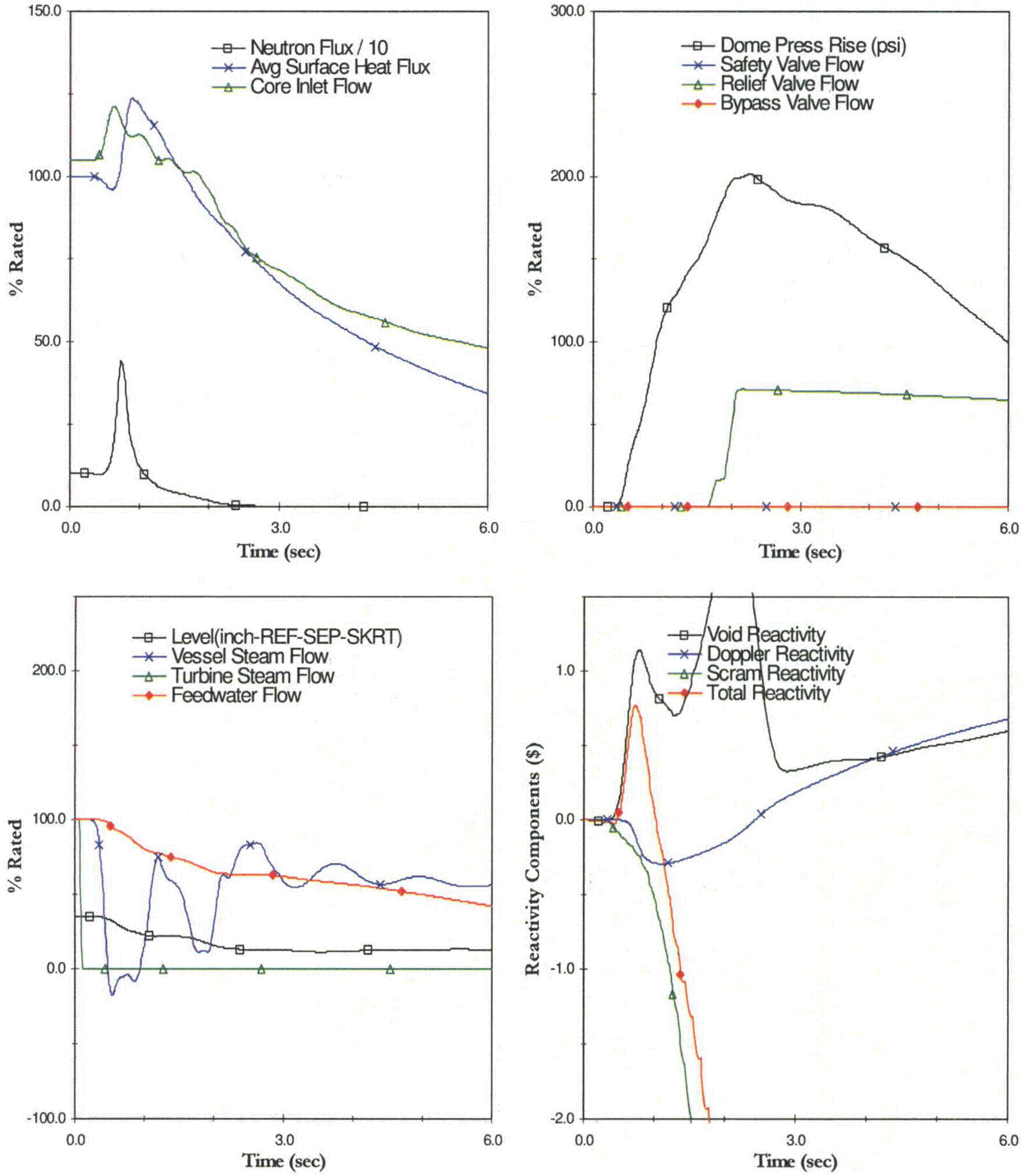


Figure 23 Plant Response to Turbine Trip w/o Bypass (EOC ICF with RPTOOS (HBB))

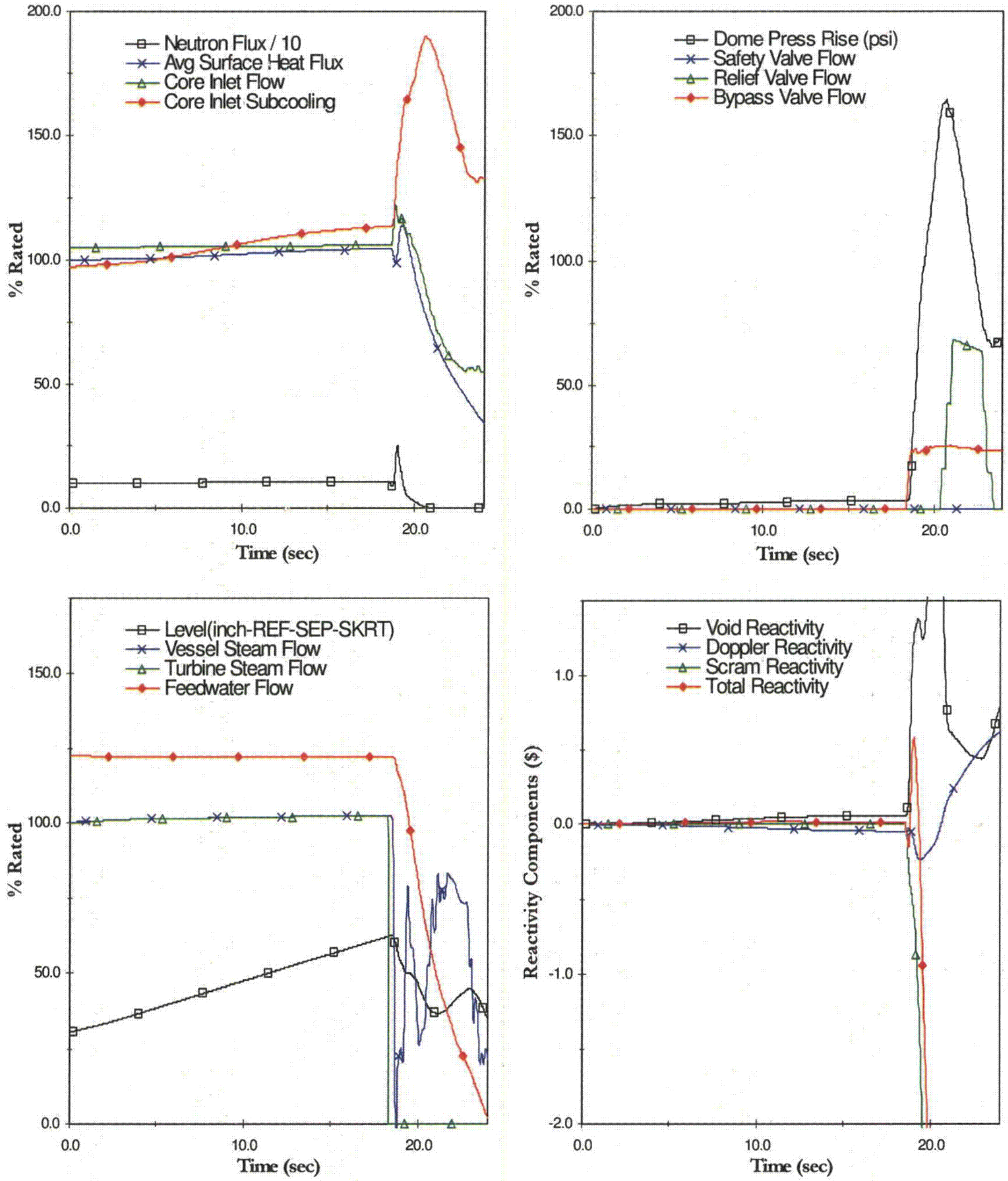


Figure 24 Plant Response to FW Controller Failure
(EOC ICF with RPTOOS (UB))

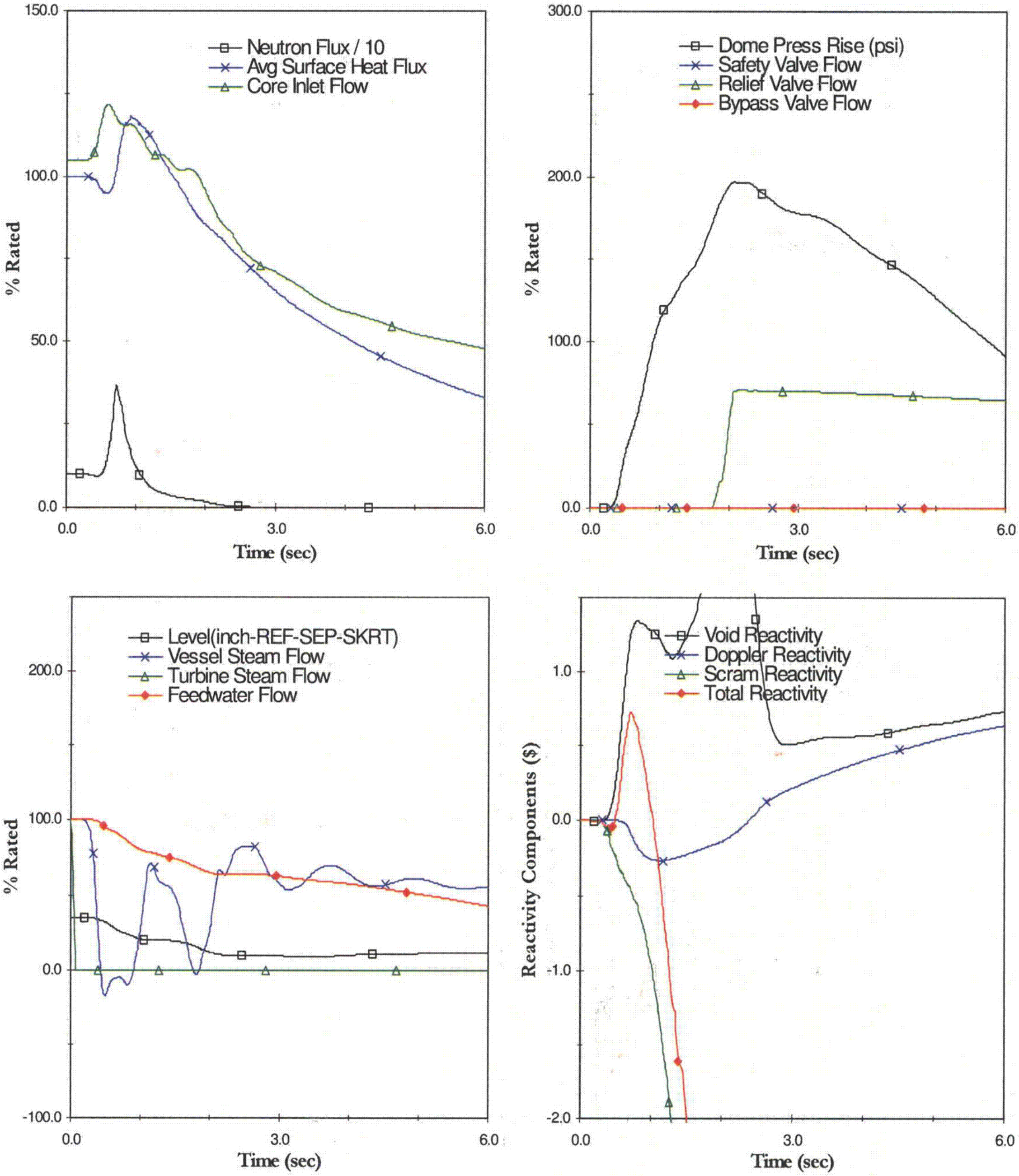


Figure 25 Plant Response to Load Rejection w/o Bypass
(EOC ICF with RPTOOS (UB))

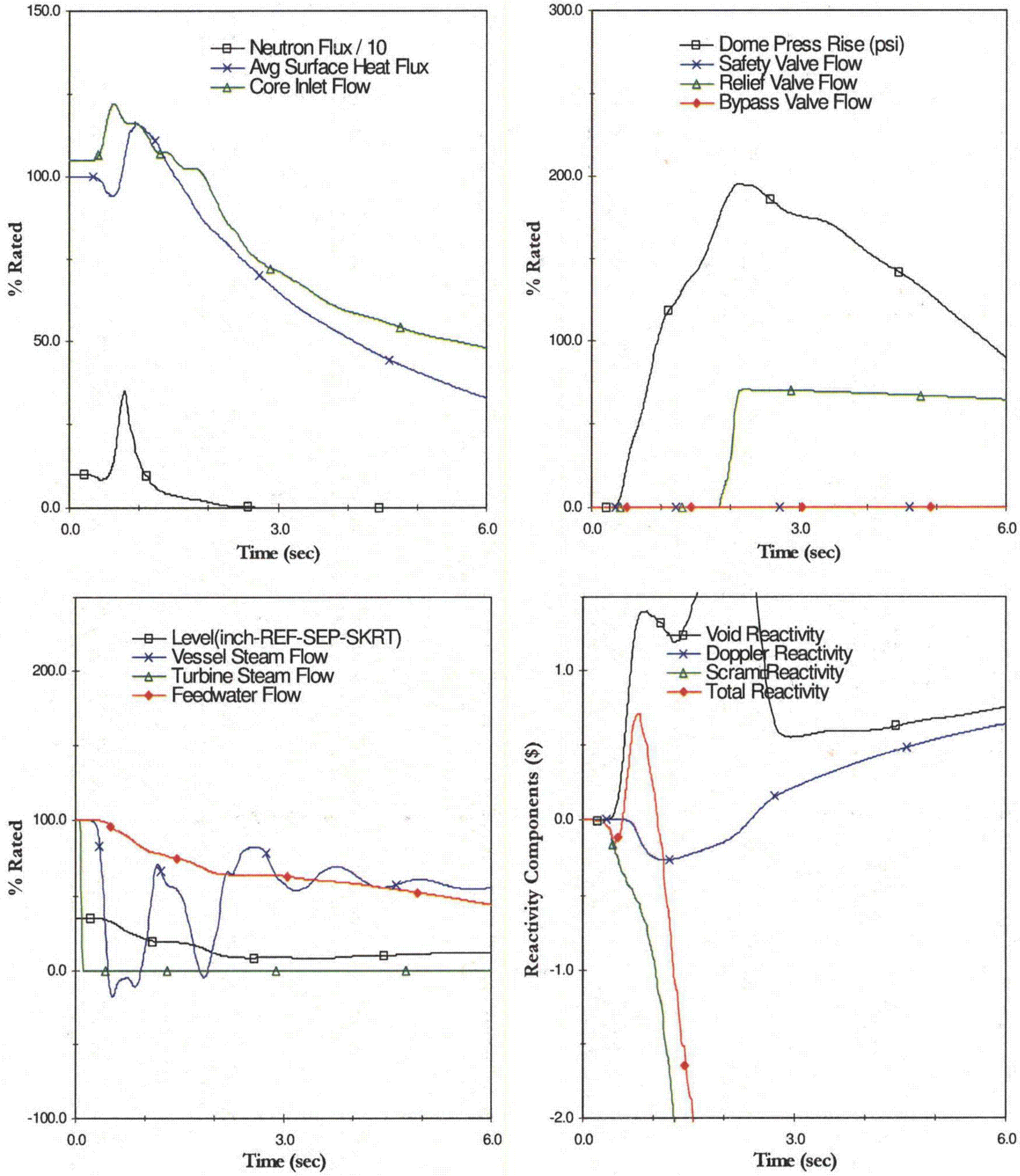


Figure 26 Plant Response to Turbine Trip w/o Bypass (EOC ICF with RPTOOS (UB))

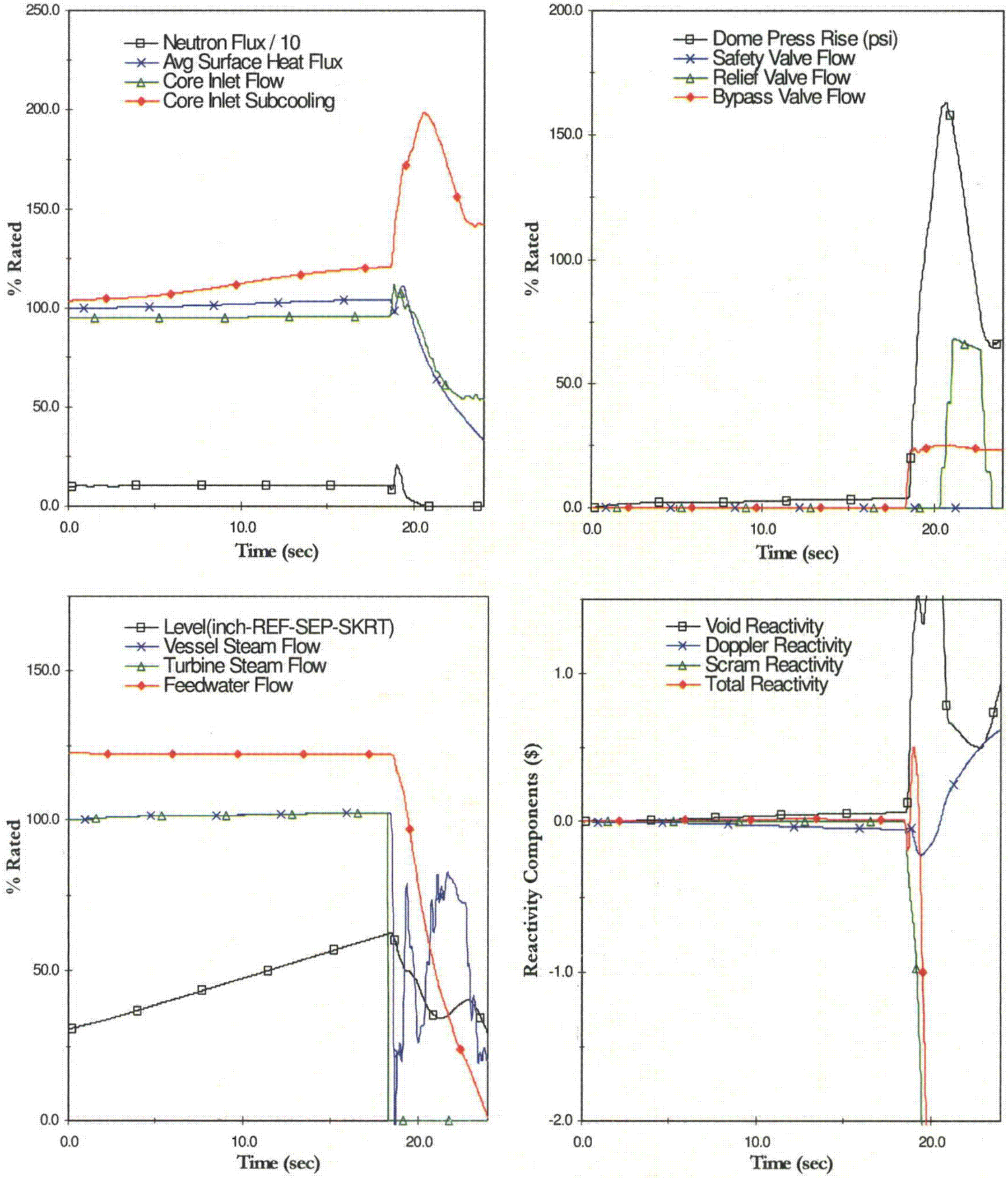


Figure 27 Plant Response to FW Controller Failure
(EOC MELLLA with RPTOOS (UB))

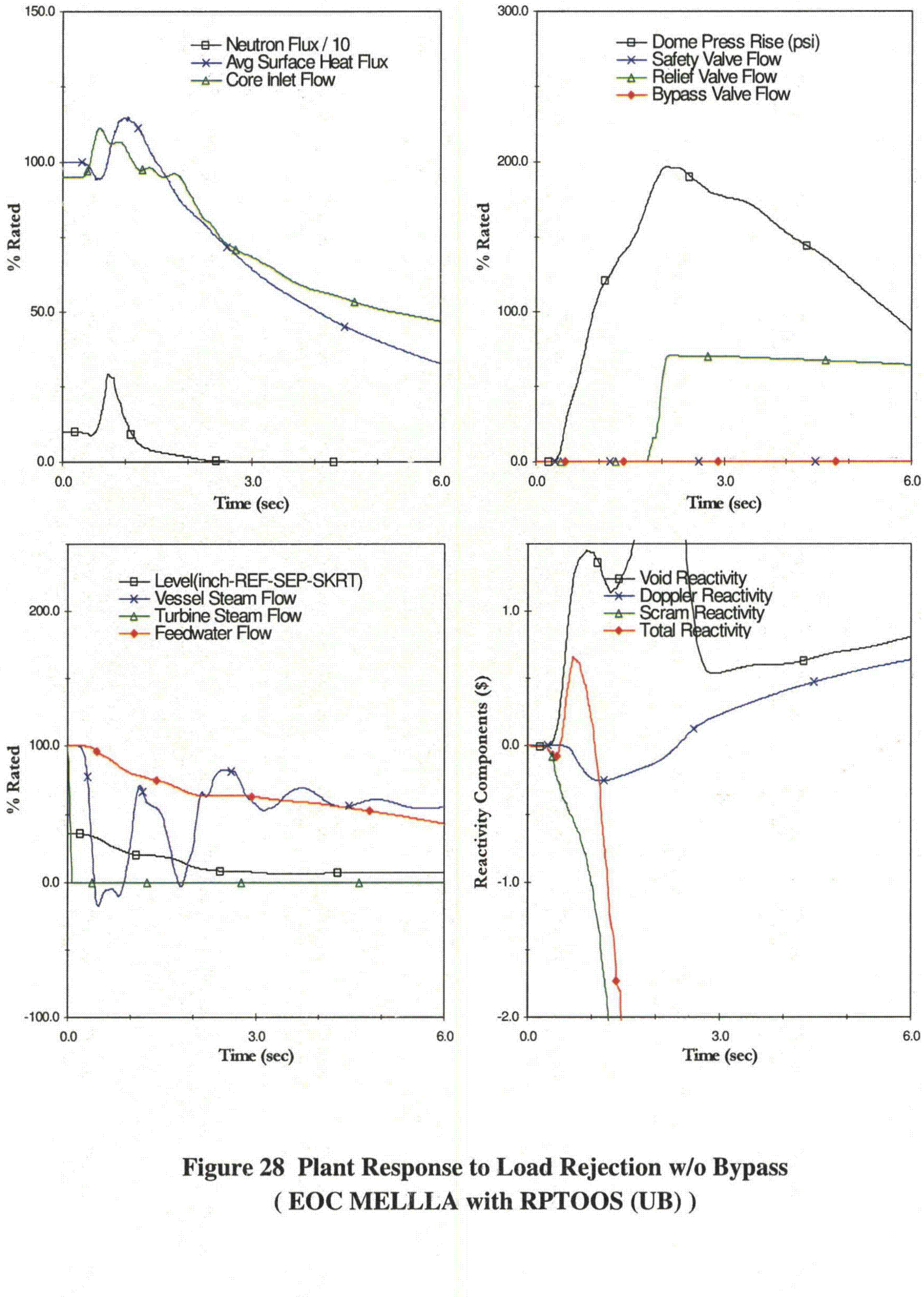


Figure 28 Plant Response to Load Rejection w/o Bypass (EOC MELLLA with RPTOOS (UB))

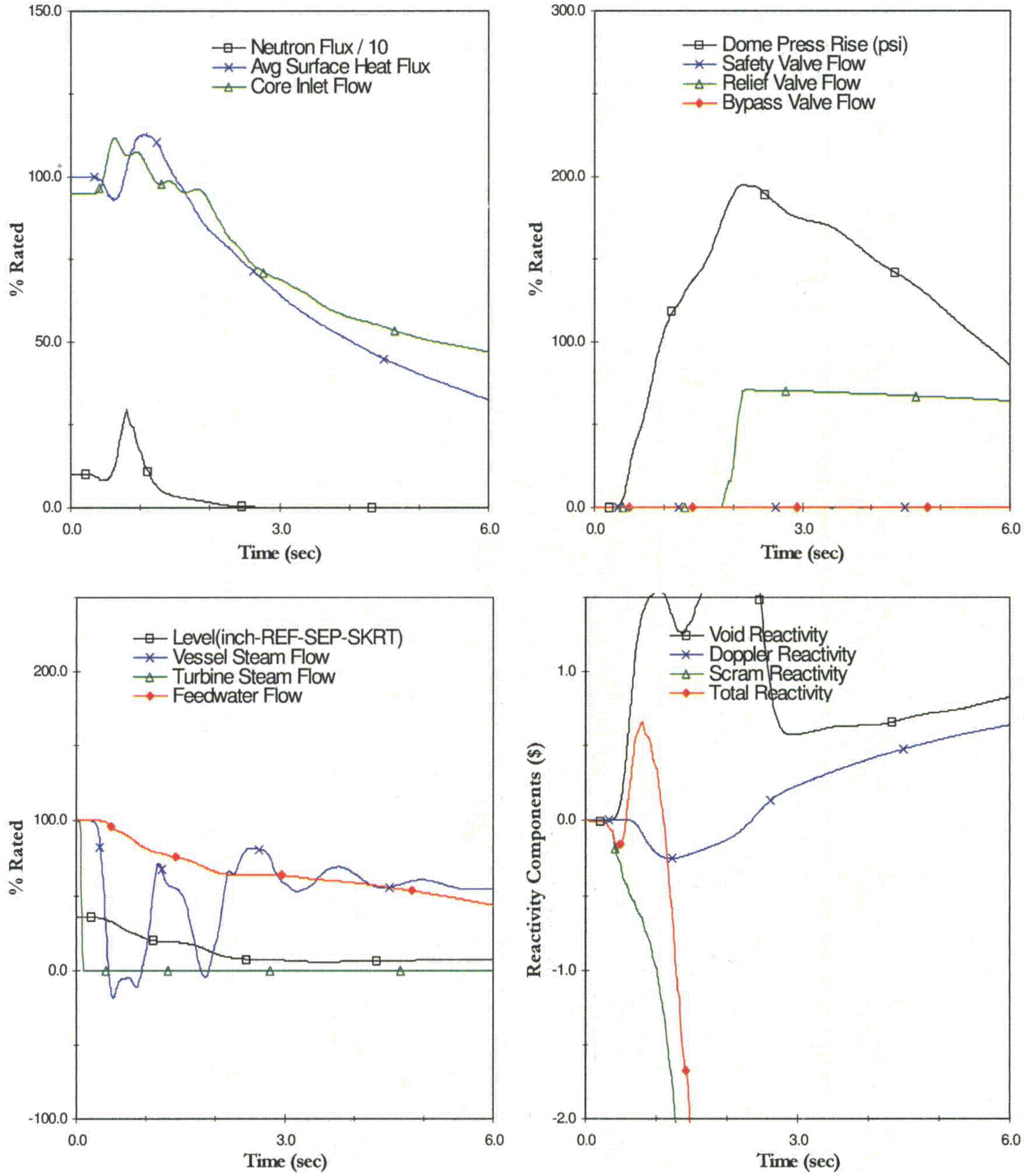


Figure 29 Plant Response to Turbine Trip w/o Bypass
(EOC MELLLA with RPTOOS (UB))

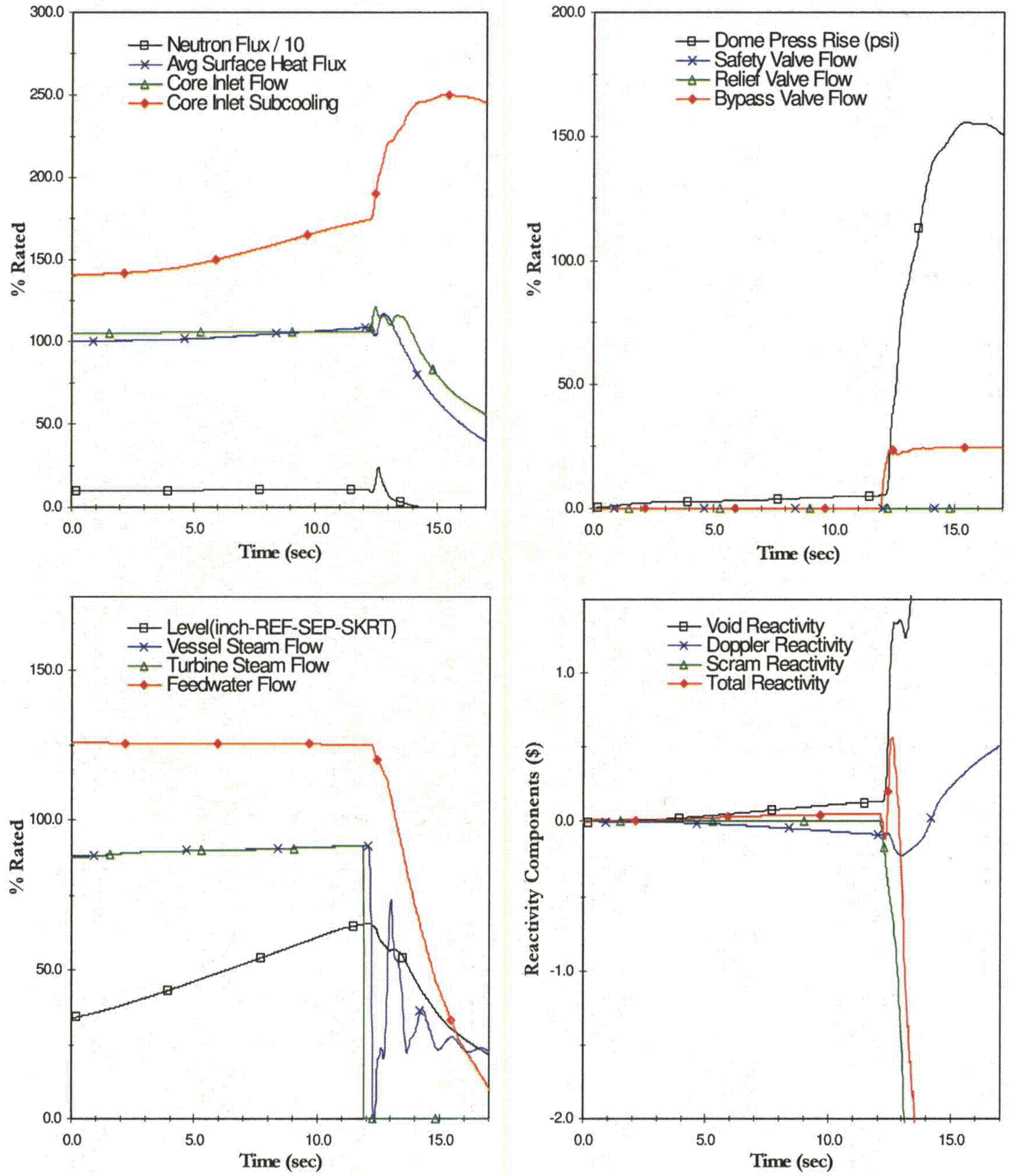


Figure 30 Plant Response to FW Controller Failure
(MOC ICF & FWTR with RPTOOS (HBB))

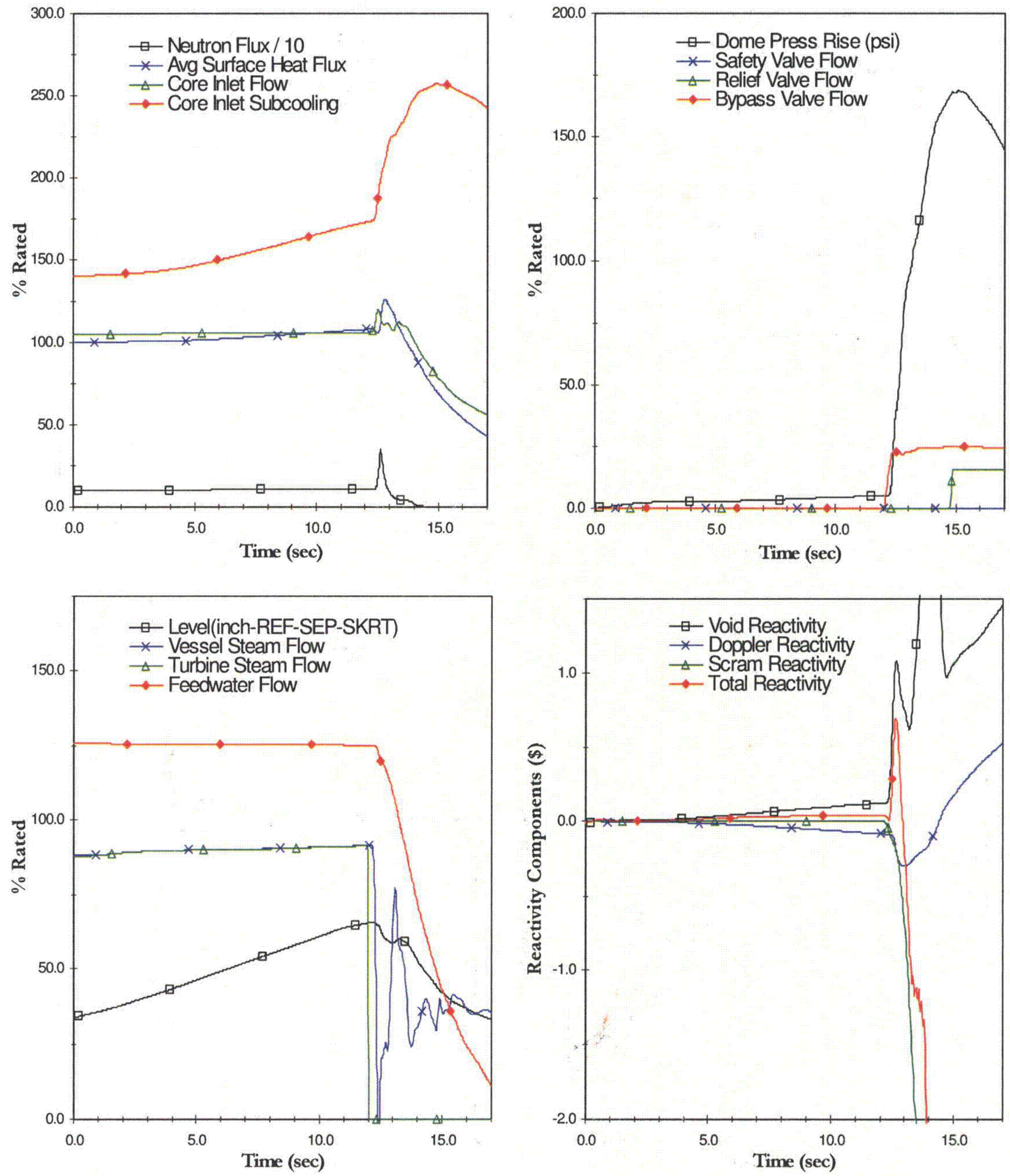


Figure 31 Plant Response to FW Controller Failure
(EOC ICF & FWTR with RPTOOS (HBB))

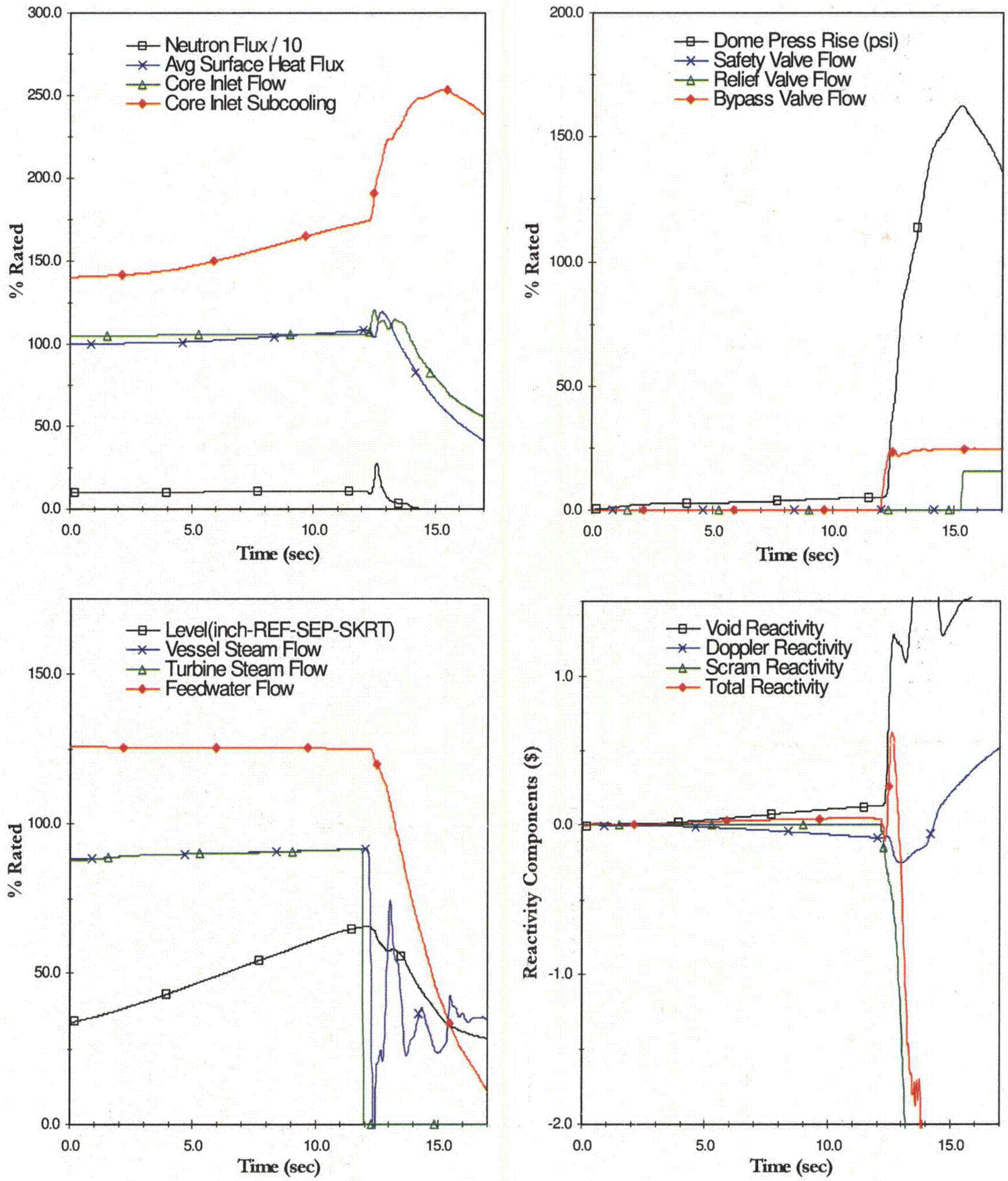


Figure 32 Plant Response to FW Controller Failure
(EOC ICF & FWTR with RPTOOS (UB))

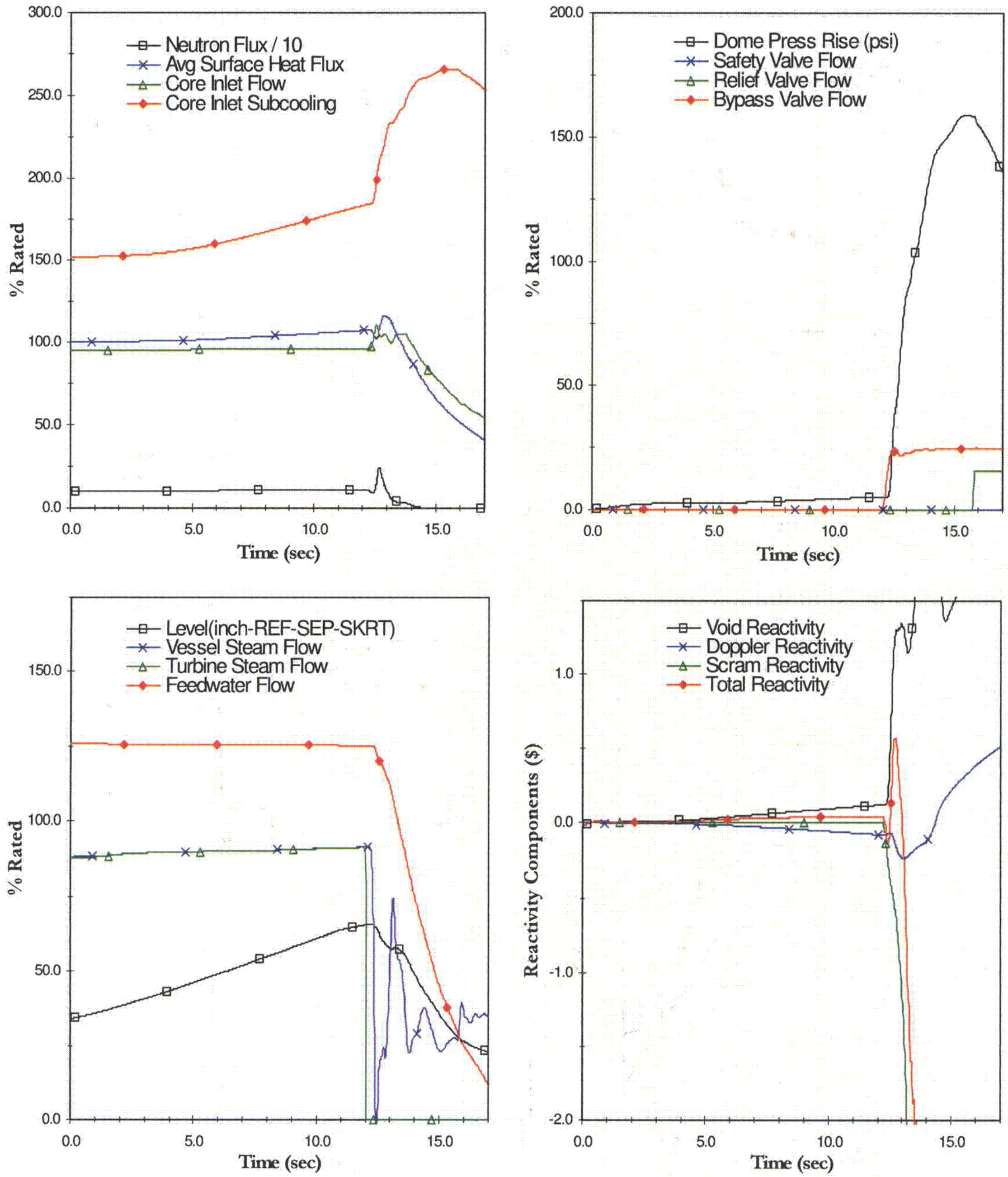


Figure 33 Plant Response to FW Controller Failure
(EOC MELLLA & FWTR with RPTOOS (UB))

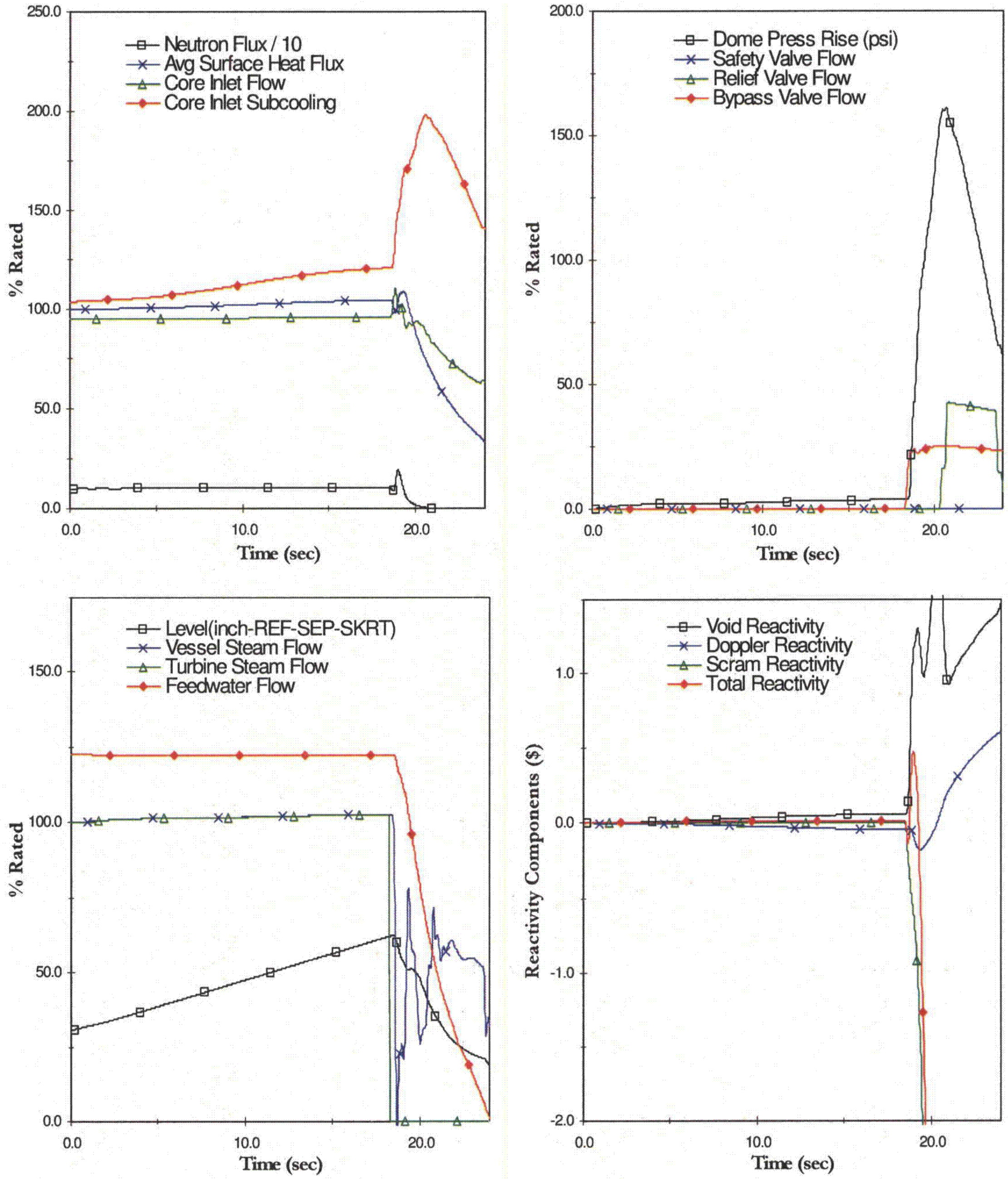


**Figure 34 Plant Response to FW Controller Failure
(MOC MELLLA (HBB))**

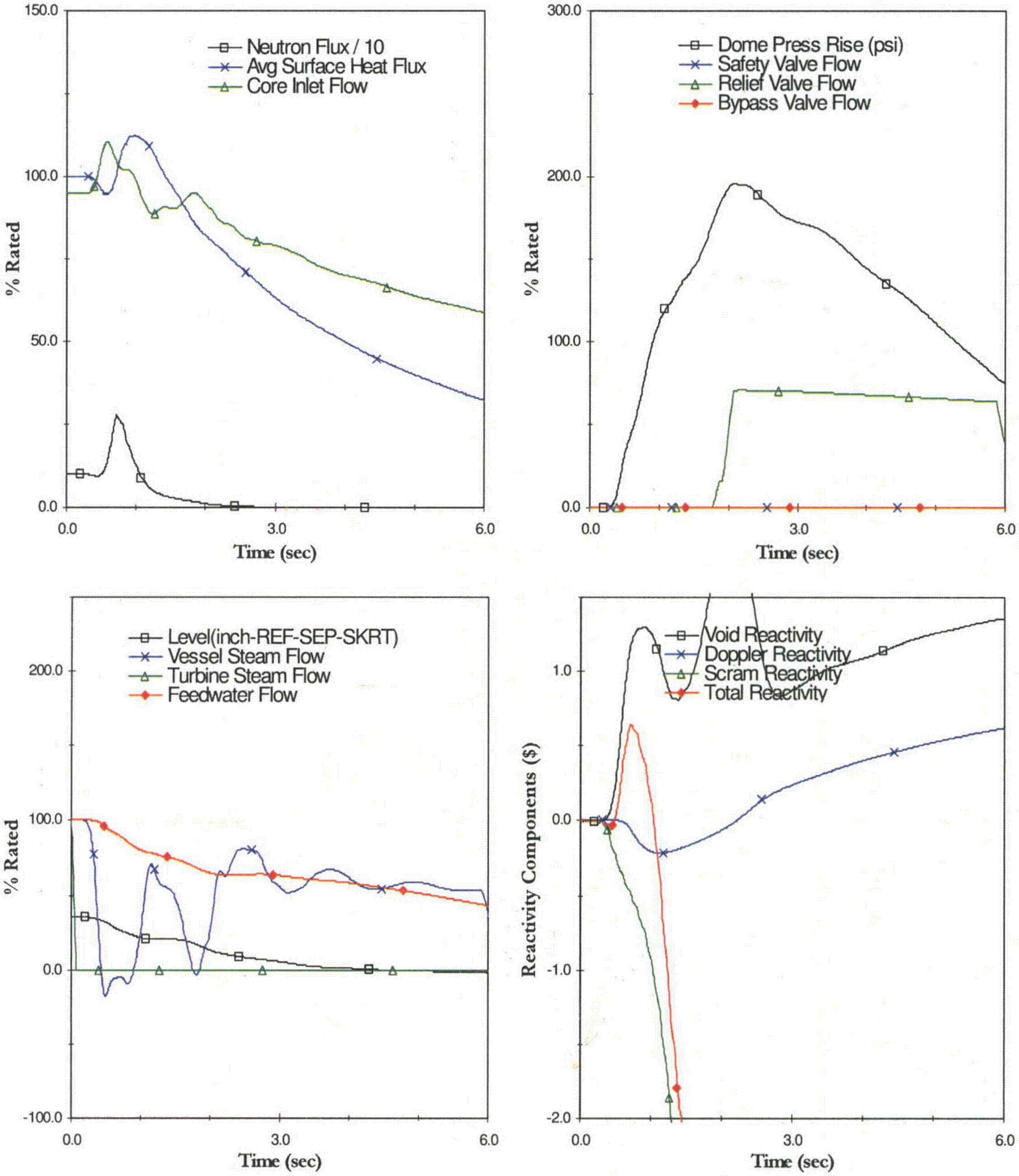


Figure 35 Plant Response to Load Rejection w/o Bypass
(MOC MELLLA (HBB))

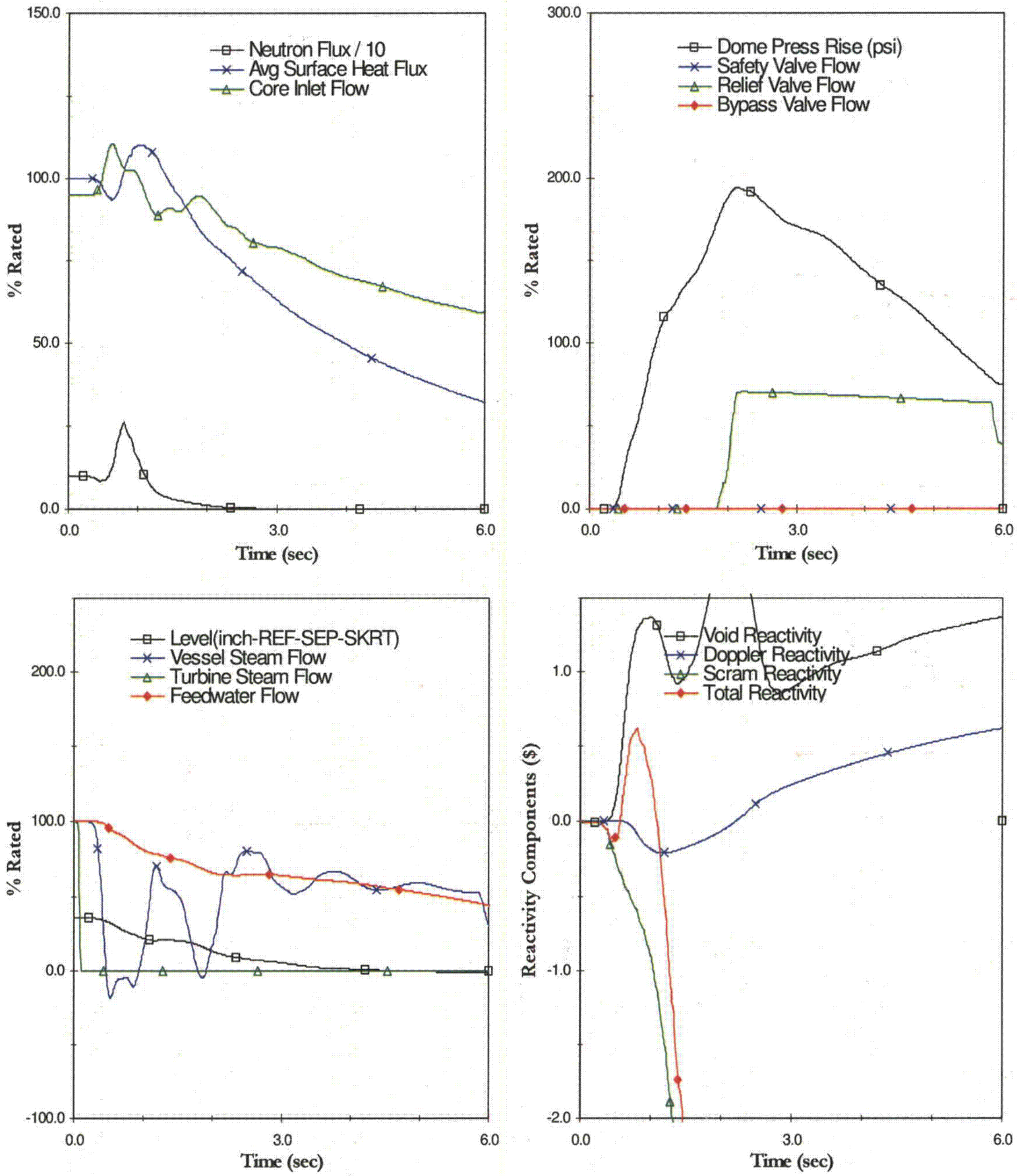


Figure 36 Plant Response to Turbine Trip w/o Bypass
(MOC MELLLA (HBB))

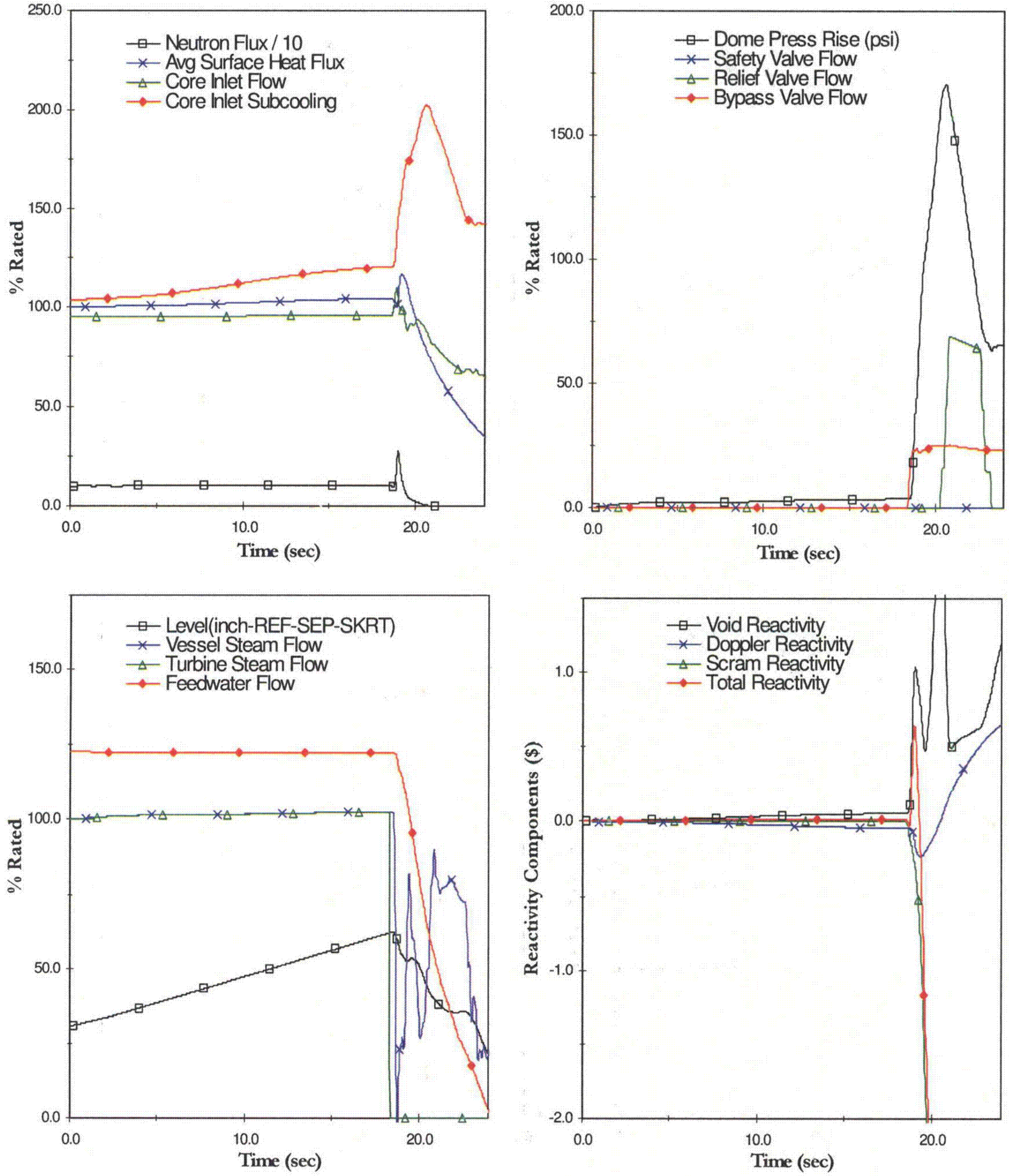


Figure 37 Plant Response to FW Controller Failure (EOC MELLLA (HBB))

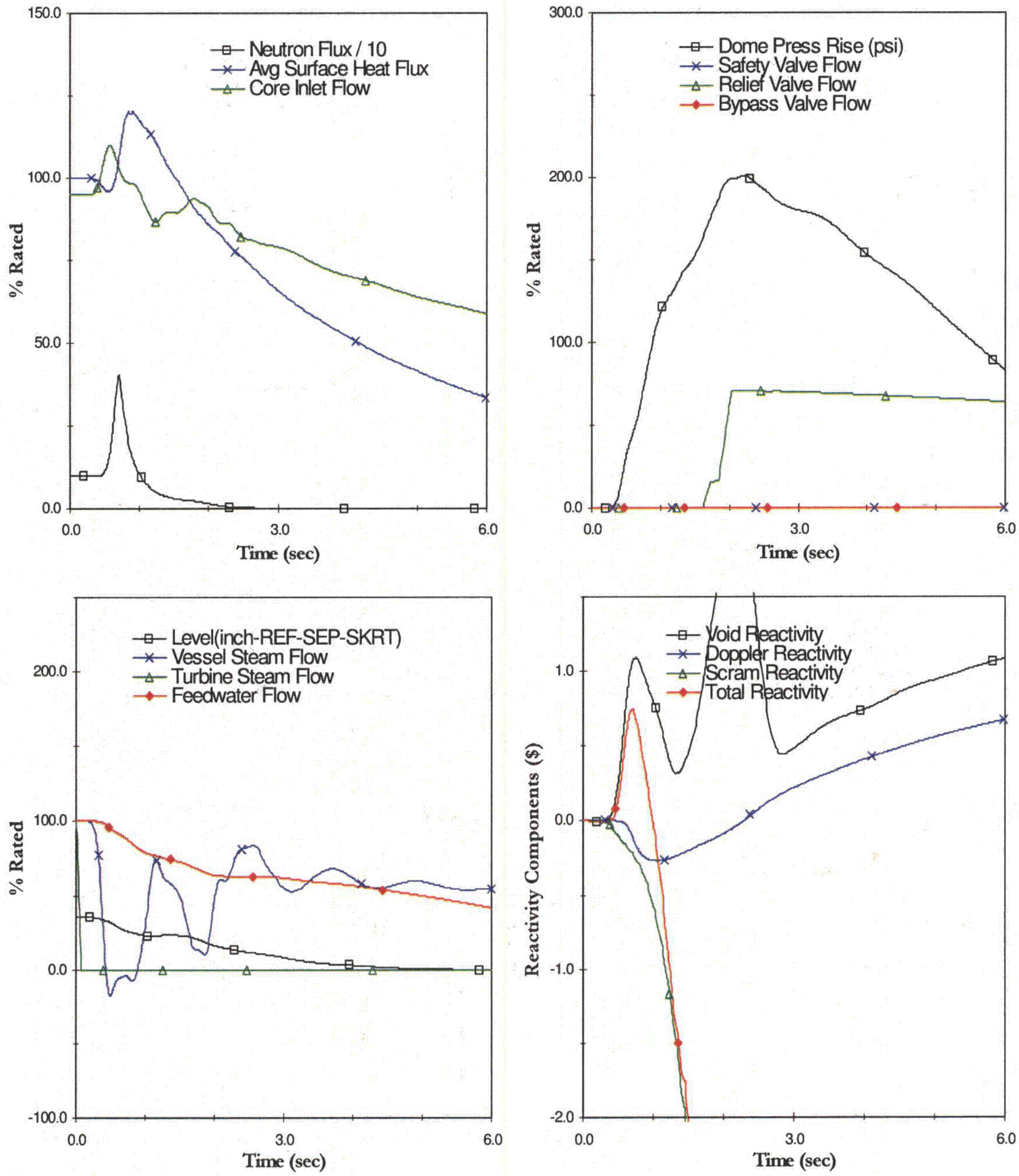


Figure 38 Plant Response to Load Rejection w/o Bypass (EOC MELLLA (HBB))

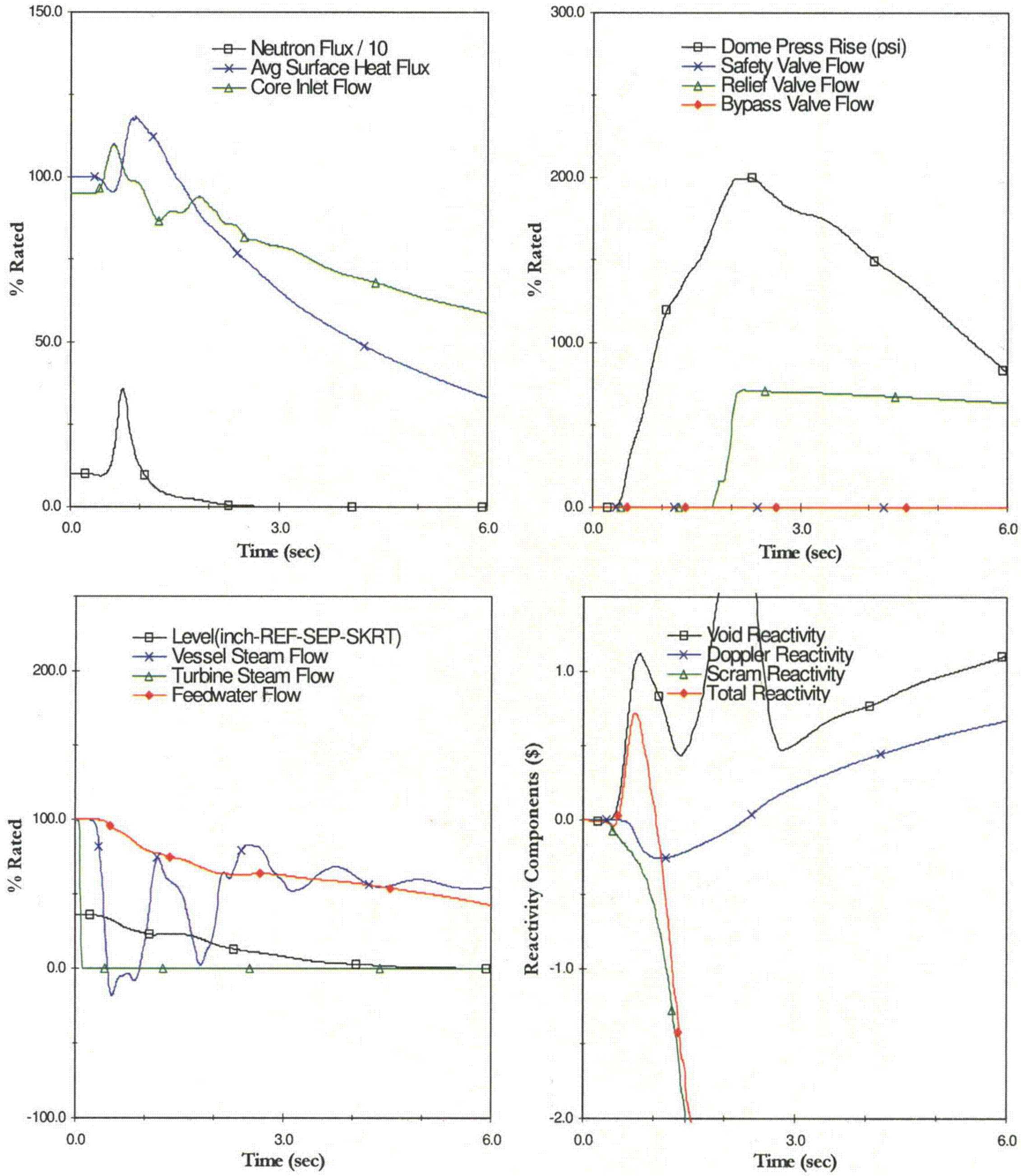


Figure 39 Plant Response to Turbine Trip w/o Bypass
(EOC MELLLA (HBB))

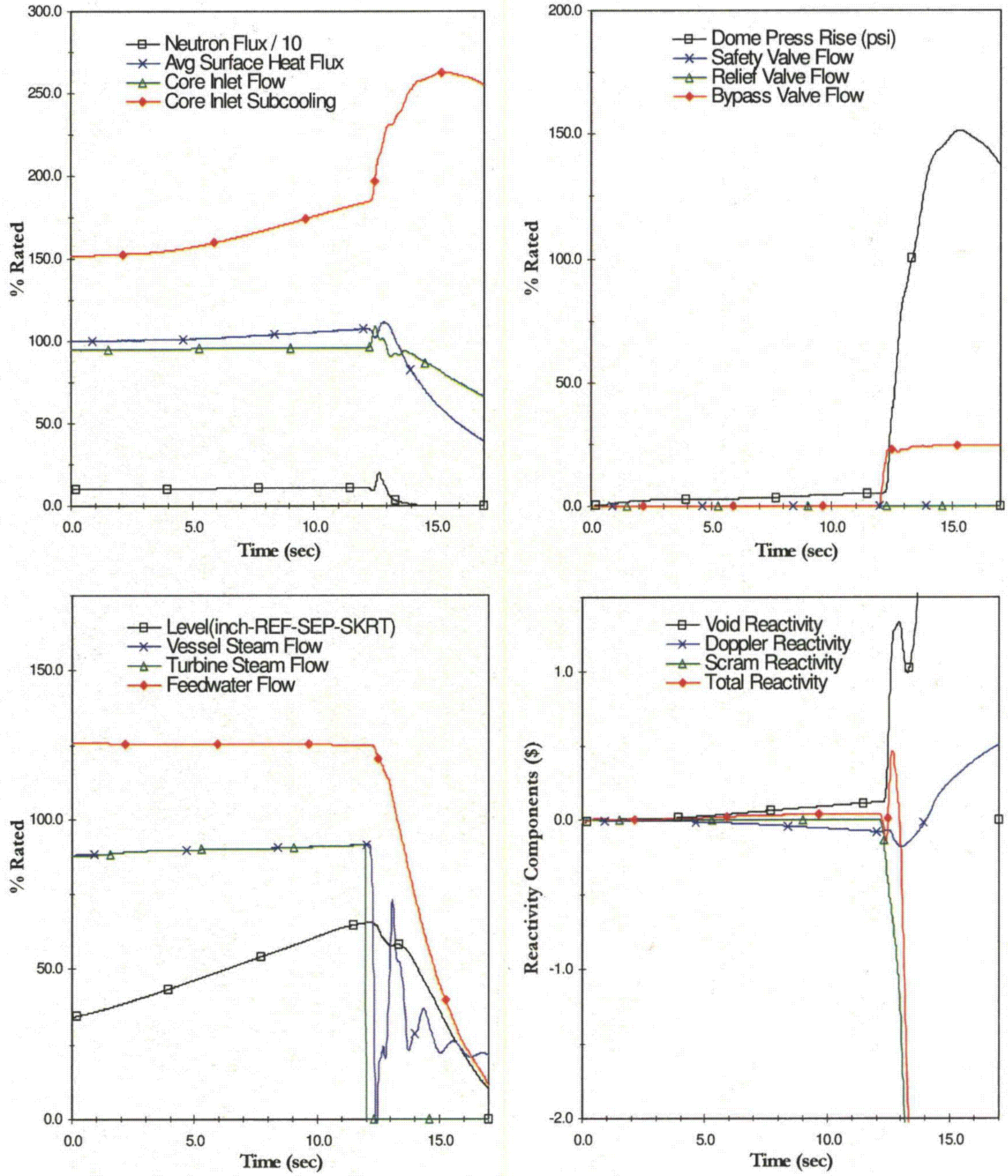


Figure 40 Plant Response to FW Controller Failure
(MOC MELLLA & FWTR (HBB))

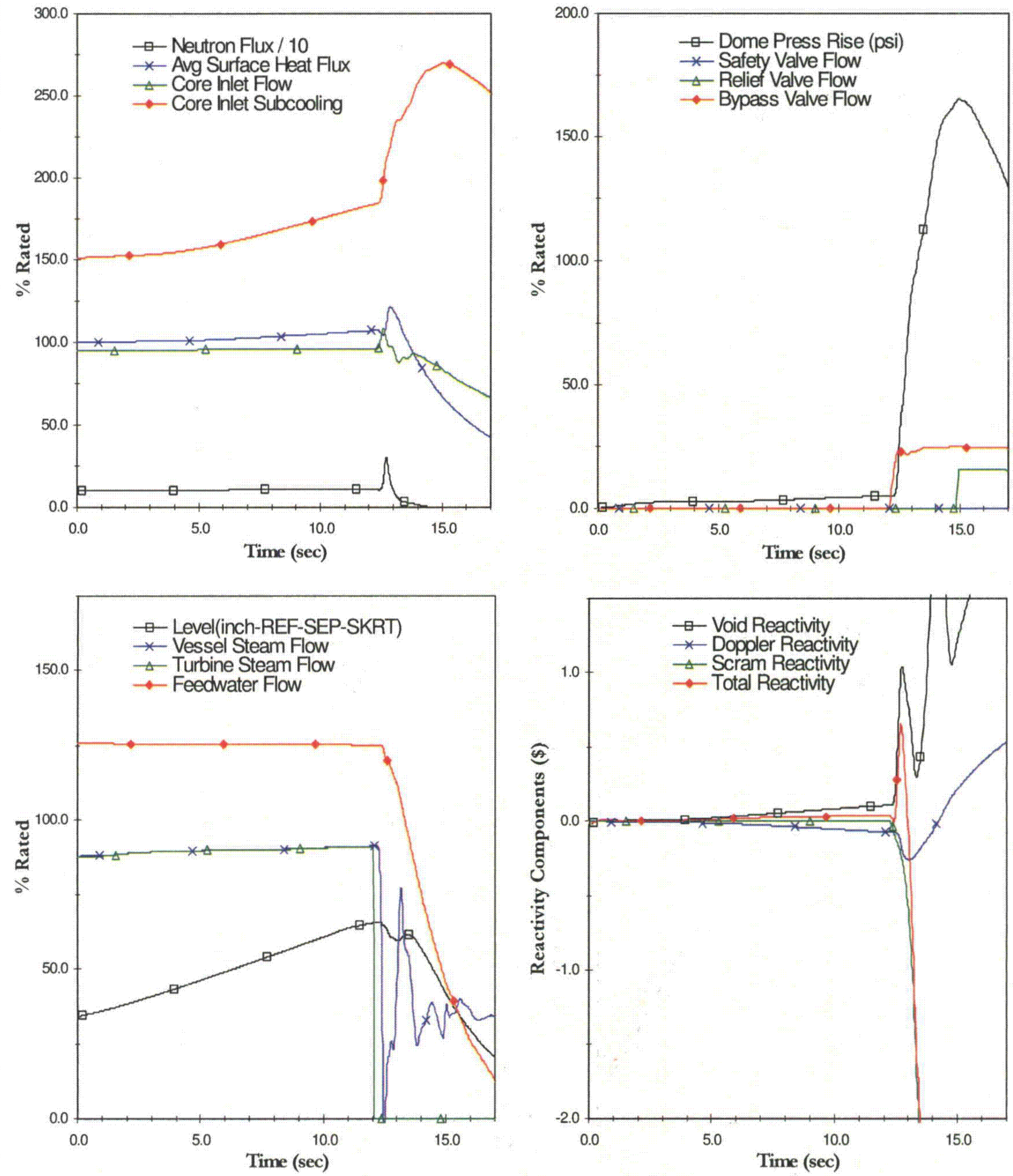


Figure 41 Plant Response to FW Controller Failure
(EOC MELLLA & FWTR (HBB))

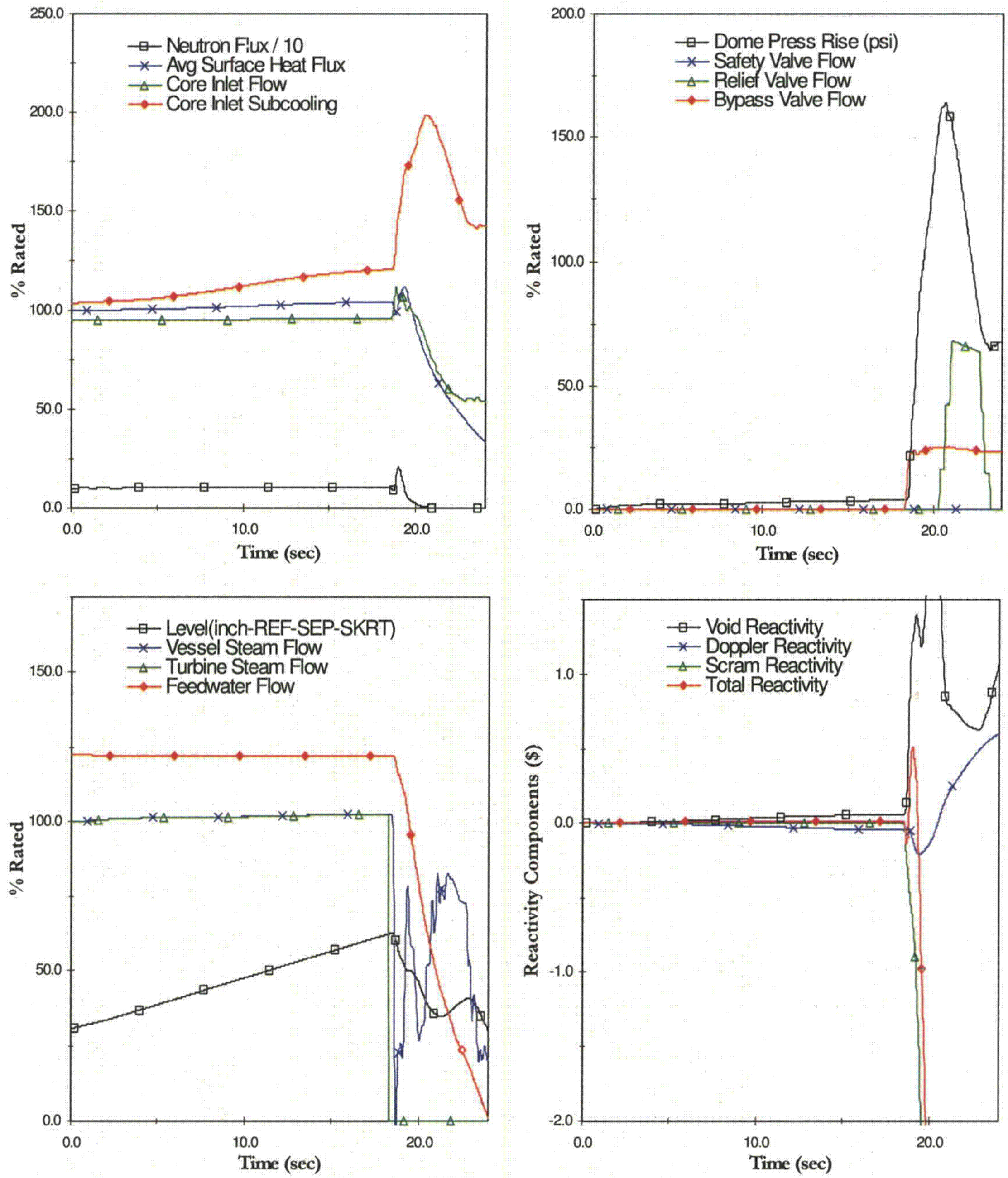


Figure 42 Plant Response to FW Controller Failure
(MOC MELLLA with RPTOOS (HBB))

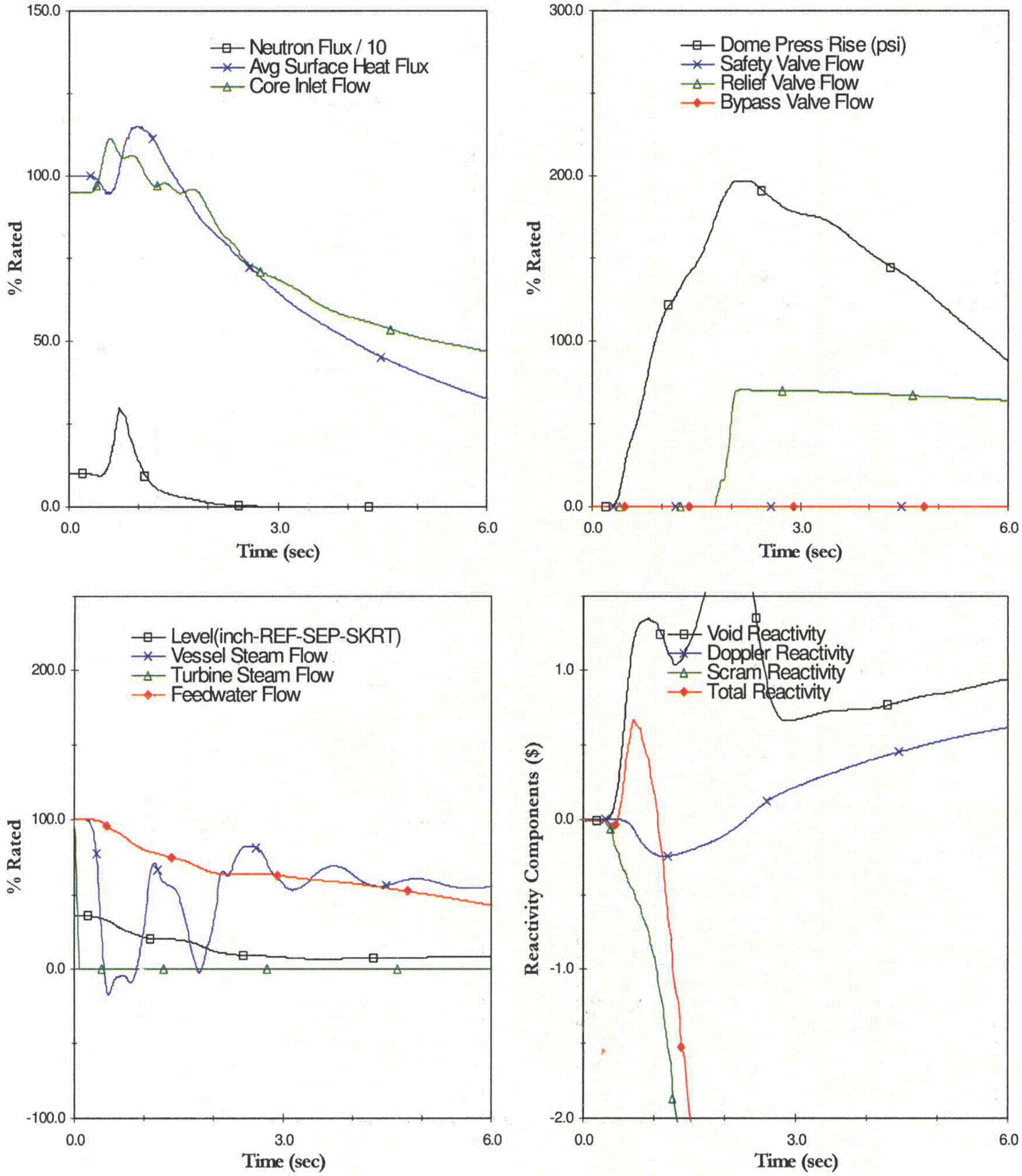


Figure 43 Plant Response to Load Rejection w/o Bypass
(MOC MELLLA with RPTOOS (HBB))

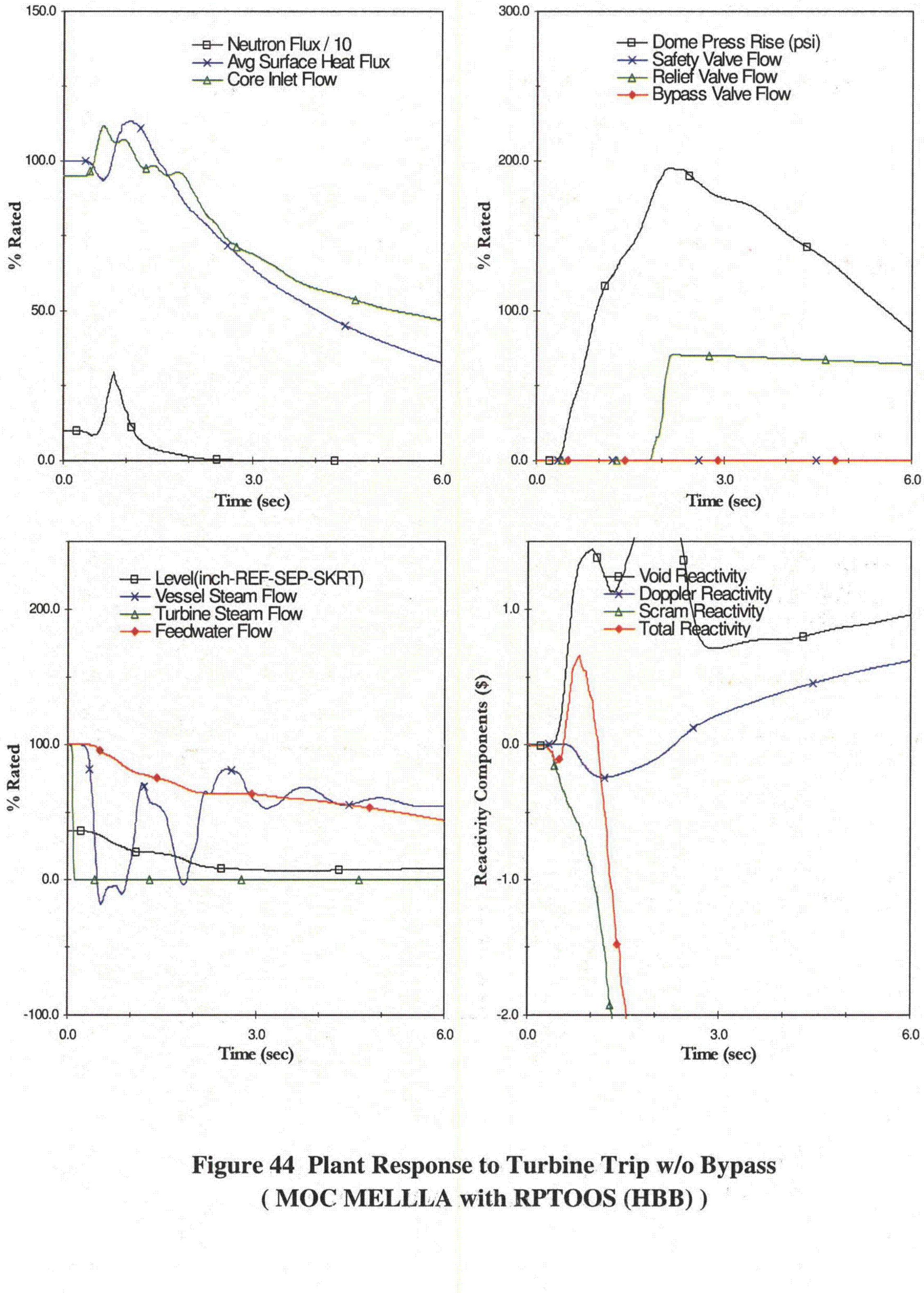


Figure 44 Plant Response to Turbine Trip w/o Bypass (MOC MELLLA with RPTOOS (HBB))

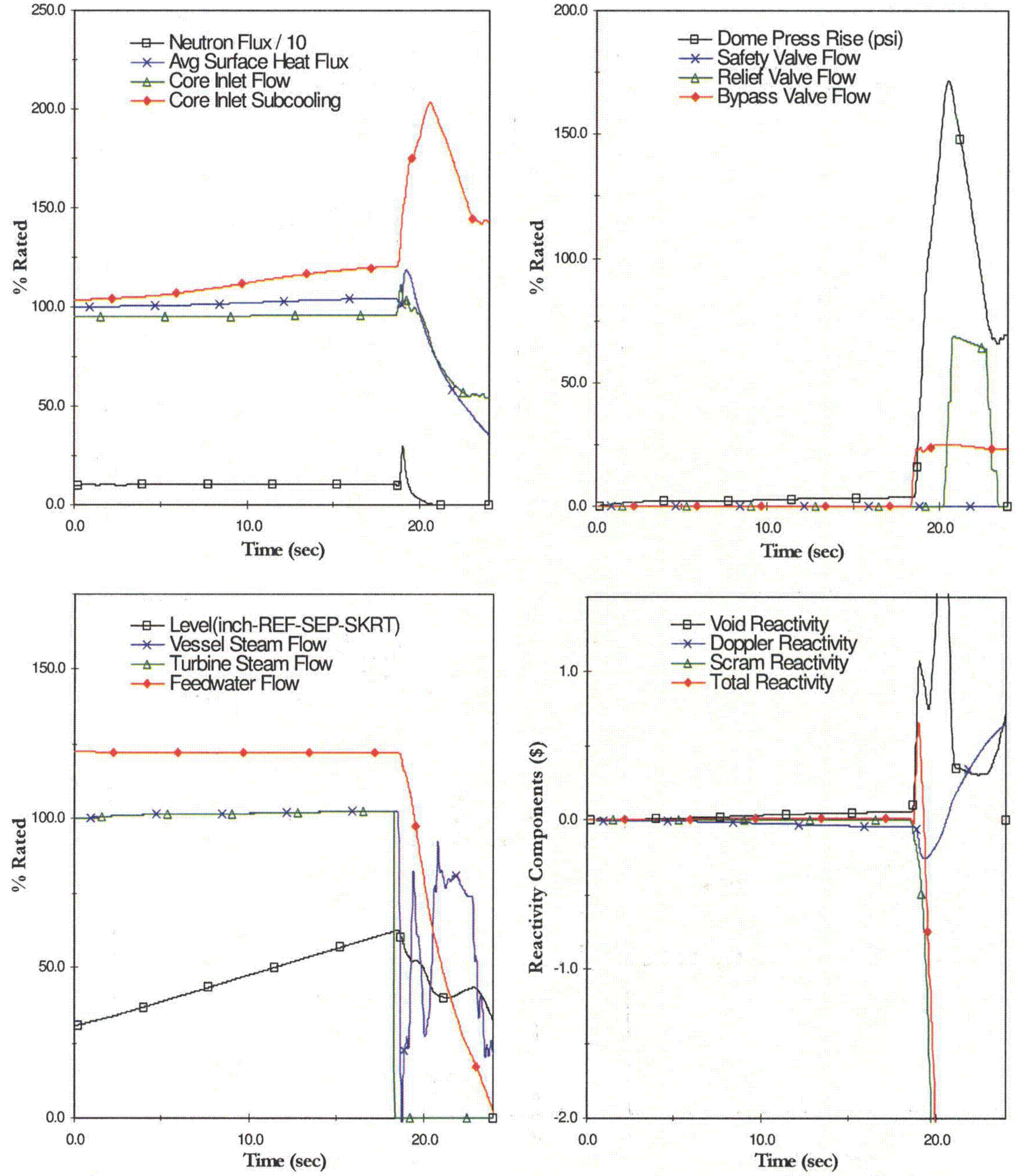


Figure 45 Plant Response to FW Controller Failure
(EOC MELLLA with RPTOOS (HBB))

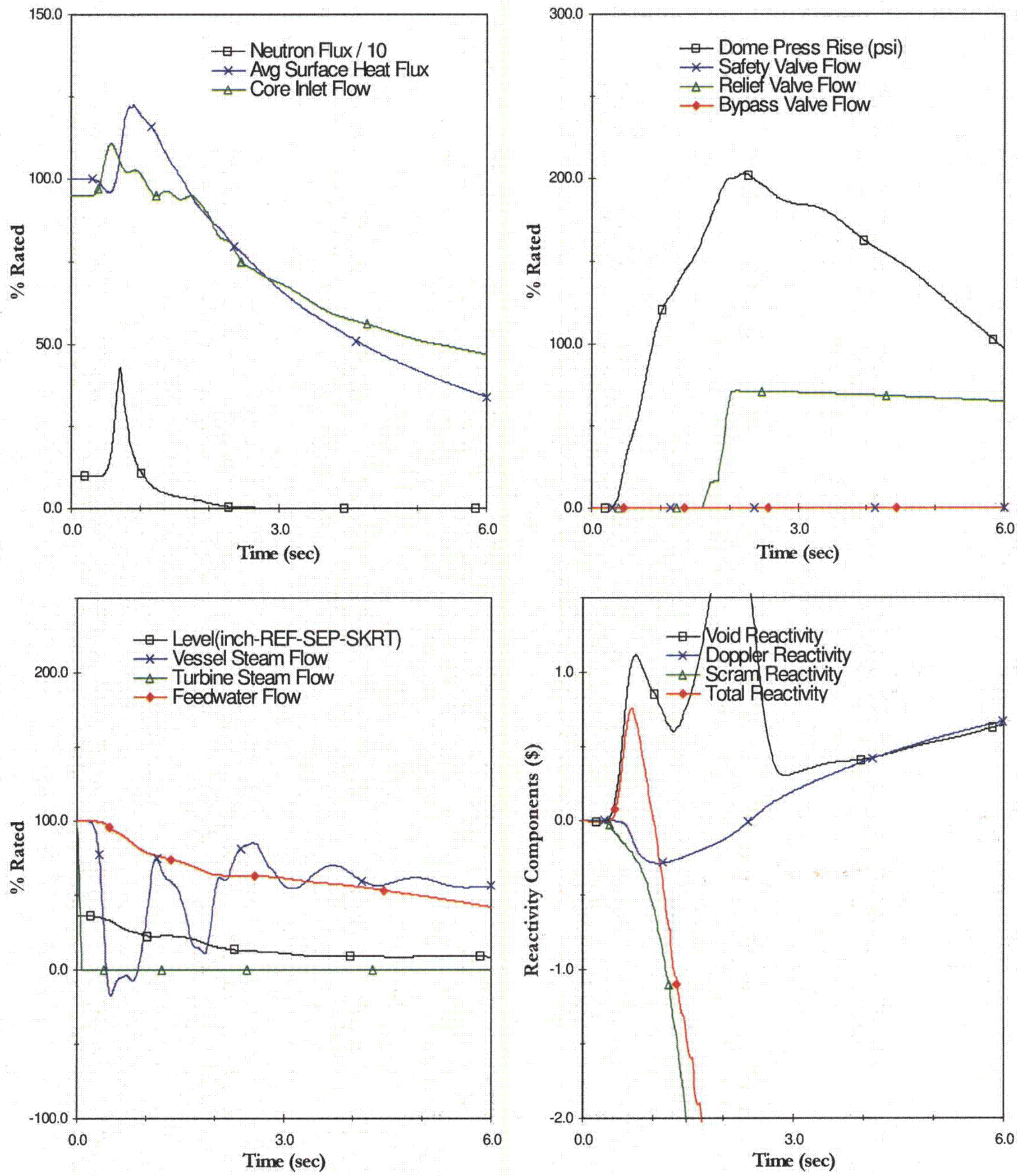


Figure 46 Plant Response to Load Rejection w/o Bypass
(EOC MELLLA with RPTOOS (HBB))

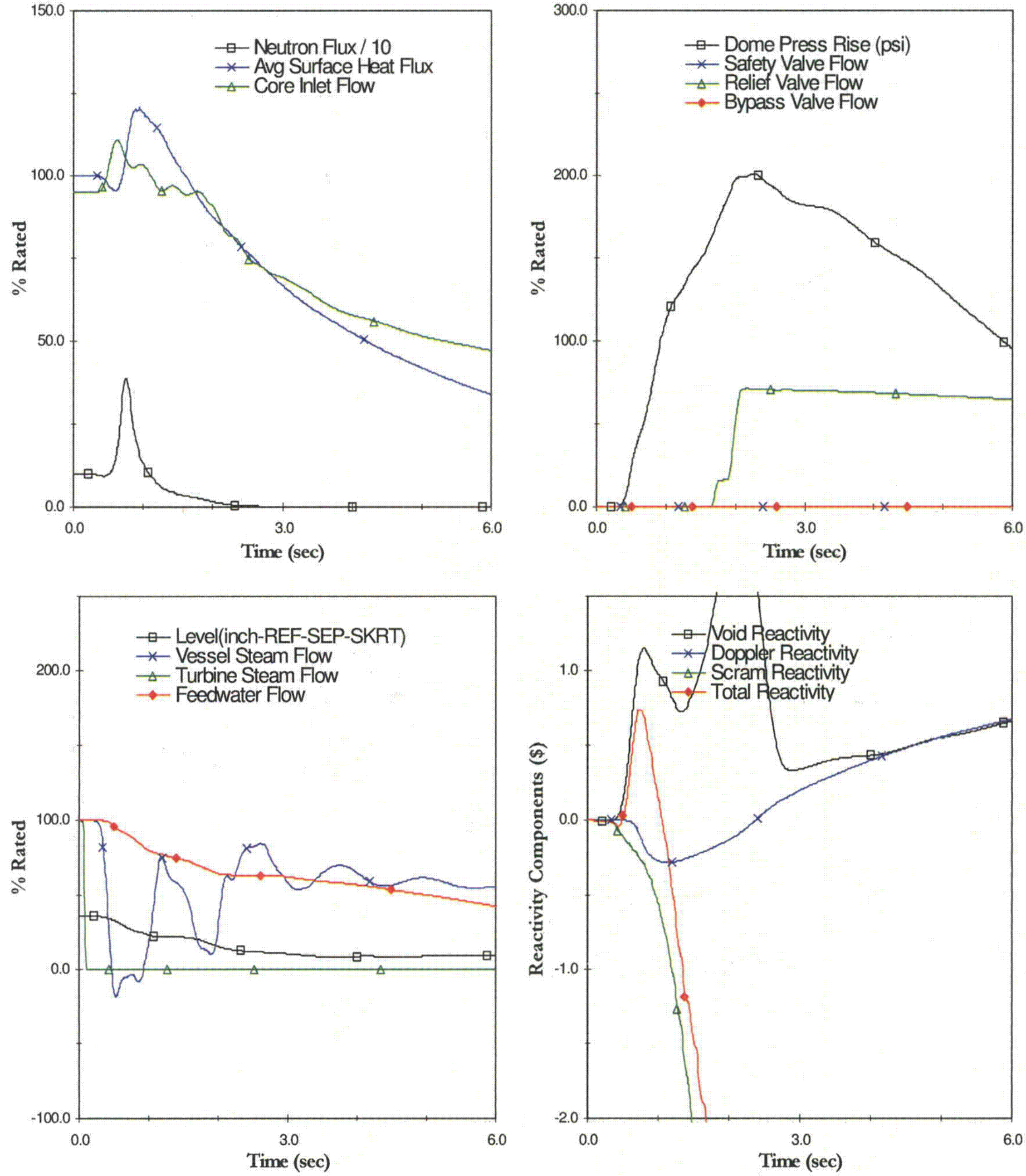


Figure 47 Plant Response to Turbine Trip w/o Bypass (EOC MELLLA with RPTOOS (HBB))

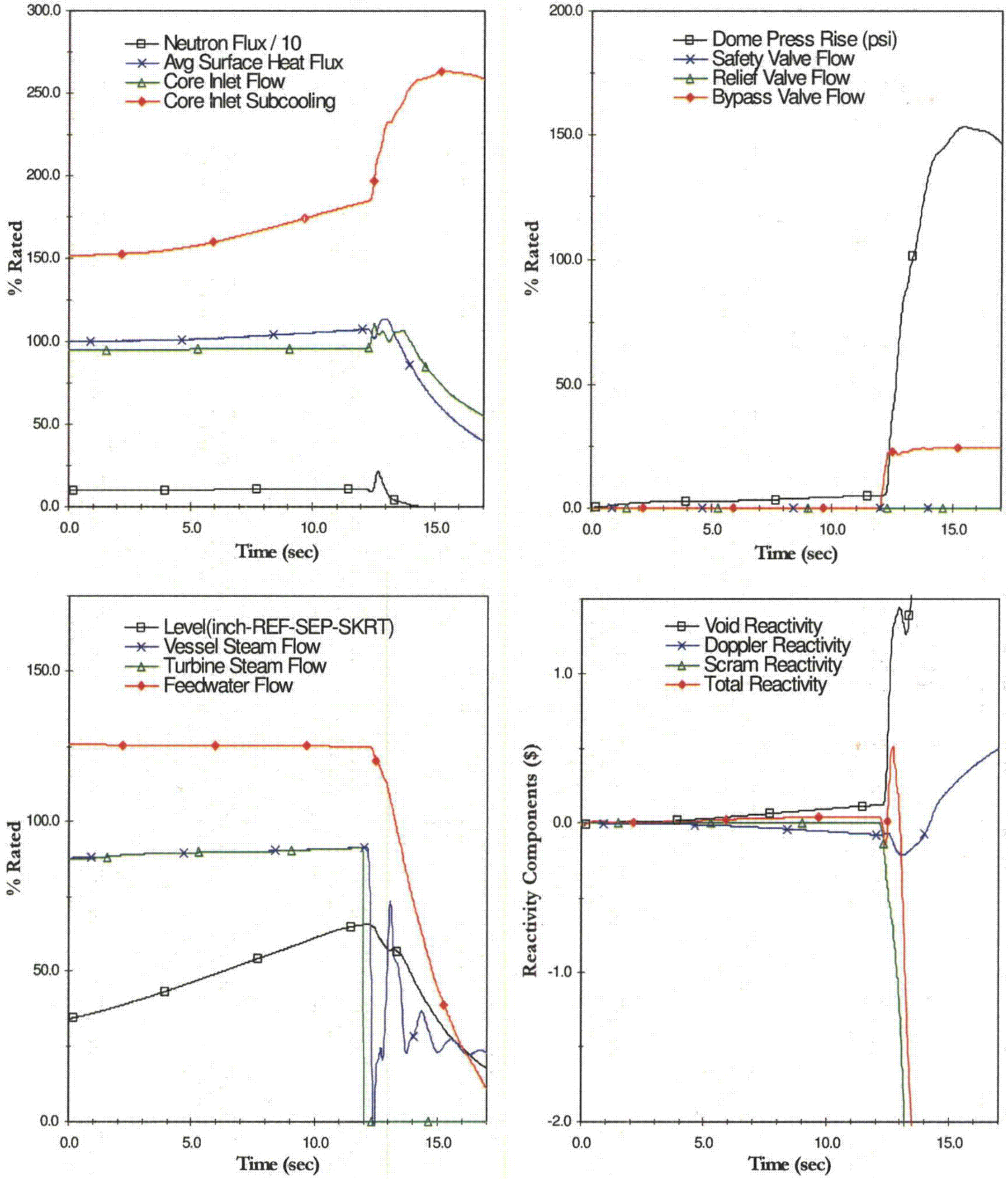


Figure 48 Plant Response to FW Controller Failure (MOC MELLLA & FWTR with RPTOOS (HBB))

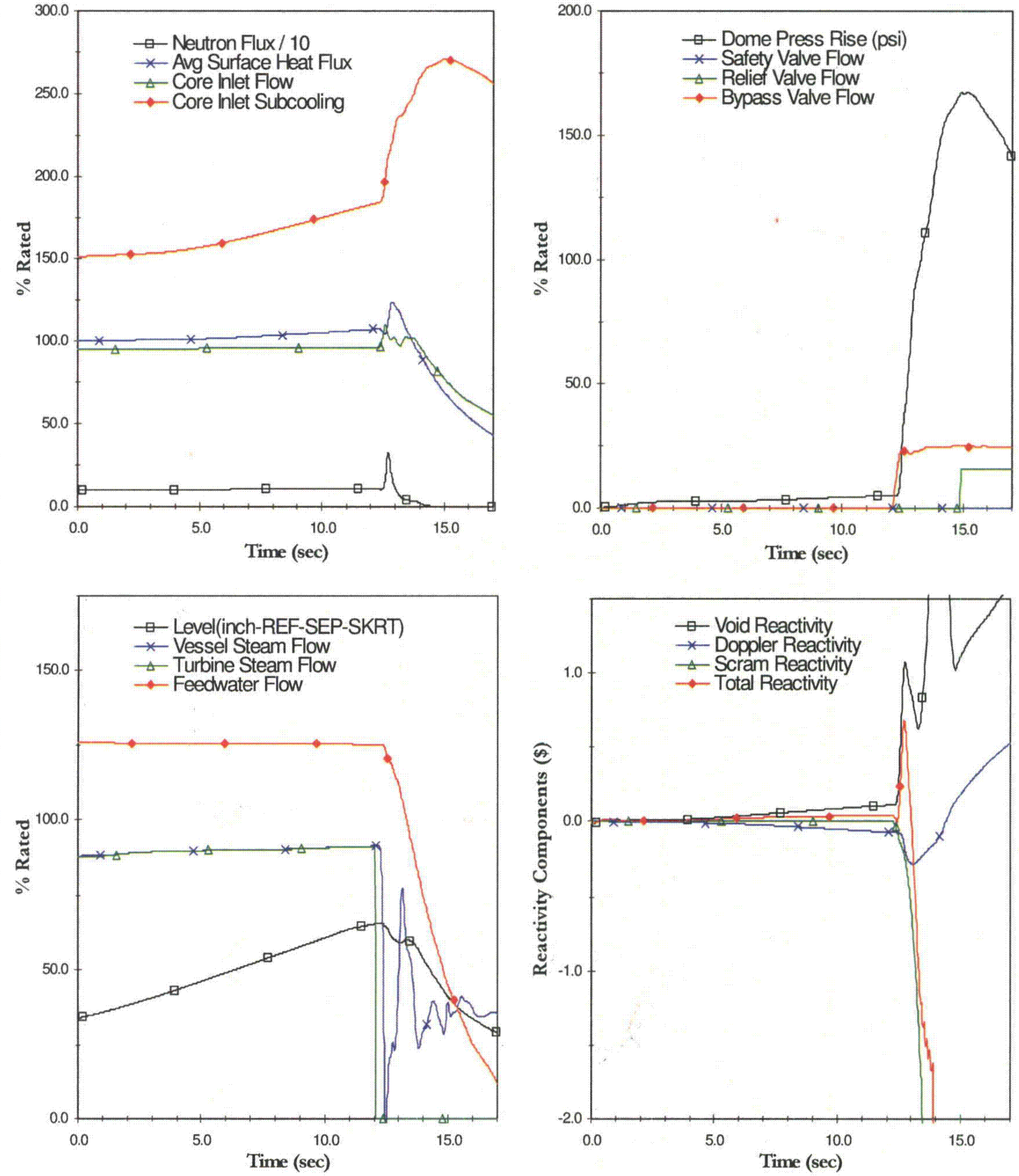


Figure 49 Plant Response to FW Controller Failure
(EOC MELLLA & FWTR with RPTOOS (HBB))

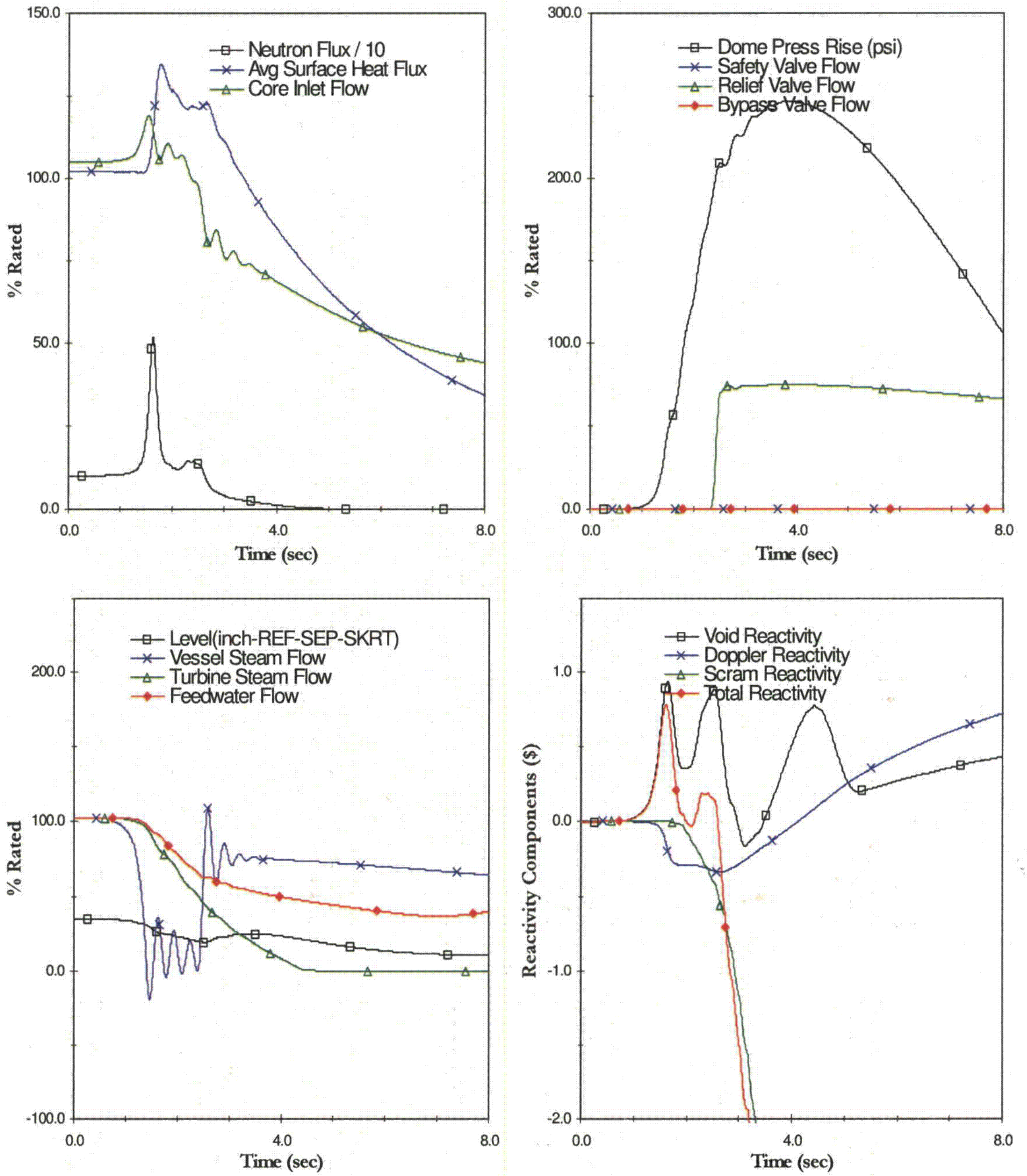


Figure 50 Plant Response to MSIV Closure (Flux Scram) - ICF (HBB)

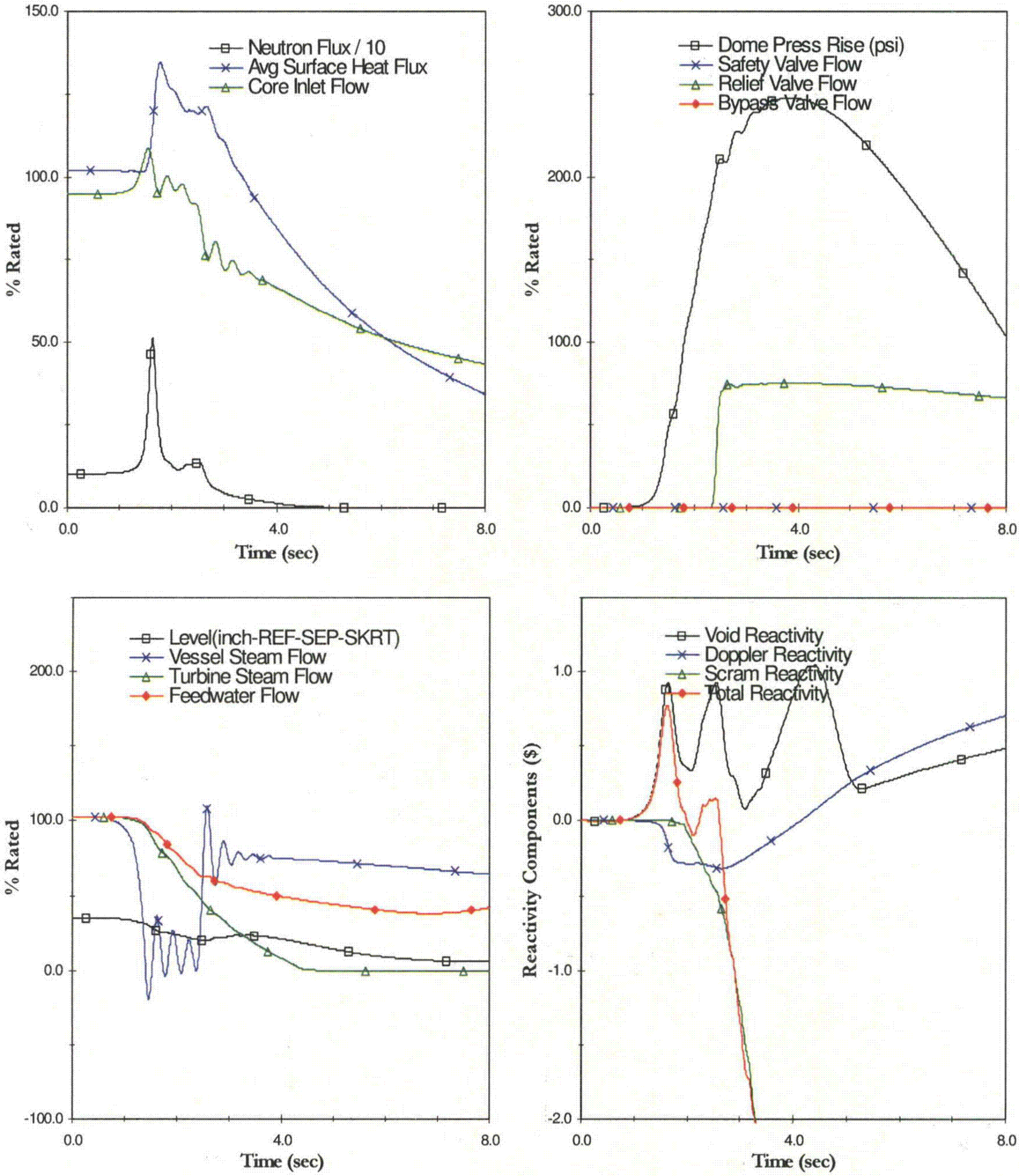


Figure 51 Plant Response to MSIV Closure (Flux Scram) - MELLLA (HBB)

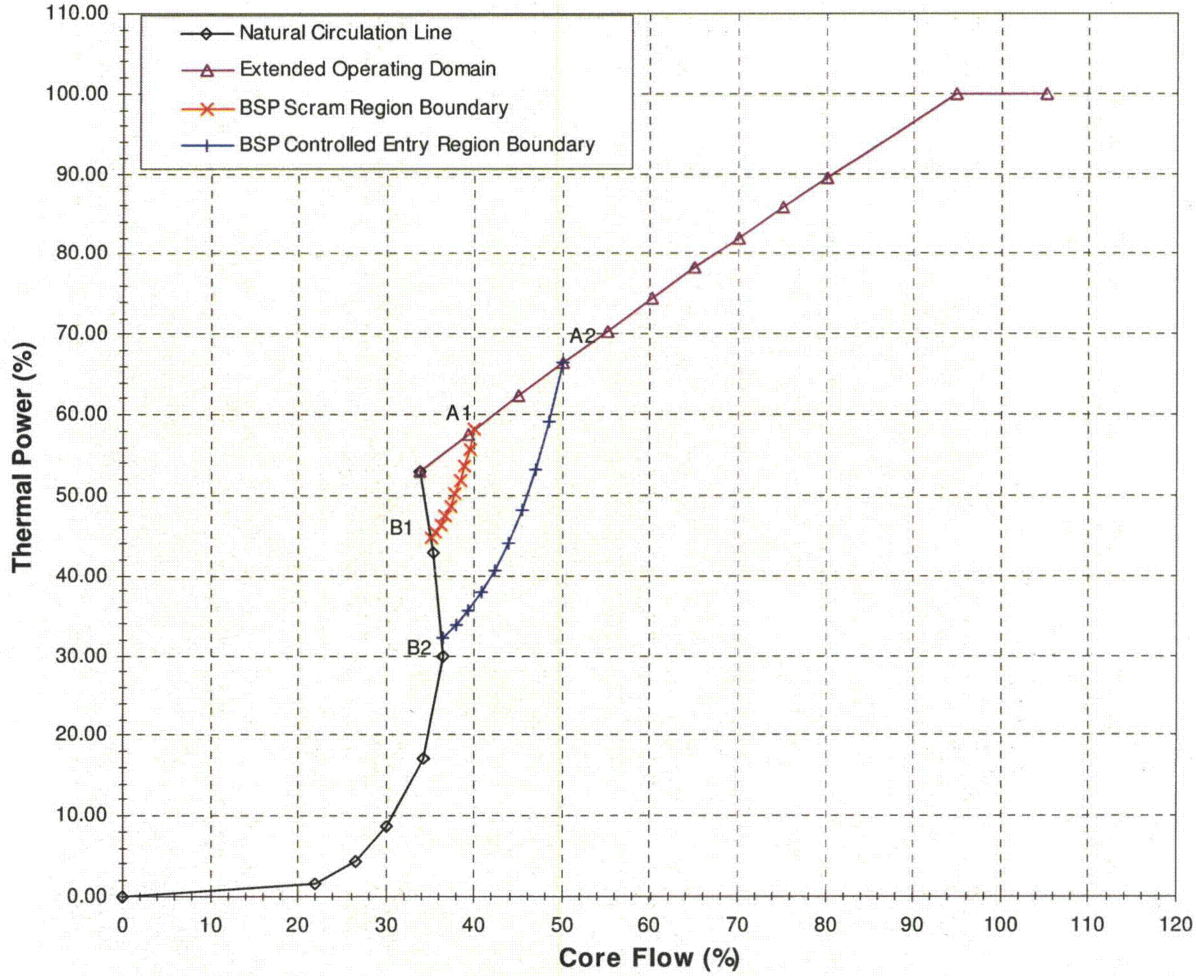


Figure 52 BSP Region Boundaries for Normal Feedwater Temperature Operation

Appendix A
Analysis Conditions

The reactor operating conditions used in the reload licensing analysis for this plant and cycle are presented in Table A-1. The pressure relief and safety valve configuration for this plant are presented in Table A-2. Additionally, the operating flexibility options listed in Section 8 are supported by the reload licensing analysis.

Table A-1 Reactor Operating Conditions

	Analysis Value			
Parameter	**ICF NFWT**	**LCF NFWT**	**ICF RFWT**	**LCF RFWT**
Thermal power, MWt	3840.0	3840.0	3840.0	3840.0
Core flow, Mlb/hr	105.0	94.8	105.0	94.8
Reactor pressure (core mid-plane), psia	1036.0	1034.0	1013.4	1011.6
Inlet enthalpy, Btu/lb	526.3	523.8	511.0	507.3
Non-fuel power fraction	0.036	0.036	0.036	0.036
Steam flow, Mlb/hr	16.80	16.78	14.75	14.73
Dome pressure, psig	1005.0	1005.0	983.6	983.6
Turbine pressure, psig	945.8	945.9	937.3	937.4

Table A-2 Pressure Relief and Safety Valve Configuration

Valve Type	Number of Valves	Lowest Setpoint (psig)
Safety/Relief Valve	14	1141.2

Appendix B
Thermal-Mechanical Compliance

A thermal-mechanical compliance check is performed for all analyzed transients to assure that the fuel will operate without violating the thermal-mechanical design limits. These limits are designed such that reactor operation within these limits provides assurance that the fuel will not exceed any thermal-mechanical design or licensing limits during all modes of operation. The fuel thermal-mechanical limits are met for the current cycle.

Appendix C
Decrease in Core Coolant Temperature Event

The Loss-of-Feedwater Heating event was analyzed at 100% rated power using the BWR Simulator Code. The use of this code is consistent with the approved methodology. The transient plots, neutron flux and heat flux values normally reported in Section 9 are not an output of the BWR Simulator Code; therefore, those items are not included in this document. The OLMCPR result is shown in Section 11.

In addition, the Inadvertent HPCI start-up event was determined to be non-limiting.

Appendix D
Off-Rated Limits

Off-Rated Power Dependent Limits

The cycle-independent power dependent limits are documented in Reference D-1. The power dependent limits provided in Reference D-1 have been validated for this cycle. Above Pbypass (24% rated power), the power dependent limits consist of Kp and LHGRFACp multipliers. The Kp and LHGRFACp multipliers are applied as follows:

Operating Limit MCPRp = Kp * Operating Limit MCPR(100%P)

LHGRp = LHGRFACp * LHGRstd

Analyses performed in support of Reference D-1 confirmed that the Kp and LHGRFACp multipliers bound the range between Pbypass and the PLU enabling power level. No thermal limits are required for below Pbypass.

Kp Limits for: Equipment In Service	
Limits for Power ≥ 24.0%	
Power (%)	**Limit, *Kp***
24.0	1.561
45.0	1.280
60.0	1.150
100.0	1.000

Kp Limits for: RPTOOS	
Limits for Power ≥ 24.0%	
Power (%)	**Limit, *Kp***
24.0	1.561
45.0	1.280
60.0	1.150
100.0	1.000

LHGRFACp Limits for: Equipment In Service	
Limits for Power ≥ 24.0%	
Power (%)	**Limit**
24.0	0.603
100.0	1.000

LHGRFACp Limits for: RPTOOS	
Limits for Power ≥ 24.0%	
Power (%)	**Limit**
24.0	0.603
100.0	1.000

Off-Rated Flow Dependent Limits

The cycle-independent flow dependent limits are documented in Reference D-1. The flow dependent limits provided in Reference D-1 have been validated for this cycle. The flow dependent limits consist of an absolute MCPRf limit and LHGRFACf multiplier.

The MCPRf limits provided in Reference D-1 are based on a SLMCPR of 1.07; therefore, the MCPRf limits are adjusted for the cycle-specific SLMCPR in Section 11. The MCPRf limits do not include the +0.01 OLMCPR adder (extended operating domain licensing commitments) because the existing off-rated limits are confirmed to be sufficiently conservative.

MCPRf Limits for: Equipment In Service	
Limits for a Maximum Runout Flow of 109.0%	
Flow (%)	**Limit** *MCPRf*
30.0	1.55
89.2	1.20
109.0	1.20

MCPRf Limits for: RPTOOS	
Limits for a Maximum Runout Flow of 109.0%	
Flow (%)	**Limit** *MCPRf*
30.0	1.55
89.2	1.20
109.0	1.20

LHGRFACf Limits for: Equipment In Service	
Limits for a Maximum Runout Flow of 109.0%	
Flow (%)	**Limit**
30.0	0.500
50.0	0.782
82.2	1.000
109.0	1.000

LHGRFACf Limits for: RPTOOS	
Limits for a Maximum Runout Flow of 109.0%	
Flow (%)	**Limit**
30.0	0.500
50.0	0.782
82.2	1.000
109.0	1.000

References for Appendix D

D-1 *Fuel Transition Report for Hope Creek Generating Station*, NEDC-33158P, Supplement 1, Revision 1, April 2005.

Appendix E
Scram Speed Licensing Basis

Hope Creek Generating Station plans to implement the Technical Specification Improvement Program (TSIP) Option A scram speed in Cycle 17. The reload transient analyses provided in this report support both the 67B and TSIP scram speeds.

Appendix F
Feedwater Temperature and Operating Dome Pressure Range

The reload transient analyses provided in this report are performed using a FFWTR/FWHOOS of 102°F/60°F. FFWTR/FWHOOS of 102°F/60°F is not currently licensed for Hope Creek Generating Station and shall not be implemented until licensed. The reload transient analyses do not by themselves allow plant operation with FFWTR/FWHOOS of 102°F/60°F.

The reload transient analyses performed with a FFWTR/FWHOOS of 102°F/60°F bound normal operational variation in feedwater heating capacity such that the feedwater temperature is at least 409°F at 100% rated power.

Normal operational variation in dome pressure (defined as ±10 psi) is acceptable as this variation has a negligible effect on the OLMCPR.

Appendix G
NEDC-33173P-A Supplementary Information

The safety evaluation for licensing topical report NEDC-33173P-A (*Applicability of GE Methods to Expanded Operating Domains*) concluded that the application of GE methods to expanded operating domains was acceptable subject to certain limitations and conditions. Several of these conditions request that additional, application-specific information be provided. The information provided below responds to these requests for the identified items.

Limitation/Condition 6 (R-factor)

The plant specific R-factor calculation at a bundle level was performed consistent with lattice axial void conditions expected for the hot channel operating state applicable to this cycle of operation. For Hope Creek Cycle 17 at the EPU licensed power level, a 60% void profile was used for the calculation of bundle R-factors.

Limitations/Conditions 10 and 11 (Thermal/Mechanical Overpower)

As required by Limitation 10 the plant limiting Thermal and Mechanical Overpower results are provided in Table G-1. The results are summarized as a percent margin to both of these limits.

Table G-1 Margin to Thermal Overpower and Mechanical Overpower Limits

Criteria	GE14C
Thermal Overpower Margin	39%
Mechanical Overpower Margin	39%

These results have been confirmed to meet the required 10% margin to the design limits for all fuel types as can be observed.

Limitation/Condition 17 (Steady State 5 Percent Bypass Voiding)

The bypass voiding condition was evaluated for the licensed core loading and confirmed that the bypass void fraction remained below 5 percent at all LPRM levels when operating at steady-state conditions within the licensed upper boundary. For a power/flow condition that conservatively bounded the licensed power/flow upper boundary, the bypass void fraction at the D level LPRM location was calculated to be 0.0%.

Appendix H
Reduced Feedwater Temperature BSP Regions

The endpoints of the BSP regions for Reduced Feedwater Temperature operation are defined in Tables H-1 and H-2. Per PSEG's request, FFWTR BSP region boundaries are based on 343.6°F, which is 88°F reduction from the rated feedwater temperature 431.6°F. The region boundaries, shown in Figures H-1 and H-2, are defined using the Modified Shape Function (MSF). See Reference H-1.

Table H-1 BSP Region Intercepts for FWHOOS
(Feedwater Temperature above 371.6°F)

Region Boundary Intercept	Power (%)	Flow (%)	Core DR	Highest Channel DR
A1	64.7	47.9	0.800	0.416
B1	43.4	35.3	0.799	0.422
A2	71.5	56.5	0.799	0.374
B2	32.2	36.3	< 0.790	< 0.391

Table H-2 BSP Region Intercepts for FFWTR
(Feedwater Temperature above 343.6°F)

Region Boundary Intercept	Power (%)	Flow (%)	Core DR	Highest Channel DR
A1	70.2	54.7	0.800	0.390
B1	41.0	35.6	0.800	0.375
A2	73.6	59.0	0.798	0.403
B2	32.2	36.3	< 0.772	< 0.395

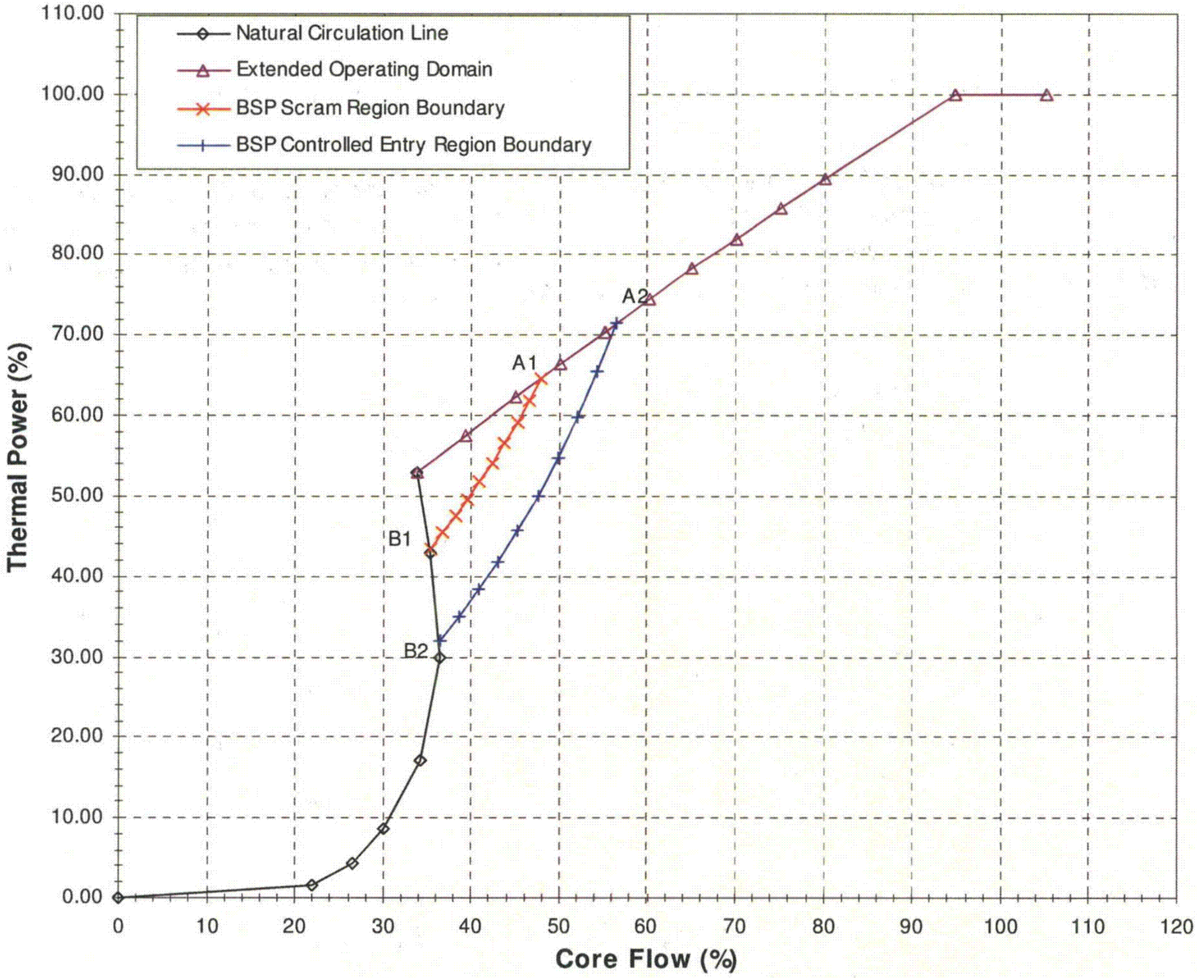


Figure H-1 BSP Region Boundaries for FWHOOS Operation

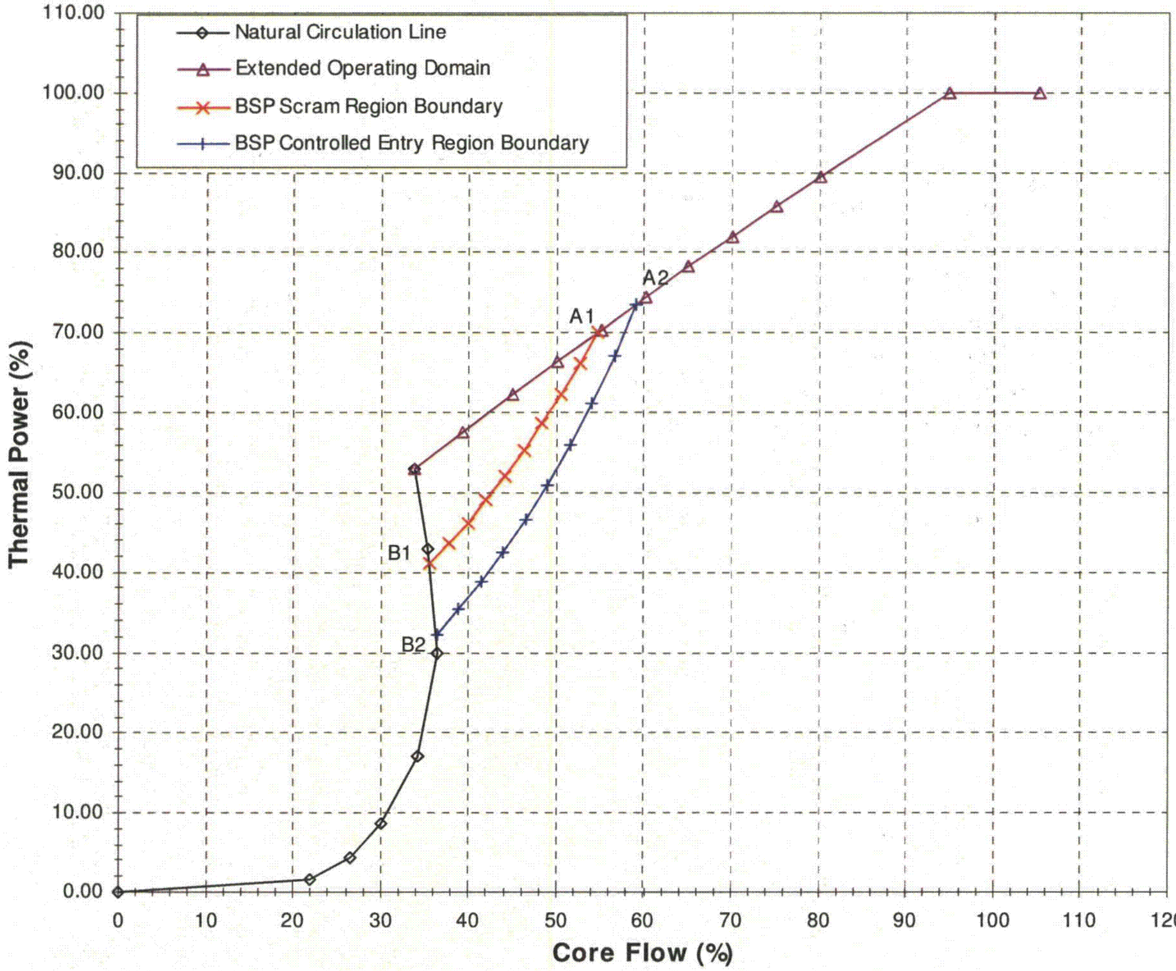


Figure H-2 BSP Region Boundaries for FFWTR Operation

References for Appendix H

H-1. *ODYSY Application for Stability Licensing Calculations Including Option I-D and II Long Term Solutions,* NEDE-33213P-A, Revision 0, GE Hitachi Nuclear Energy (Proprietary), April 2009.

Appendix I
Calculated BSP Region End Points

The BSP region end points reported in Section 15 represent the proposed BSP region. The proposed BSP region is conservative and bounds the calculated BSP region end points.

To support the initial introduction of GE14I Isotope Test Assemblies (ITAs), this appendix provides the calculated BSP region end points and decay ratios. These calculated power/flow points and decay ratios represent typical calculations for Hope Creek. The plant- and cycle-specific calculations provide reasonable assurance that the thermal hydraulic stability as prescribed by Option III with respect to the size of the BSP regions is maintained with ITAs in the Hope Creek core.

Table I-1 BSP Region Calculated Intercepts for Normal Feedwater Temperature

Region Boundary Intercept	Power (%)	Flow (%)	Core DR	Highest Channel DR
A1	58.1	39.9	0.799	0.437
B1	47.7	34.6	0.798	0.447
A2	66.1	49.7	0.799	0.404
B2	39.2	35.7	0.790	0.391

Appendix J
GE14I Fuel Introduction

Reference J-1 provided the results of the cycle-independent evaluations supporting the introduction of GE14I fuel in subject plant. These GE14I bundles, also referred to as GE14I Isotope Test Assemblies (ITAs), were designed for mechanical, nuclear and thermal-hydraulic compatibility with the GE14C fuel designs. The subject core was designed such that the ITAs would be placed in non-limiting locations with respect to thermal limit margins and shutdown margins. The analysis results reported in this report are applicable to GE14I unless otherwise specified. Section 11 of this report presents the GE14C cycle-dependent MCPR limits; an adder of 0.07 should be applied to these results for the GE14I ITAs.

References for Appendix J

J-1. *Safety Analysis Report to Support Introduction of GE14i Isotope Test Assemblies (ITAs) in Hope Creek Generating Station,* NEDC-33529P, Revision 0, GE Hitachi Nuclear Energy (Proprietary), December 2009; and *Errata and Addenda Number 1*, June 10, 2010.

Appendix K
List of Acronyms

Acronym	Description
ΔCPR	Delta Critical Power Ratio
Δk	Delta k-effective
2PT	Two Recirculation Pump Trip
ADS	Automatic Depressurization System
ADSOOS	Automatic Depressurization System Out of Service
AOO	Anticipated Operational Occurrence
APRM	Average Power Range Monitor
ARTS	APRM, Rod Block and Technical Specification Improvement Program
BOC	Beginning of Cycle
BSP	Backup Stability Protection
Btu	British thermal unit
BWROG	Boiling Water Reactor Owners Group
COLR	Core Operating Limits Report
CPR	Critical Power Ratio
DIVOM	Delta CPR over Initial MCPR vs. Oscillation Magnitude
DR	Decay Ratio
DS/RV	Dual Mode Safety/Relief Valve
ECCS	Emergency Core Cooling System
ELLLA	Extended Load Line Limit Analysis
EOC	End of Cycle (including all planned cycle extensions)
EOR	End of Rated (All Rods Out 100%Power / 100%Flow / NFWT)
EPU	Extended Power Uprate
ER	Exclusion Region
FFWTR	Final Feedwater Temperature Reduction
FMCPR	Final MCPR
FOM	Figure of Merit
FWCF	Feedwater Controller Failure
FWHOOS	Feedwater Heaters Out of Service
FWTR	Feedwater Temperature Reduction
GDC	General Design Criterion
GESTAR	General Electric Standard Application for Reactor Fuel
GETAB	General Electric Thermal Analysis Basis
GSF	Generic Shape Function
HAL	Haling Burn
HBB	Hard Bottom Burn
HBOM	Hot Bundle Oscillation Magnitude
HCOM	Hot Channel Oscillation Magnitude
HFCL	High Flow Control Line
HPCI	High Pressure Coolant Injection
ICA	Interim Corrective Action

Acronym	Description
ICF	Increased Core Flow
IMCPR	Initial MCPR
IVM	Initial Validation Matrix
Kf	Off-rated flow dependent OLMCPR multiplier
Kp	Off-rated power dependent OLMCPR multiplier
L8	Turbine Trip on high water level (Level 8)
LCF	Low Core Flow
LHGR	Linear Heat Generation Rate
LHGRFACf	Off-rated flow dependent LHGR multiplier
LHGRFACp	Off-rated power dependent LHGR multiplier
LOCA	Loss of Coolant Accident
LPRM	Local Power Range Monitor
LRHBP	Load Rejection with Half Bypass
LRNBP	Load Rejection without Bypass
LTR	Licensing Topical Report
MAPFACf	Off-rated flow dependent MAPLHGR multiplier
MAPFACp	Off-rated power dependent MAPLHGR multiplier
MAPLHGR	Maximum Average Planar Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio
MCPRf	Off-rated flow dependent OLMCPR
MCPRp	Off-rated power dependent OLMCPR
MELLLA	Maximum Extended Load Line Limit Analysis
MELLLA+	MELLLA Plus
MOC	Middle of Cycle
MRB	Maximal Region Boundaries
MSIV	Main Steam Isolation Valve
MSIVOOS	Main Steam Isolation Valve Out of Service
MSR	Moisture Separator Reheater
MSROOS	Moisture Separator Reheater Out of Service
MTU	Metric Ton Uranium
MWd	Megawatt day
MWd/ST	Megawatt days per Standard Ton
MWd/MT	Megawatt days per Metric Ton
MWt	Megawatt Thermal
N/A	Not Applicable
NBP	No Bypass
NCL	Natural Circulation Line
NFWT	Normal Feedwater Temperature
NOM	Nominal Burn
NTR	Normal Trip Reference
OLMCPR	Operating Limit MCPR
OOS	Out of Service
OPRM	Oscillation Power Range Monitor
Pbypass	Reactor power level below which the TSV position and the TCV fast closure scrams are bypassed

Acronym	Description
Pdome	Peak Dome Pressure
Psl	Peak Steam Line Pressure
Pv	Peak Vessel Pressure
PCT	Peak Clad Temperature
PHE	Peak Hot Excess
PLHGR	Peak Linear Heat Generation Rate
PLU	Power Load Unbalance
PLUOOS	Power Load Unbalance Out of Service
PRFDS	Pressure Regulator Failure Downscale
PROOS	Pressure Regulator Out of Service
Q/A	Heat Flux
RBM	Rod Block Monitor
RC	Reference Cycle
RCF	Rated Core Flow
RFWT	Reduced Feedwater Temperature
RPS	Reactor Protection System
RPT	Recirculation Pump Trip
RPTOOS	Recirculation Pump Trip Out of Service
RV	Relief Valve
RVM	Reload Validation Matrix
RWE	Rod Withdrawal Error
SC	Standard Cycle
SL	Safety Limit
SLMCPR	Safety Limit Minimum Critical Power Ratio
SLO	Single Loop Operation
SRLR	Supplemental Reload Licensing Report
S/RV	Safety/Relief Valve
SRVOOS	Safety/Relief Valve(s) Out of Service
SS	Steady State
SSV	Spring Safety Valve
STU	Short Tons (or Standard Tons) of Uranium
TBV	Turbine Bypass Valve
TBVOOS	Turbine Bypass Valves Out of Service
TCV	Turbine Control Valve
TCVOOS	Turbine Control Valve Out of Service
TCVSC	Turbine Control Valve Slow Closure
TLO	Two Loop Operation
TRF	Trip Reference Function
TSIP	Technical Specifications Improvement Program
TSV	Turbine Stop Valve
TSVOOS	Turbine Stop Valve Out of Service
TT	Turbine Trip
TTHBP	Turbine Trip with Half Bypass
TTNBP	Turbine Trip without Bypass
UB	Under Burn