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Supplemental Reload Licensing Report

for
DRESDEN UNIT 3

Reload 17 Cycle 18

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Important Notice Regarding

Contents of This Report

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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 Fuel Engineering Services (GNFFES) and GENE Nuclear and Safety Analysis (GENE N&SA) personnel. The Supplemental Reload Licensing Report was prepared by H. Zhang. This document has been verified by G.I. Maldonado.

The basis for this report is *General Electric Standard Application for Reactor Fuel*, NEDE-24011-P-A-14, June 2000; and the U.S. Supplement, NEDE-24011-P-A-14-US, June 2000.

1. Plant-unique Items

Appendix A: Analysis Conditions
Appendix B: Decrease in Core Coolant Temperature Events
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2. Reload Fuel Bundles

Fuel Type	Cycle Loaded	Number
Irradiated:		
ANF9X9-2-P9DANB313-7G3.5-SPC80M-145-T6-2453	14	6
ANF9X9-2-P9DANB313-11GZ-SPC80M-145-T6-2452	14	18
ATRM9-P9DATB362-12GZ-SPC100T-9WR-144-T6-2450	16	160
ATRM9-P9DATB360-12GZ-SPC100T-9WR-144-T6-2451	16	16
ATRM9-P9DATB378-13GZ-SPC100T-9WR-144-T6-2464	17	112
ATRM9-P9DATB378-11GZ-SPC100T-9WR-144-T6-2465	17	128
New:		
GE14-P10DNAB408-16GZ-100T-145-T6-2554 (GE14C)	18	136
GE14-P10DNAB411-4G7.0/9G6.0-100T-145-T6-2553 (GE14C)	18	148
Total		724

3. Reference Core Loading Pattern

Nominal previous cycle core average exposure at end of cycle:	30784 MWd/MT (27927 MWd/ST)
Minimum previous cycle core average exposure at end of cycle from cold shutdown considerations:	30284 MWd/MT (27473 MWd/ST)
Assumed reload cycle core average exposure at beginning of cycle:	15102 MWd/MT (13700 MWd/ST)
Assumed reload cycle core average exposure at end of cycle:	31428 MWd/MT (28511 MWd/ST)
Reference core loading pattern:	Figure 1

4. Calculated Core Effective Multiplication and Control System Worth - No Voids, 20°C

Beginning of Cycle, $k_{effective}$	
Uncontrolled	1.105
Fully controlled	0.950
Strongest control rod out	0.989
R, Maximum increase in cold core reactivity with exposure into cycle, Δk	0.001

5. Standby Liquid Control System Shutdown Capability

Boron (ppm) (at 20°C)	Shutdown Margin (Δk) (at 160°C, Xenon Free)
600	0.021

6. Reload Unique GETAB Anticipated Operational Occurrences (AOO) Analysis Initial Condition Parameters[1]

Exposure: BOC18 to EOR[2]-1663 MWd/MT ICF-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.55	1.64	1.040	6.173	118.3	1.39
ATRM9	1.20	1.39	1.64	1.050	5.511	123.6	1.39

Exposure: EOR-1663 MWd/MT to EOC18[3] ICF-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.48	1.77	1.040	5.912	121.0	1.41
ATRM9	1.20	1.39	1.77	1.050	5.543	124.0	1.36

Exposure: BOC18 to EOR-1663 MWd/MT ICF-FFWTR-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.60	1.62	1.040	6.376	116.6	1.40
ATRM9	1.20	1.44	1.62	1.050	5.692	121.8	1.39

Exposure: EOR-1663 MWd/MT to EEOC18[4] ICF-FFWTR-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.55	1.78	1.040	6.178	119.5	1.40
ATRM9	1.20	1.42	1.78	1.050	5.633	123.2	1.38

[1] Note that FANP 9x9-2 fuel in DRESDEN 3 Reload 17 is bounded by FANP ATRIUM-9B fuel.
[2] EOR is the end of rated exposure obtained at 100% power and 100% flow conditions.
[3] EOC is the exposure obtained with increased core flow only.
[4] EEOC is the exposure obtained with increased core flow and with up to 120°F feedwater temperature reduction.

Exposure: EOR-1663 MWd/MT to EOC18 MELLLA-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.49	1.71	1.040	5.951	105.3	1.37
ATRM9	1.20	1.40	1.71	1.050	5.542	107.7	1.34

Exposure: BOC18 to EOC18 ICF_TBPOOS-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.42	1.77	1.040	5.665	122.5	1.47
ATRM9	1.20	1.35	1.77	1.050	5.352	125.4	1.41

Exposure: BOC18 to EEOC18 ICF-FFWTR_TBPOOS-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.48	1.78	1.040	5.904	121.2	1.47
ATRM9	1.20	1.39	1.78	1.050	5.524	124.0	1.41

Exposure: BOC18 to EOC18 MELLLA_TBPOOS-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.45	1.71	1.040	5.758	106.4	1.42
ATRM9	1.20	1.35	1.71	1.050	5.346	109.0	1.40

Exposure: BOC18 to EOC18 ICF_TCVSC-HBB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.49	1.77	1.040	5.936	120.8	1.40
ATRM9	1.20	1.40	1.77	1.050	5.551	124.0	1.36

Exposure: BOC18 to EOC18 MELLLA_TCVSC-HBB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.48	1.71	1.040	5.902	105.6	1.38
ATRM9	1.20	1.40	1.71	1.050	5.545	107.7	1.34

Exposure: BOC18 to EOC18 ICF_PLUOOS-HBB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.45	1.77	1.040	5.762	121.9	1.45
ATRM9	1.20	1.36	1.77	1.050	5.396	125.1	1.40

Exposure: BOC18 to EOC18 MELLLA_PLUOOS-HBB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.45	1.71	1.040	5.781	106.3	1.42
ATRM9	1.20	1.37	1.71	1.050	5.449	108.3	1.37

Exposure: BOC18 to EOC18 ICF-UDB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.64	1.28	1.040	6.522	113.7	1.41
ATRM9	1.20	1.49	1.28	1.050	5.907	119.5	1.37

Exposure: BOC18 to EEOC18 ICF-FFWTR-UDB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.69	1.27	1.040	6.714	112.0	1.42
ATRM9	1.20	1.52	1.27	1.050	6.025	118.0	1.38

Exposure: EOR-1663 MWd/MT to EOC18 MELLLA-UDB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.60	1.23	1.040	6.376	99.4	1.40
ATRM9	1.20	1.50	1.23	1.050	5.944	103.2	1.33

Exposure: BOC18 to EOC18 ICF_TBPOOS-UDB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.59	1.28	1.040	6.329	114.9	1.46
ATRM9	1.20	1.45	1.28	1.050	5.752	120.7	1.41

Exposure: BOC18 to EEOC18 ICF-FFWTR_TBPOOS-UDB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.65	1.27	1.040	6.550	113.1	1.46
ATRM9	1.20	1.50	1.27	1.050	5.926	118.8	1.41

Exposure: BOC18 to EOC18 MELLLA_TBPOOS-UDB							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GE14C	1.45	1.55	1.23	1.040	6.183	100.6	1.45
ATRM9	1.20	1.44	1.23	1.050	5.721	104.8	1.39

Exposure: BOC18 to EOC18 ICF_TCVSC-UDB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.65	1.28	1.040	6.588	113.3	1.40
ATRM9	1.20	1.54	1.28	1.050	6.125	117.9	1.32

Exposure: BOC18 to EOC18 MELLLA_TCVSC-UDB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.64	1.23	1.040	6.510	98.6	1.37
ATRM9	1.20	1.53	1.23	1.050	6.060	102.4	1.30

Exposure: BOC18 to EOC18 ICF_PLUOOS-UDB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.62	1.28	1.040	6.438	114.2	1.44
ATRM9	1.20	1.50	1.28	1.050	5.947	119.2	1.36

Exposure: BOC18 to EOC18 MELLLA_PLUOOS-UDB							
	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GE14C	1.45	1.58	1.23	1.040	6.292	99.9	1.43
ATRM9	1.20	1.49	1.23	1.050	5.891	103.6	1.34

7. Selected Margin Improvement Options

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

8. Operating Flexibility Options

Single-loop operation:	Yes
Load line limit:	No
Extended load line limit:	No
Maximum extended load line limit:	Yes
Increased core flow throughout cycle:	Yes
Flow point analyzed:	108.0 %
Feedwater temperature reduction throughout cycle:	Yes
Temperature reduction:[5]	120.0°F
Final feedwater temperature reduction:	Yes
ARTS Program (power and flow dependent limits):	Yes
Maximum extended operating domain:	Yes
Moisture separator reheater OOS:	No
Turbine bypass system OOS:	Yes
Safety/relief valves OOS:	Yes (1 valve OOS)
ADS OOS:	No
EOC RPT OOS:	No
Main steam isolation valves OOS:	Yes

[5] See Appendix C.

Turbine control valve slow closure: Yes

Turbine control valve stuck closed: Yes

Power load unbalance OOS: Yes

9. Core-wide AOO Analysis Results

Methods used: GEMINI; GEXL-PLUS

Exposure range: BOC18 to EOR-1663 MWd/MT ICF-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	593	137	0.29	0.29	2
Load Reject w/o Bypass	572	130	0.28	0.25	3
Turbine Trip w/o Bypass	566	129	0.27	0.25	4

Exposure range: EOR-1663 MWd/MT to EOC18 ICF-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	547	134	0.28	0.28	5
Load Reject w/o Bypass	526	128	0.31	0.26	6
Turbine Trip w/o Bypass	523	127	0.29	0.25	7

Exposure range: BOC18 to EOR-1663 MWd/MT ICF-FFWTR-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	568	139	0.30	0.29	8

Exposure range: EOR-1663 MWd/MT to EEOC18 ICF-FFWTR-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	506	136	0.29	0.28	9

Exposure range: EOR-1663 MWd/MT to EOC18 MELLLA-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	533	134	0.26	0.27	10
Load Reject w/o Bypass	520	128	0.27	0.24	11
Turbine Trip w/o Bypass	517	127	0.26	0.24	12

Exposure range: BOC18 to EOC18 ICF_TBPOOS-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	586	137	0.37	0.31	13

Exposure range: BOC18 to EEOC18 ICF-FFWTR_TBPOOS-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	521	137	0.37	0.31	14

Exposure range: BOC18 to EOC18 MELLLA_TBPOOS-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	579	136	0.32	0.29	15

Exposure range: BOC18 to EOC18 ICF_TCVSC-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	328	120	0.30	0.26	16

Exposure range: BOC18 to EOC18 MELLLA_TCVSC-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	327	120	0.28	0.24	17

Exposure range: BOC18 to EOC18 ICF_PLUOOS-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	374	127	0.35	0.30	18

Exposure range: BOC18 to EOC18 MELLLA_PLUOOS-HBB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	367	127	0.31	0.26	19

Exposure range: BOC18 to EOC18 ICF-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	482	131	0.31	0.27	20
Load Reject w/o Bypass	488	126	0.30	0.25	21
Turbine Trip w/o Bypass	491	125	0.30	0.25	22

Exposure range: BOC18 to EEOC18 ICF-FFWTR-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	457	134	0.32	0.28	23

Exposure range: EOR-1663 MWd/MT to EOC18 MELLLA-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	411	127	0.29	0.24	24
Load Reject w/o Bypass	422	123	0.30	0.23	25
Turbine Trip w/o Bypass	414	122	0.30	0.23	26

Exposure range: BOC18 to EOC18 ICF_TBPOOS-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	552	135	0.36	0.31	27

Exposure range: BOC18 to EEOC18 ICF-FFWTR_TBPOOS-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	482	136	0.36	0.31	28

Exposure range: BOC18 to EOC18 MELLLA_TBPOOS-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
FW Controller Failure	481	132	0.36	0.29	29

Exposure range: BOC18 to EOC18 ICF_TCVSC-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	362	123	0.29	0.22	30

Exposure range: BOC18 to EOC18 MELLLA_TCVSC-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	356	123	0.27	0.20	31

Exposure range: BOC18 to EOC18 ICF_PLUOOS-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	341	126	0.33	0.26	32

Exposure range: BOC18 to EOC18 MELLLA_PLUOOS-UDB					
			Uncorrected ΔCPR		
Event	**Flux (%NBR)**	**Q/A (%NBR)**	**GE14C**	**ATRM9**	**Fig.**
Load Reject w/o Bypass	307	123	0.32	0.24	33

10. Local Rod Withdrawal Error (With Limiting Instrument Failure) AOO Summary

Rod Block	ΔCPR	
	GE14C	**ATRM9**
Unblocked	0.24	0.24

See Figure 36 for Limiting Rod Pattern.

11. Cycle MCPR Values [6]

Safety limit: 1.10

Single loop operation safety limit: 1.11

Non-pressurization events:

	All Fuel Types
Fuel Loading Error (Misoriented)	1.26[7]
Control Rod Withdrawal Error (Unblocked)	1.34
Loss of Feedwater Heating (See Appendix B)	1.29

[6] For single-loop operation, the MCPR operating limit is 0.01 greater than the two-loop value.
[7] Based on GE14 results reported in Section 13.

Pressurization events: [8]

Exposure range: BOC18 to EOR-1663 MWd/MT ICF-HBB Exposure point: EOR-1663 MWd/MT				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.51	1.52	1.40	1.41
Load Reject w/o Bypass	1.51	1.48	1.40	1.37
Turbine Trip w/o Bypass	1.50	1.48	1.39	1.37

Exposure range: EOR-1663 MWd/MT to EOC18 ICF-HBB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.61	1.61	1.44	1.44
Load Reject w/o Bypass	1.63	1.59	1.46	1.42
Turbine Trip w/o Bypass	1.62	1.57	1.45	1.40

Exposure range: BOC18 to EOR-1663 MWd/MT ICF-FFWTR-HBB Exposure point: EOR-1663 MWd/MT				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.53	1.52	1.42	1.41

Exposure range: EOR-1663 MWd/MT to EEOC18 ICF-FFWTR-HBB Exposure point: EEOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.62	1.61	1.45	1.44

[8] ECCS MCPR value is 1.27 for GE14C and 1.35 for ATRM9.

Exposure range: EOR-1663 MWd/MT to EOC18 MELLLA-HBB **Exposure point: EOC18**				
	Option A		**Option B**	
	GE14C	**ATRM9**	**GE14C**	**ATRM9**
FW Controller Failure	1.59	1.59	1.42	1.42
Load Reject w/o Bypass	1.59	1.56	1.42	1.39
Turbine Trip w/o Bypass	1.58	1.56	1.41	1.39

Exposure range: BOC18 to EOC18 ICF_TBPOOS-HBB **Exposure point: EOC18**				
	Option A		**Option B**	
	GE14C	**ATRM9**	**GE14C**	**ATRM9**
FW Controller Failure	1.70	1.64	1.53	1.47

Exposure range: BOC18 to EEOC18 ICF-FFWTR_TBPOOS-HBB **Exposure point: EEOC18**				
	Option A		**Option B**	
	GE14C	**ATRM9**	**GE14C**	**ATRM9**
FW Controller Failure	1.70	1.64	1.53	1.47

Exposure range: BOC18 to EOC18 MELLLA_TBPOOS-HBB **Exposure point: EOC18**				
	Option A		**Option B**	
	GE14C	**ATRM9**	**GE14C**	**ATRM9**
FW Controller Failure	1.65	1.62	1.48	1.45

Exposure range: BOC18 to EOC18 ICF_TCVSC-HBB **Exposure point: EOC18**				
	Option A		**Option B**	
	GE14C	**ATRM9**	**GE14C**	**ATRM9**
Load Reject w/o Bypass	1.63	1.58	1.46	1.41

Exposure range: BOC18 to EOC18 MELLLA_TCVSC-HBB **Exposure point: EOC18**				
	Option A		**Option B**	
	GE14C	**ATRM9**	**GE14C**	**ATRM9**
Load Reject w/o Bypass	1.61	1.56	1.44	1.39

Exposure range: BOC18 to EOC18 ICF_PLUOOS-HBB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
Load Reject w/o Bypass	1.68	1.63	1.51	1.46

Exposure range: BOC18 to EOC18 MELLLA_PLUOOS-HBB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
Load Reject w/o Bypass	1.64	1.59	1.47	1.42

Exposure range: BOC18 to EOC18 ICF-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.64	1.60	1.47	1.43
Load Reject w/o Bypass	1.63	1.58	1.46	1.41
Turbine Trip w/o Bypass	1.63	1.57	1.46	1.40

Exposure range: BOC18 to EEOC18 ICF-FFWTR-UDB Exposure point: EEOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.65	1.61	1.48	1.44

Exposure range: EOR-1663 MWd/MT to EOC18 MELLLA-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.62	1.56	1.45	1.39
Load Reject w/o Bypass	1.63	1.55	1.46	1.38
Turbine Trip w/o Bypass	1.62	1.55	1.45	1.38

Exposure range: BOC18 to EOC18 ICF_TBPOOS-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.69	1.64	1.52	1.47

Exposure range: BOC18 to EEOC18 ICF-FFWTR_TBPOOS-UDB Exposure point: EEOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.69	1.64	1.52	1.47

Exposure range: BOC18 to EOC18 MELLLA_TBPOOS-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
FW Controller Failure	1.69	1.61	1.52	1.44

Exposure range: BOC18 to EOC18 ICF_TCVSC-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
Load Reject w/o Bypass	1.62	1.54	1.45	1.37

Exposure range: BOC18 to EOC18 MELLLA_TCVSC-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
Load Reject w/o Bypass	1.59	1.52	1.42	1.35

Exposure range: BOC18 to EOC18 ICF_PLUOOS-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
Load Reject w/o Bypass	1.66	1.58	1.49	1.41

Exposure range: BOC18 to EOC18 MELLLA_PLUOOS-UDB Exposure point: EOC18				
	Option A		Option B	
	GE14C	ATRM9	GE14C	ATRM9
Load Reject w/o Bypass	1.65	1.56	1.48	1.39

12. Overpressurization Analysis Summary

Event	P_{Dome} (psig)	Pv (psig)	Psl (psig)	Plant Response
ICF-HBB MSIV Closure (Flux Scram) (0 SRV OOS)	1336.4	1362.2	1332.8	Figure 34
MEL-HBB MSIV Closure (Flux Scram) (0 SRV OOS)	1338.6	1361.2	1334.9	Figure 35

13. Loading Error Results

Variable water gap misoriented bundle analysis: Yes [9]

Misoriented Fuel Bundle	ΔCPR
GE14-P10DNAB411-4G7.0/9G6.0-100T-145-T6-2553 (GE14C)	0.05
GE14-P10DNAB408-16GZ-100T-145-T6-2554 (GE14C)	0.16
ATRM9-P9DATB362-12GZ-SPC100T-9WR-144-T6-2450	0.27
ATRM9-P9DATB360-12GZ-SPC100T-9WR-144-T6-2451	0.29
ATRM9-P9DATB378-13GZ-SPC100T-9WR-144-T6-2464	0.13
ATRM9-P9DATB378-11GZ-SPC100T-9WR-144-T6-2465	0.13

14. Control Rod Drop Analysis Results

This is a banked position withdrawal sequence plant, therefore, the control rod drop accident analysis is not required. NRC approval is documented in NEDE-24011-P-A-14-US.

If a rod sequence that eliminates some of the standard BPWS banked positions of 04, 08, and 12 (e.g. fast shutdown sequence) is to be used during the cycle, a cycle specific control rod drop accident analysis will be performed.

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

15. Stability Analysis Results

GE SIL-380 recommendations and BWROG Interim Corrective Actions (BWROG-94079) have been included in the Dresden 3 Cycle 18 operating procedures. Regions of restricted operation defined in Attachment 1 to NRC Bulletin No. 88-07, Supplement 1, *Power Oscillations in Boiling Water Reactors (BWRs)* and expanded in BWROG-94079, are applicable to Dresden 3 Cycle 18 operation.

These provide the stability licensing bases for Dresden 3 Cycle 18. The validation of Interim Corrective Action regions can be found in Appendix E.

16. Loss-of-Coolant Accident Results

LOCA method used: SAFER/GESTR-LOCA

The SAFER/GESTR-LOCA analysis is documented in NEDC-32990P, Revision 1, "SAFER/GESTR-LOCA Loss-of Coolant Accident for Dresden Nuclear Station 2 and 3 and Quad Cities Nuclear Station Units 1 and 2," September 2001. This analysis yielded the Licensing Basis Peak Cladding Temperatures (PCT) of 2110°F for GE14C and 2060°F for ATRIUM-9B fuels. The maximum local oxidation is <6% and the core-wide metal water reaction is <0.1%. The initial operating MCPRs are 1.27 for GE14C and 1.35 for ATRIUM-9B fuels. The multipliers on PLHGR and MAPLHGR at SLO conditions are 0.77 for GE14C and 0.84 for ATRIUM-9B fuels. The multipliers on PLHGR and MAPLHGR to permit operation with one ADS valve out-of-service (ADSOOS) are 0.75 for both GE14C and ATRIUM-9B. When the plant is operated with both SLO and ADSOOS at the same time, the lower of the SLO and ADSOOS multipliers (0.75) should be applied to the PLHGR and MAPLHGR for both fuel types. This reduction will provide adequate protection for both conditions.

All reported ECCS-LOCA 10CFR50.46 errors have been addressed in the GE14C and ATRIUM-9B ECCS-LOCA analyses. No additional adjustment to the licensing PCT for GE14C and ATRIUM-9B is required.

16. Loss-of-Coolant Accident Results (cont.)

The ECCS MAPLHGR operating limits for each of the fuel bundle types available for Dresden Unit 3 Cycle 18 core are presented in the following tables:

Bundle Type: GE14-P10DNAB411-4G7.0/9G6.0-100T-145-T6-2553		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	11.68
14.51	16.00	11.68
50.00	55.12	8.01
57.61	63.50	6.97
63.50	70.00	4.36

Bundle Type: GE14-P10DNAB408-16GZ-100T-145-T6-2554		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	11.68
14.51	16.00	11.68
50.00	55.12	8.01
57.61	63.50	6.97
63.50	70.00	4.36

Bundle Type: ATRM9-P9DATB378-13GZ-SPC100T-9WR-144-T6-2464		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	13.52
15.65	17.25	13.52
63.50	70.00	7.84

Bundle Type: ATRM9-P9DATB378-11GZ-SPC100T-9WR-144-T6-2465		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	13.52
15.65	17.25	13.52
63.50	70.00	7.84

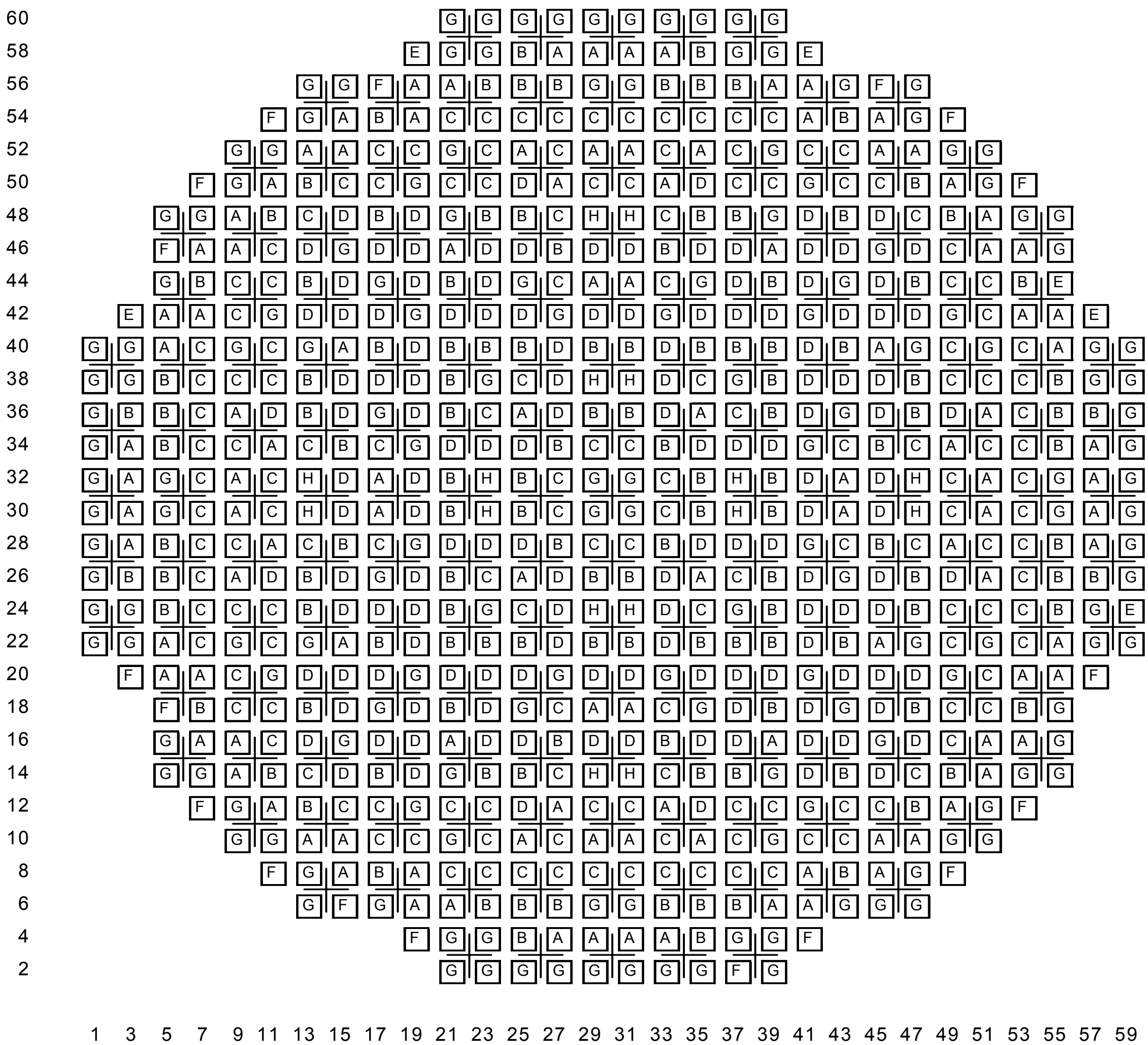
16. Loss-of-Coolant Accident Results (cont.)

Bundle Type: ATRM9-P9DATB362-12GZ-SPC100T-9WR-144-T6-2450		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	13.52
15.65	17.25	13.52
63.50	70.00	7.84

Bundle Type: ATRM9-P9DATB360-12GZ-SPC100T-9WR-144-T6-2451		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	13.52
15.65	17.25	13.52
63.50	70.00	7.84

Bundle Type: ANF9X9-2-P9DANB313-11GZ-SPC80M-145-T6-2452		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	13.52
15.65	17.25	13.52
63.50	70.00	7.84

Bundle Type: ANF9X9-2-P9DANB313-7G3.5-SPC80M-145-T6-2453		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.00	0.00	13.52
15.65	17.25	13.52
63.50	70.00	7.84



Fuel Type			
A=ATRM9-P9DATB378-13GZ-SPC100T-9WR-144-T6-2464	(Cycle 17)	E=ANF9X9-2-P9DANB313-7G3.5-SPC80M-145-T6-2453	(Cycle 14)
B=ATRM9-P9DATB378-11GZ-SPC100T-9WR-144-T6-2465	(Cycle 17)	F=ANF9X9-2-P9DANB313-11GZ-SPC80M-145-T6-2452	(Cycle 14)
C=GE14-P10DNAB411-4G7.0/9G6.0-100T-145-T6-2553	(Cycle 18)	G=ATRM9-P9DATB362-12GZ-SPC100T-9WR-144-T6-2450	(Cycle 16)
D=GE14-P10DNAB408-16GZ-100T-145-T6-2554	(Cycle 18)	H=ATRM9-P9DATB360-12GZ-SPC100T-9WR-144-T6-2451	(Cycle 16)

Figure 1 Reference Core Loading Pattern

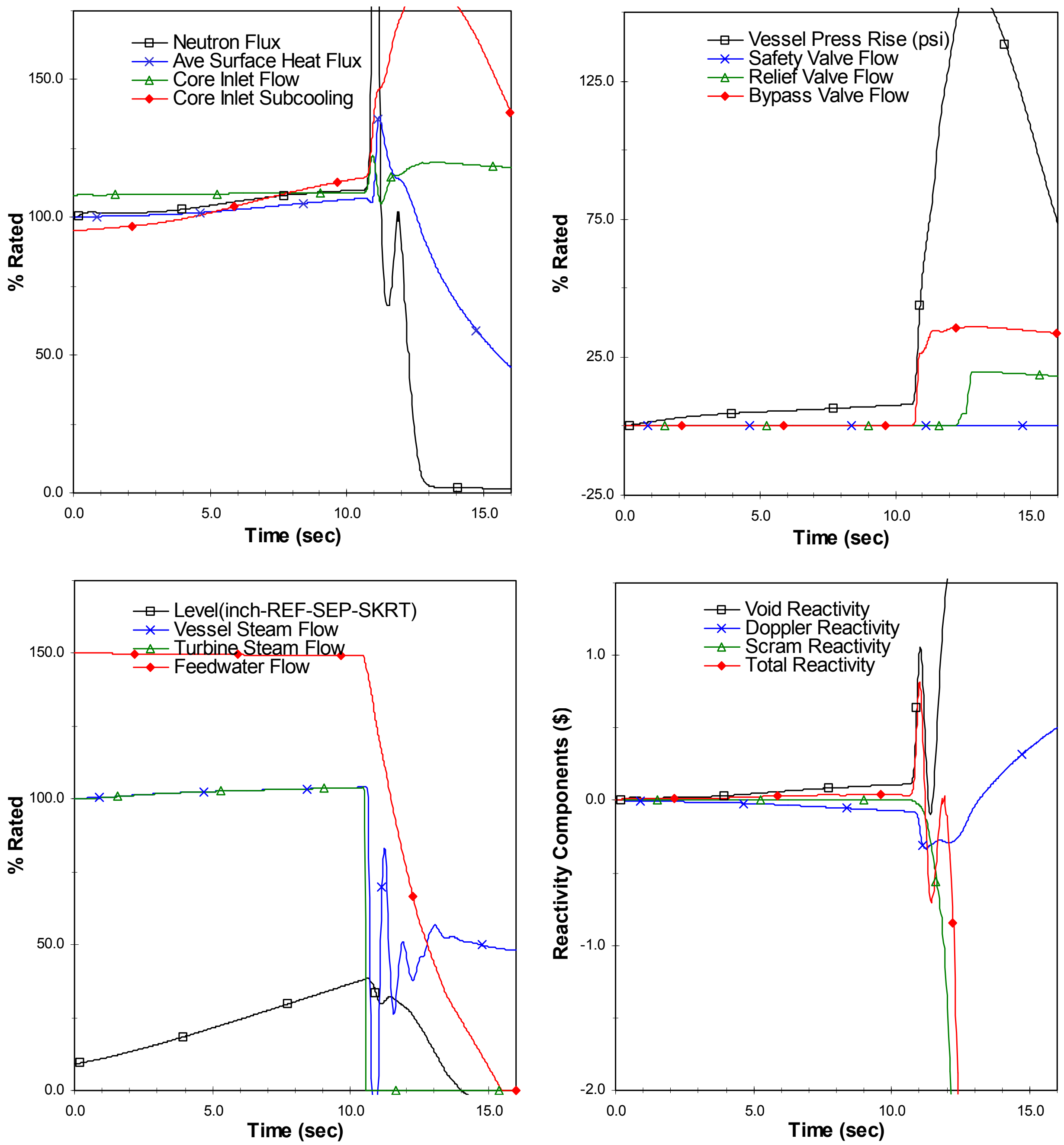


Figure 2 Plant Response to FW Controller Failure (BOC18 to EOR-1663 MWd/MT ICF-HBB)

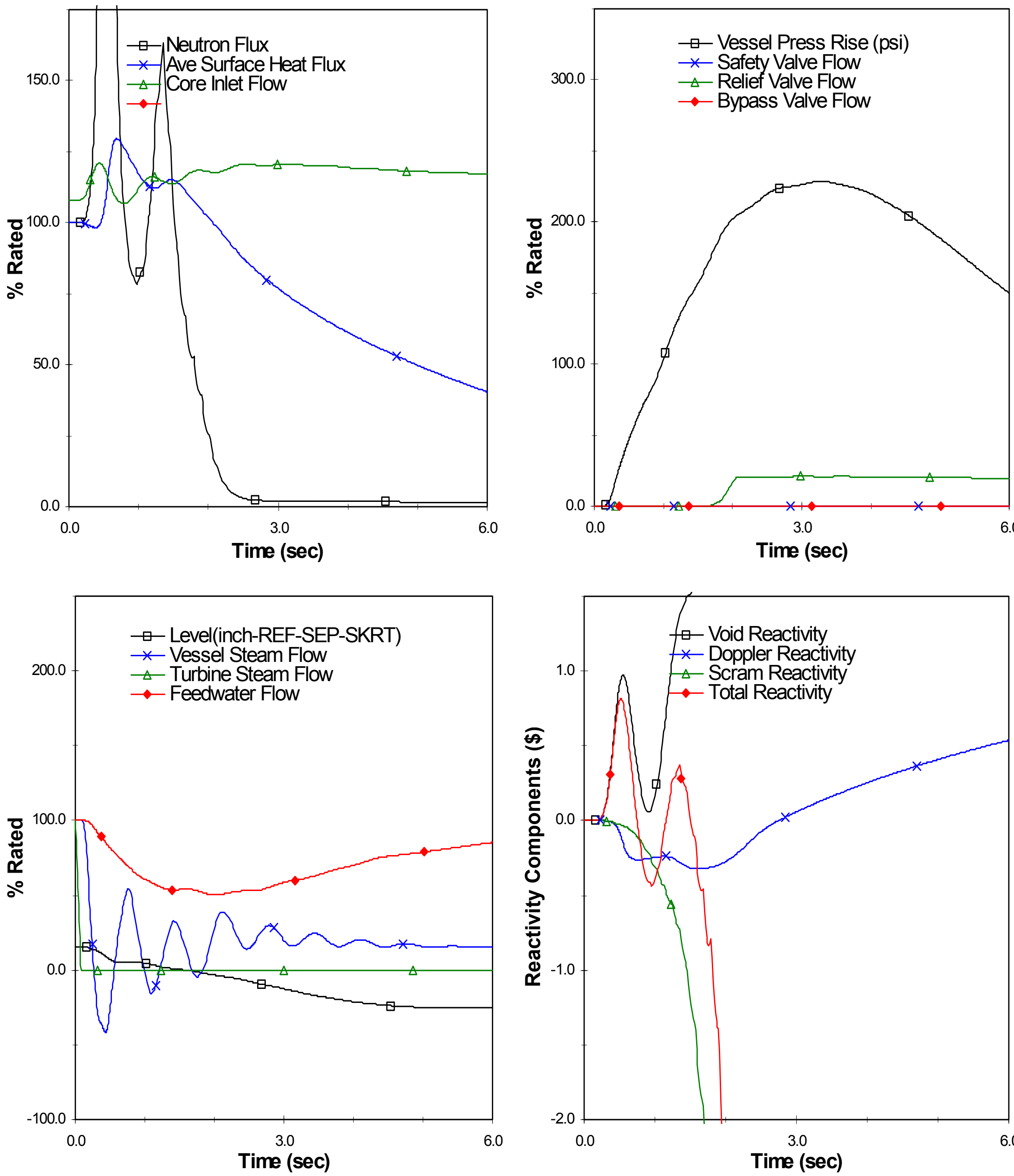


Figure 3 Plant Response to Load Reject w/o Bypass (BOC18 to EOR-1663 MWd/MT ICF-HBB)

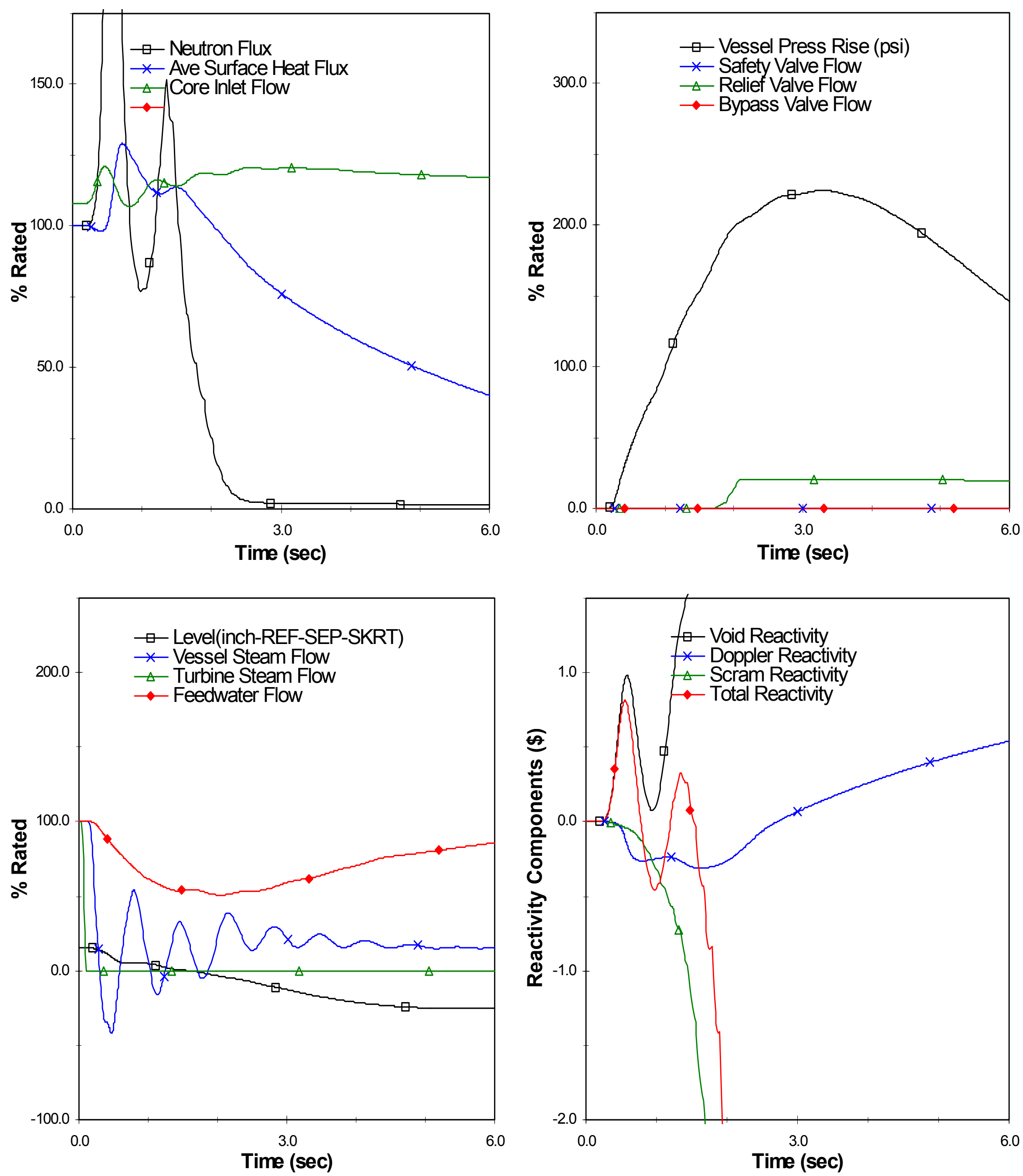


Figure 4 Plant Response to Turbine Trip w/o Bypass (BOC18 to EOR-1663 MWd/MT ICF-HBB)

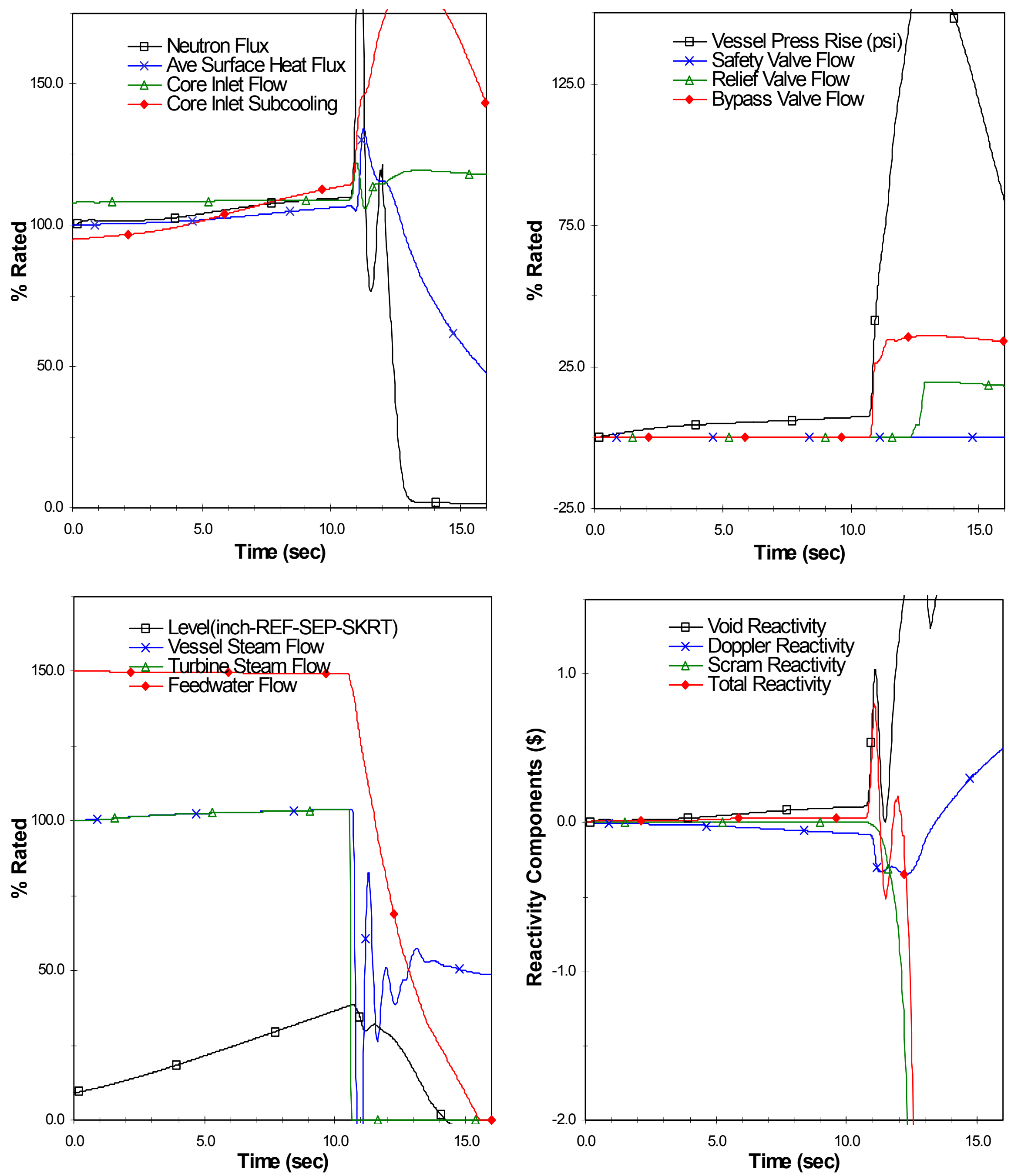


Figure 5 Plant Response to FW Controller Failure (EOR-1663 MWd/MT to EOC18 ICF-HBB)

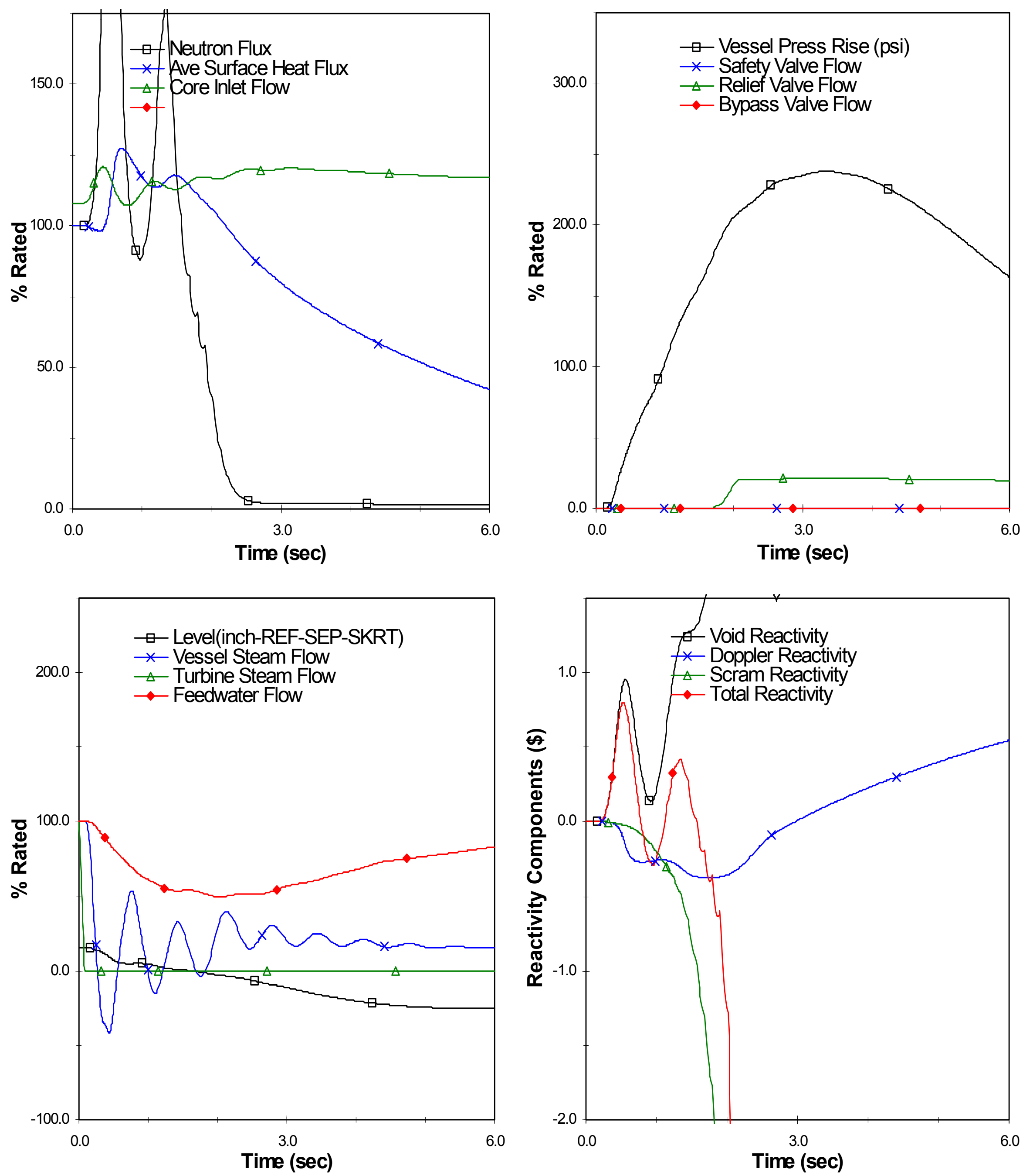


Figure 6 Plant Response to Load Reject w/o Bypass (EOR-1663 MWd/MT to EOC18 ICF-HBB)

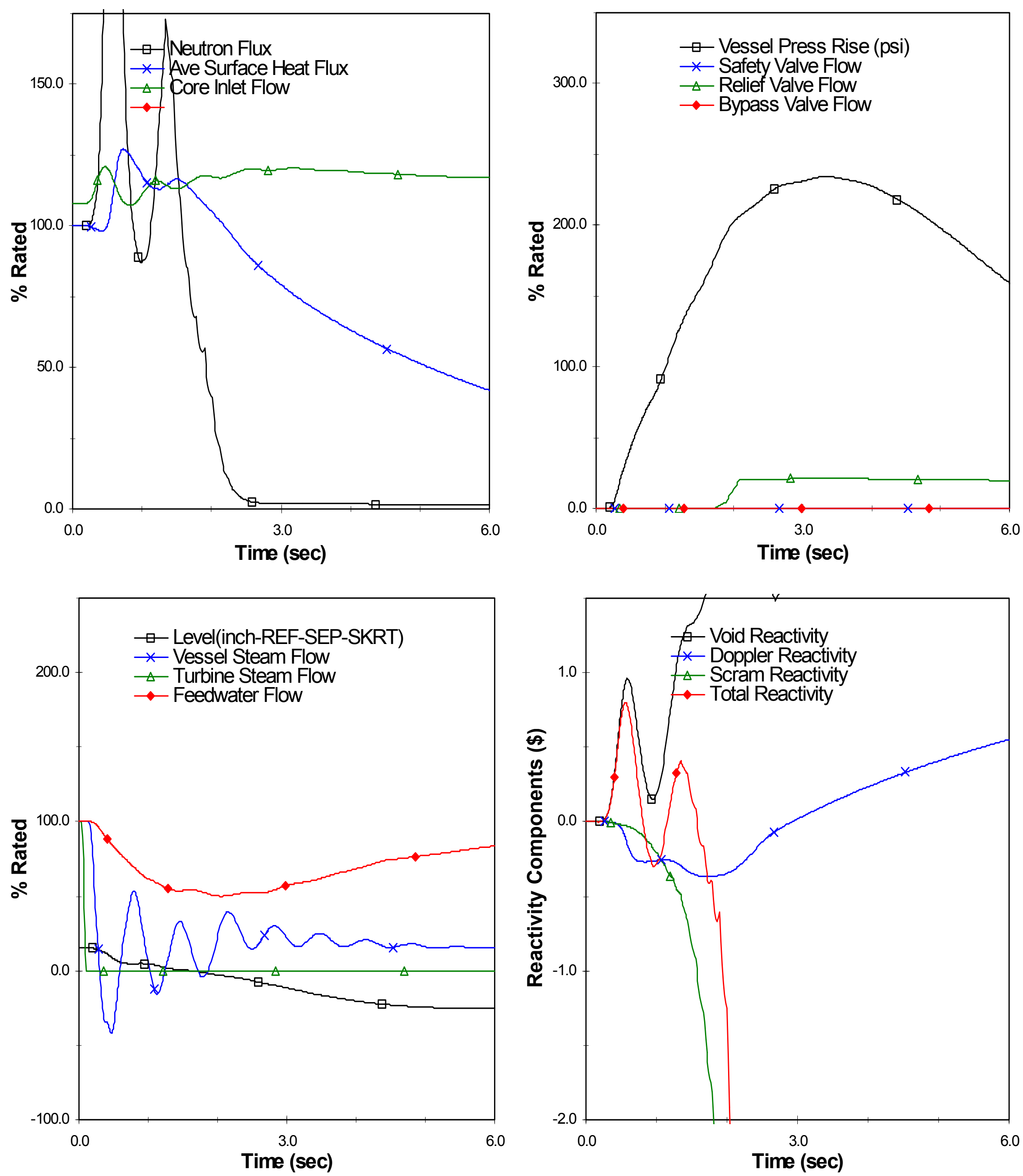


Figure 7 Plant Response to Turbine Trip w/o Bypass (EOR-1663 MWd/MT to EOC18 ICF-HBB)

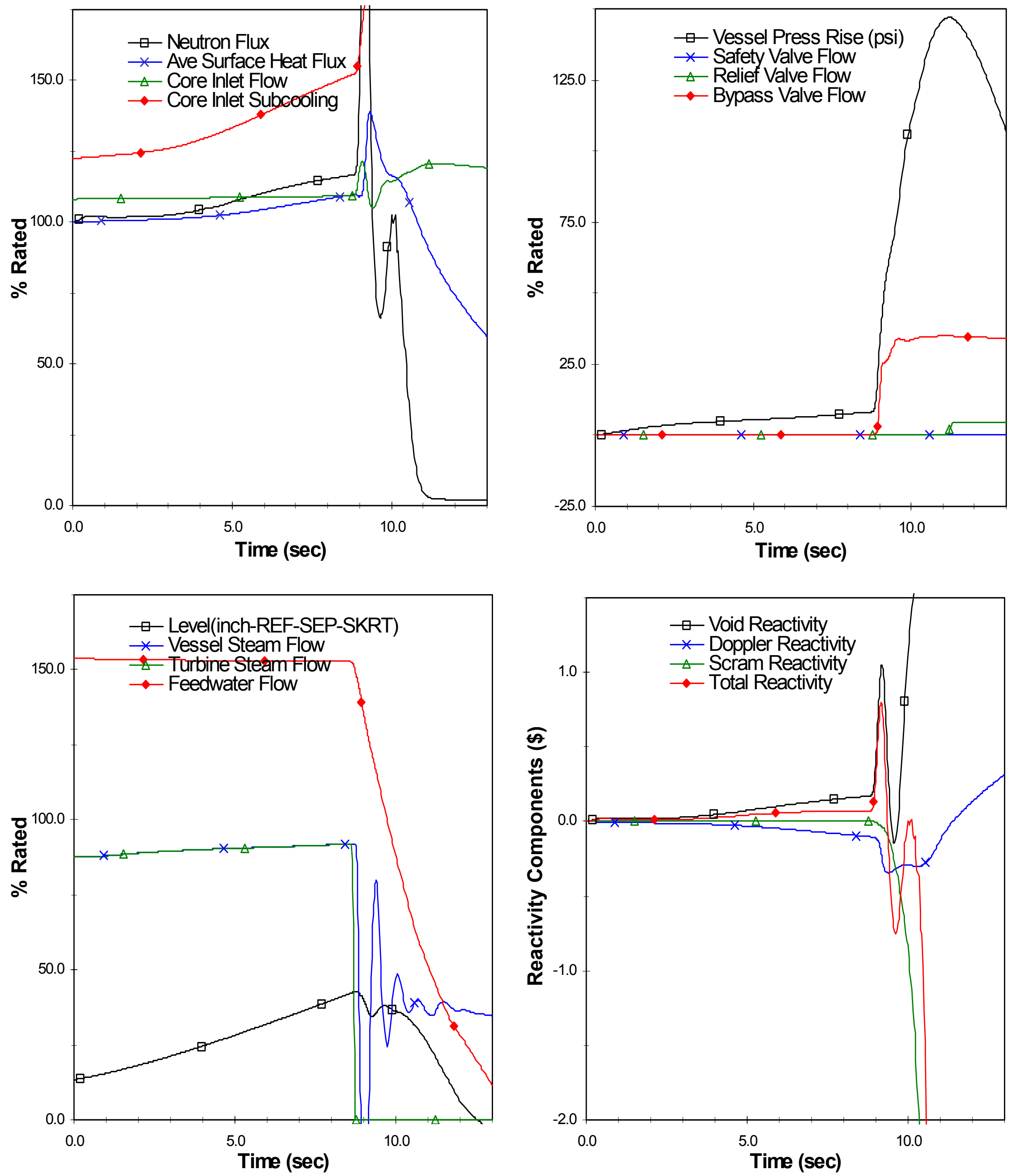


Figure 8 Plant Response to FW Controller Failure (BOC18 to EOR-1663 MWd/MT ICF-FFWTR-HBB)

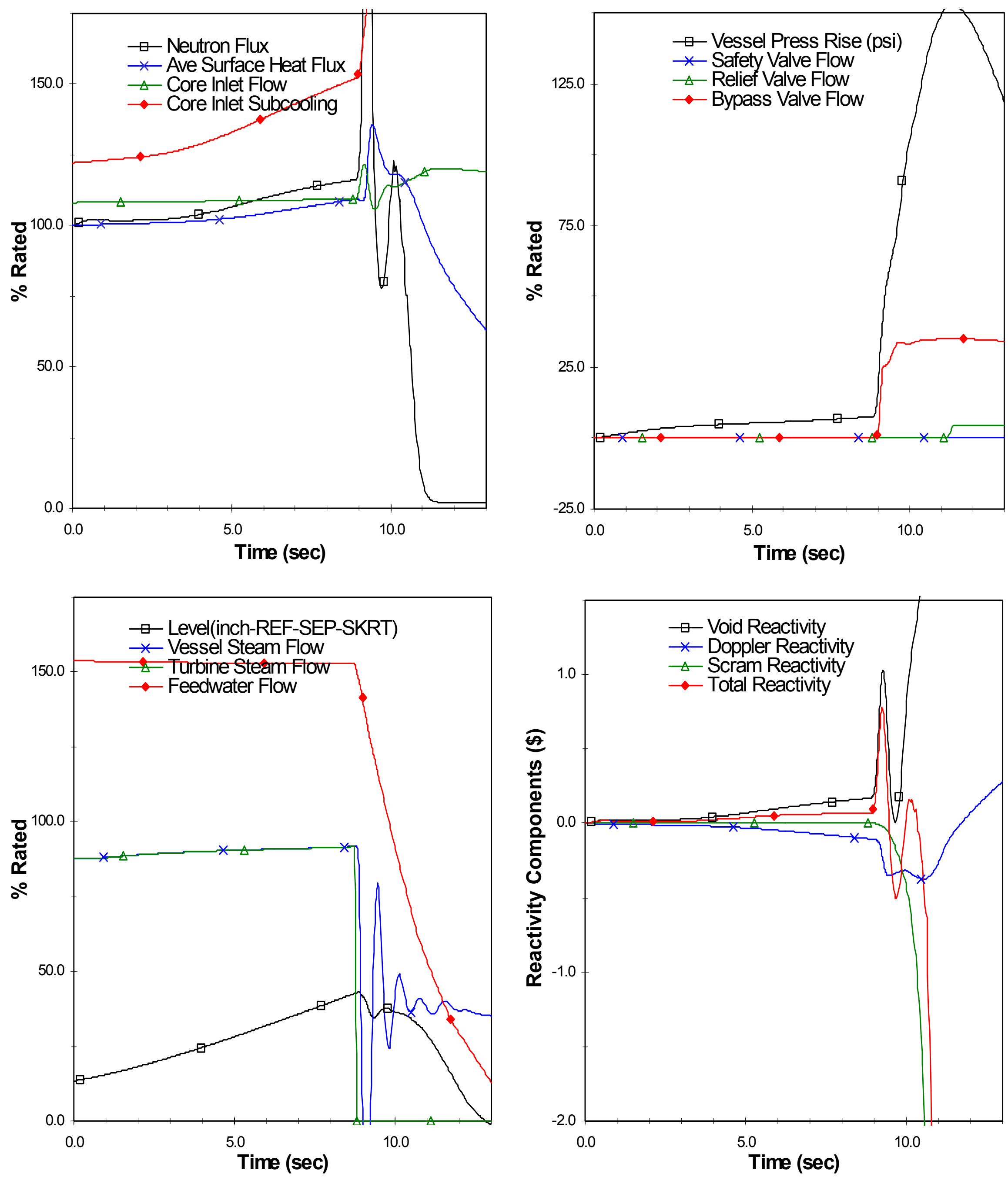


Figure 9 Plant Response to FW Controller Failure (EOR-1663 MWd/MT to EEOC18 ICF-FFWTR-HBB)

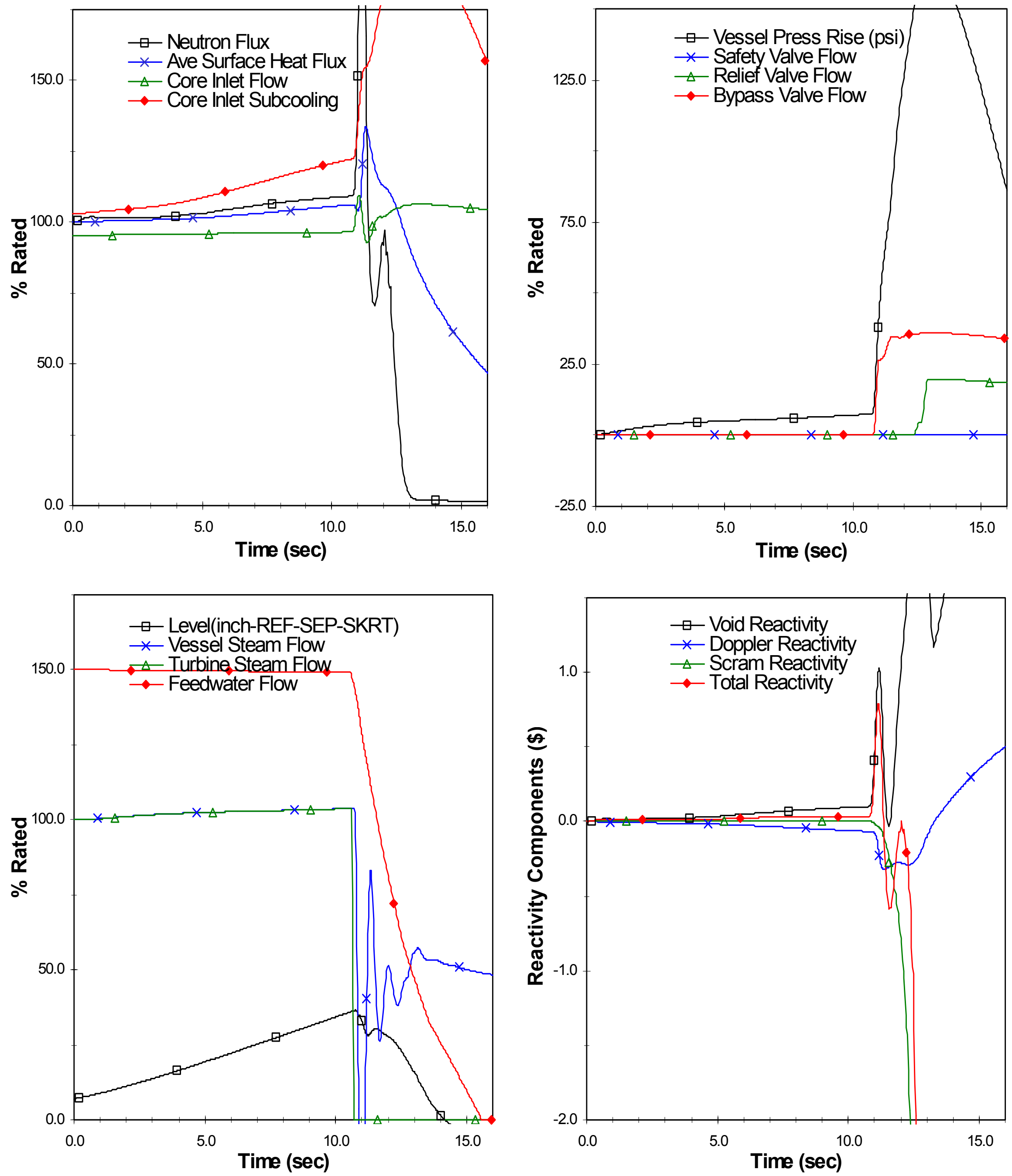


Figure 10 Plant Response to FW Controller Failure (EOR-1663 MWd/MT to EOC18 MELLLA-HBB)

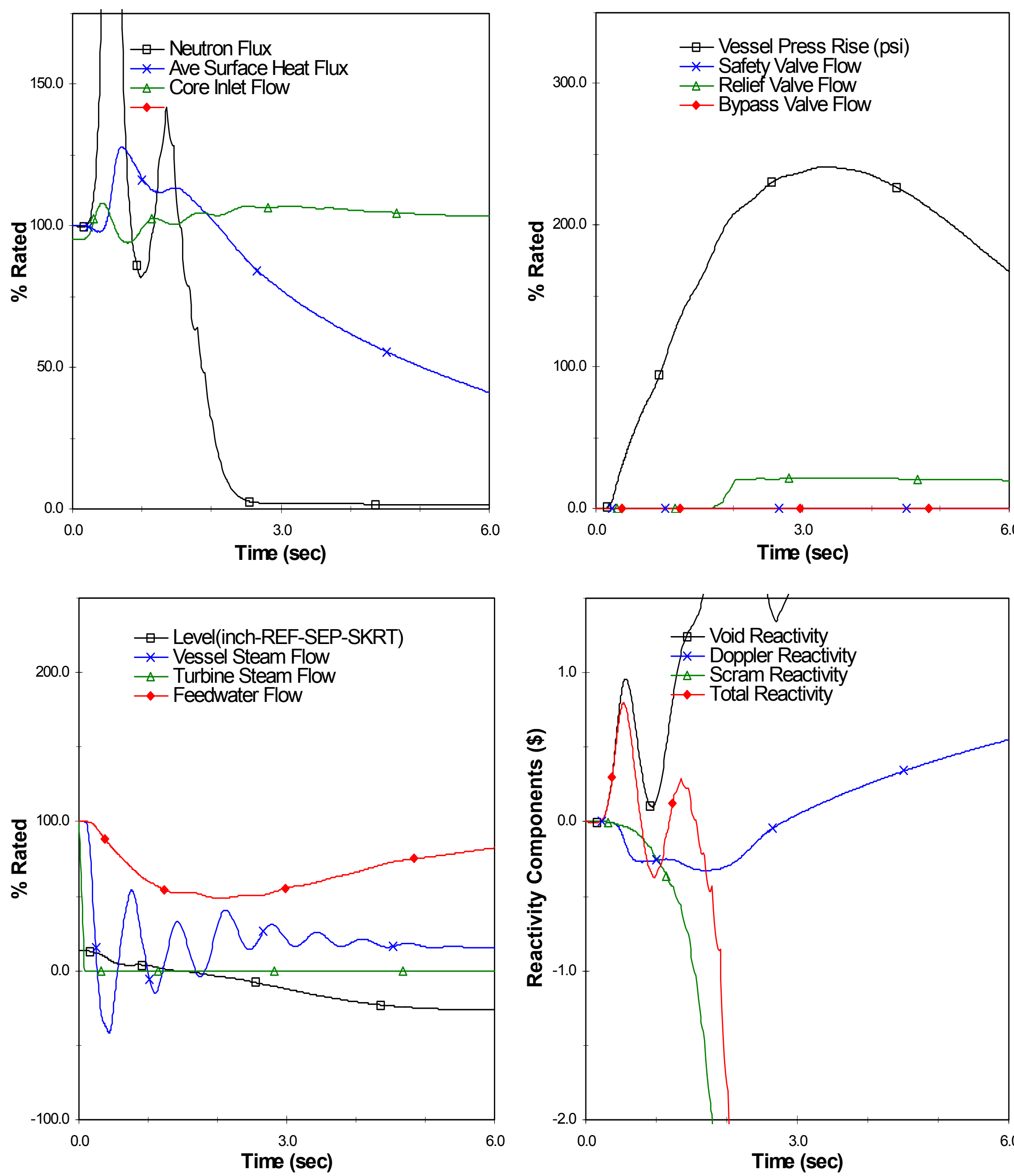


Figure 11 Plant Response to Load Reject w/o Bypass (EOR-1663 MWd/MT to EOC18 MELLLA-HBB)

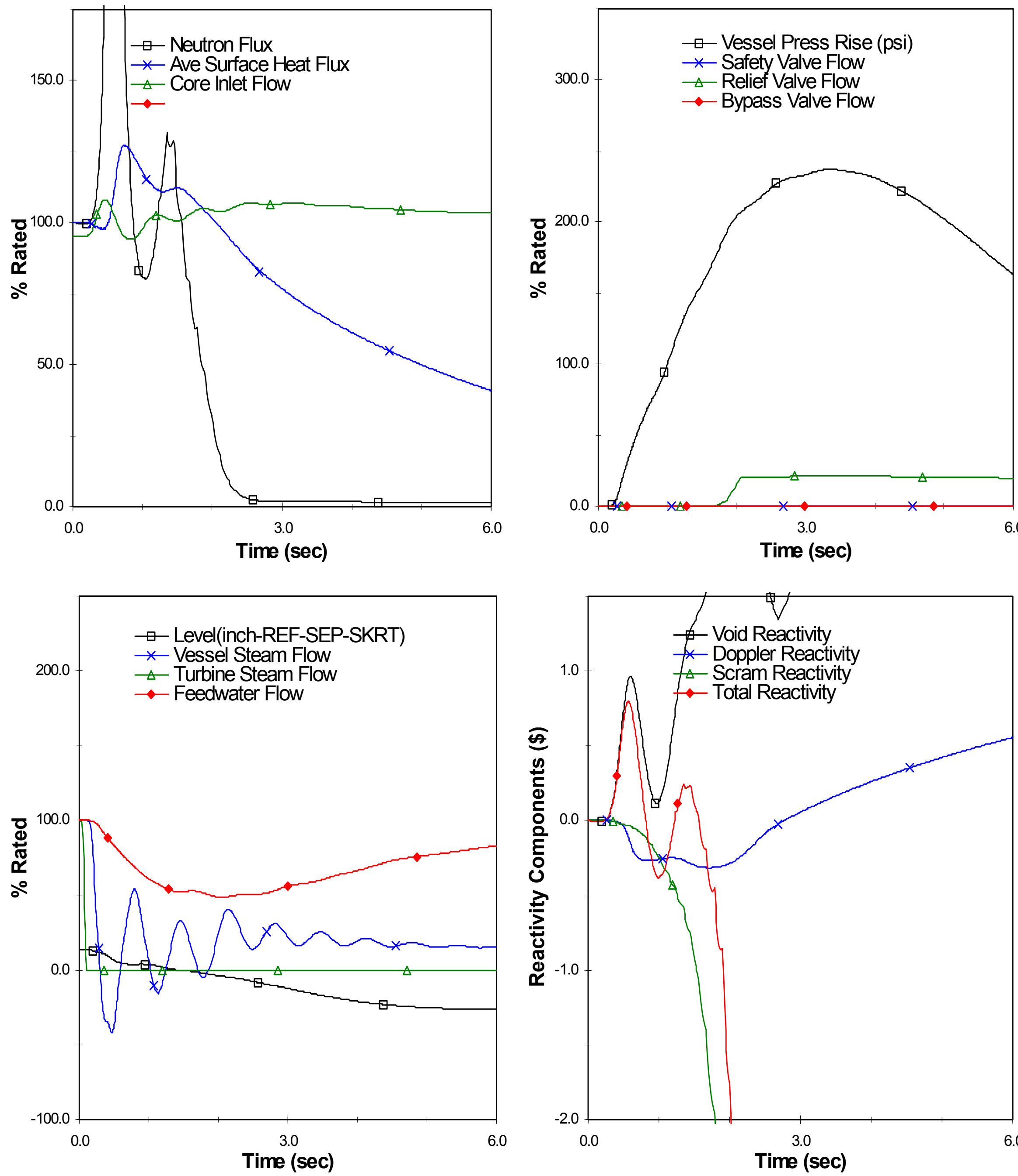


Figure 12 Plant Response to Turbine Trip w/o Bypass (EOR-1663 MWd/MT to EOC18 MELLLA-HBB)

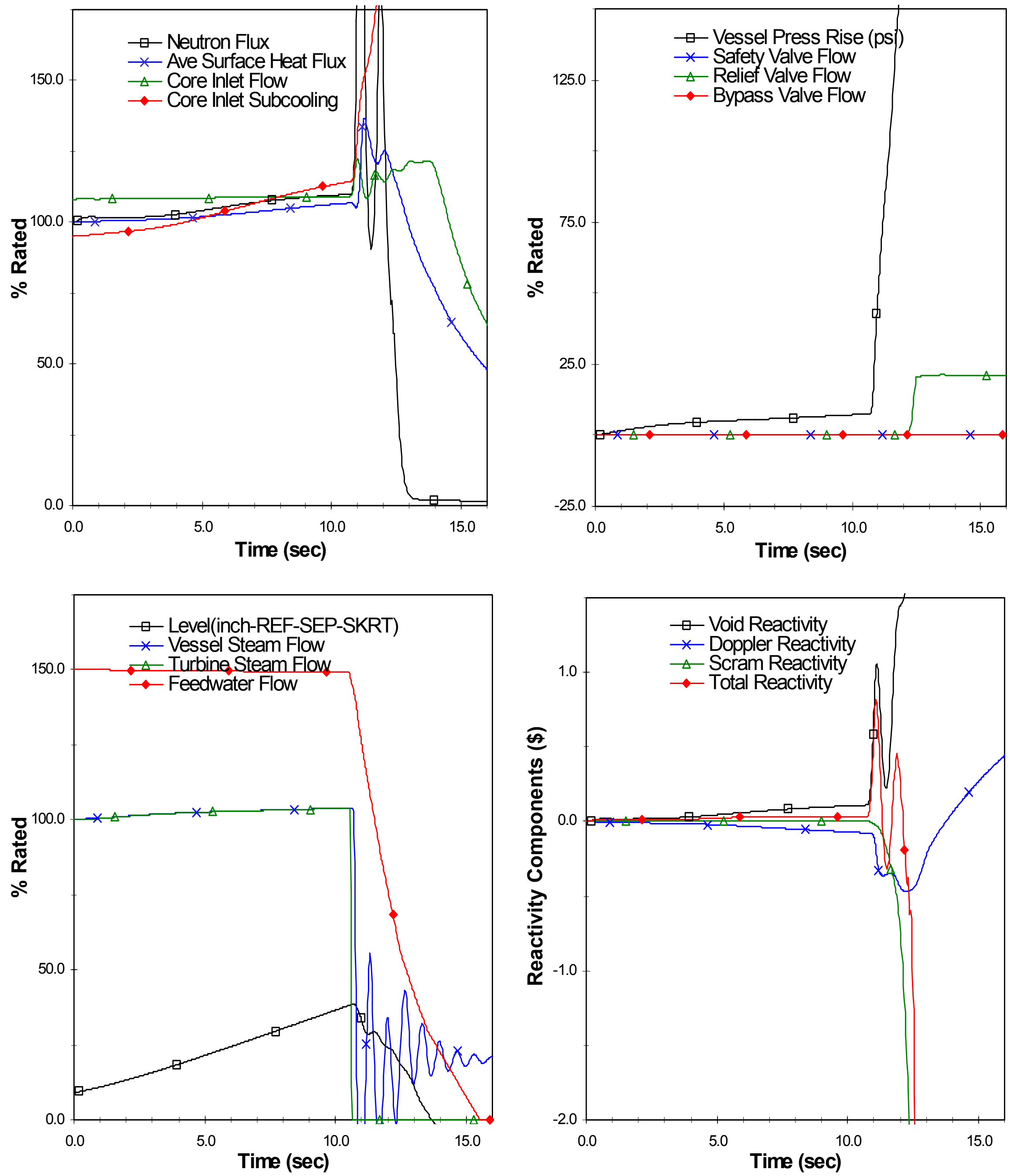


Figure 13 Plant Response to FW Controller Failure (BOC18 to EOC18 ICF_TBPOOS-HBB)

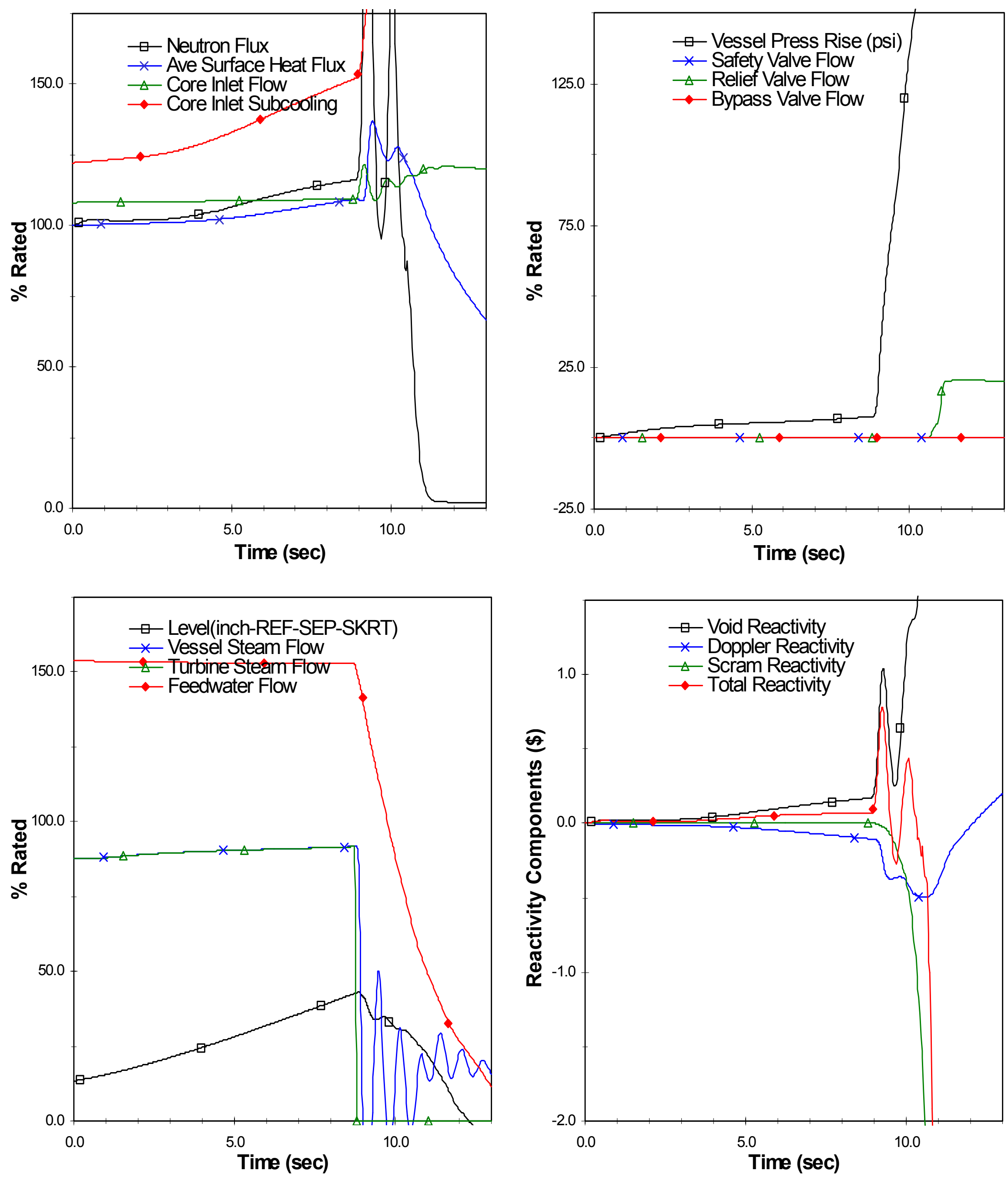


Figure 14 Plant Response to FW Controller Failure (BOC18 to EEOC18 ICF-FFWTR_TBPOOS-HBB)

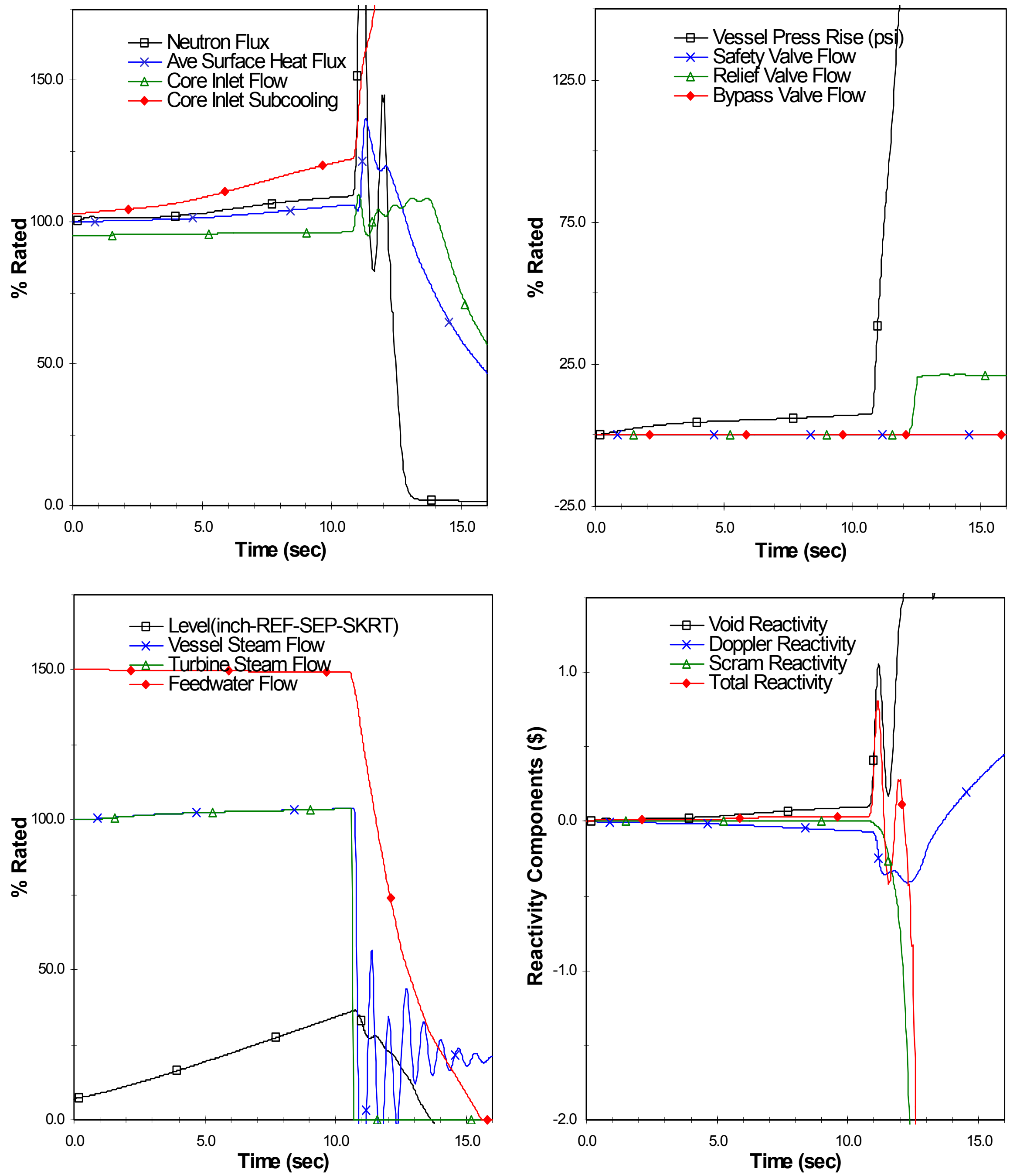


Figure 15 Plant Response to FW Controller Failure (BOC18 to EOC18 MELLLA_TBPOOS-HBB)

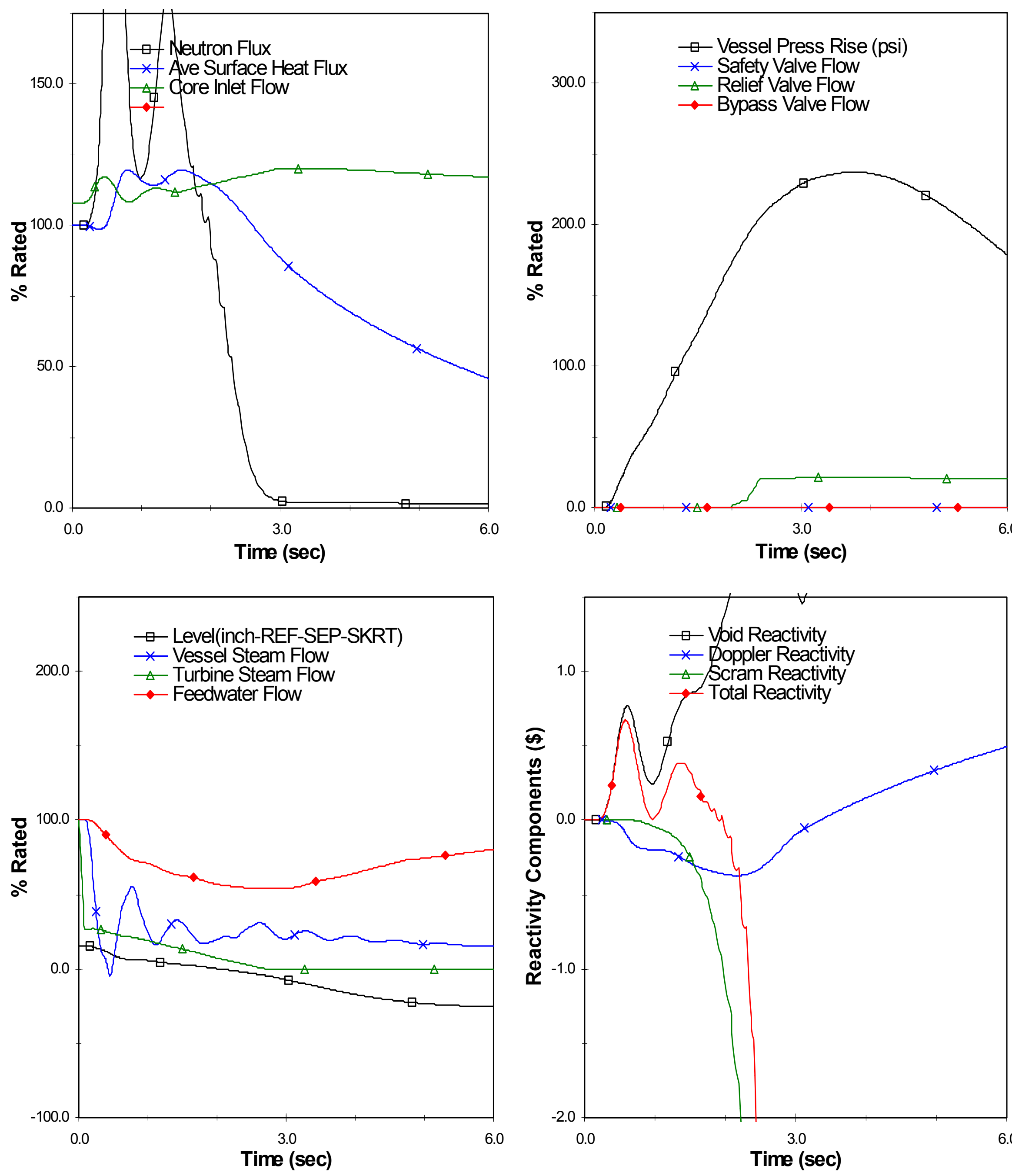


Figure 16 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 ICF_TCVSC-HBB)

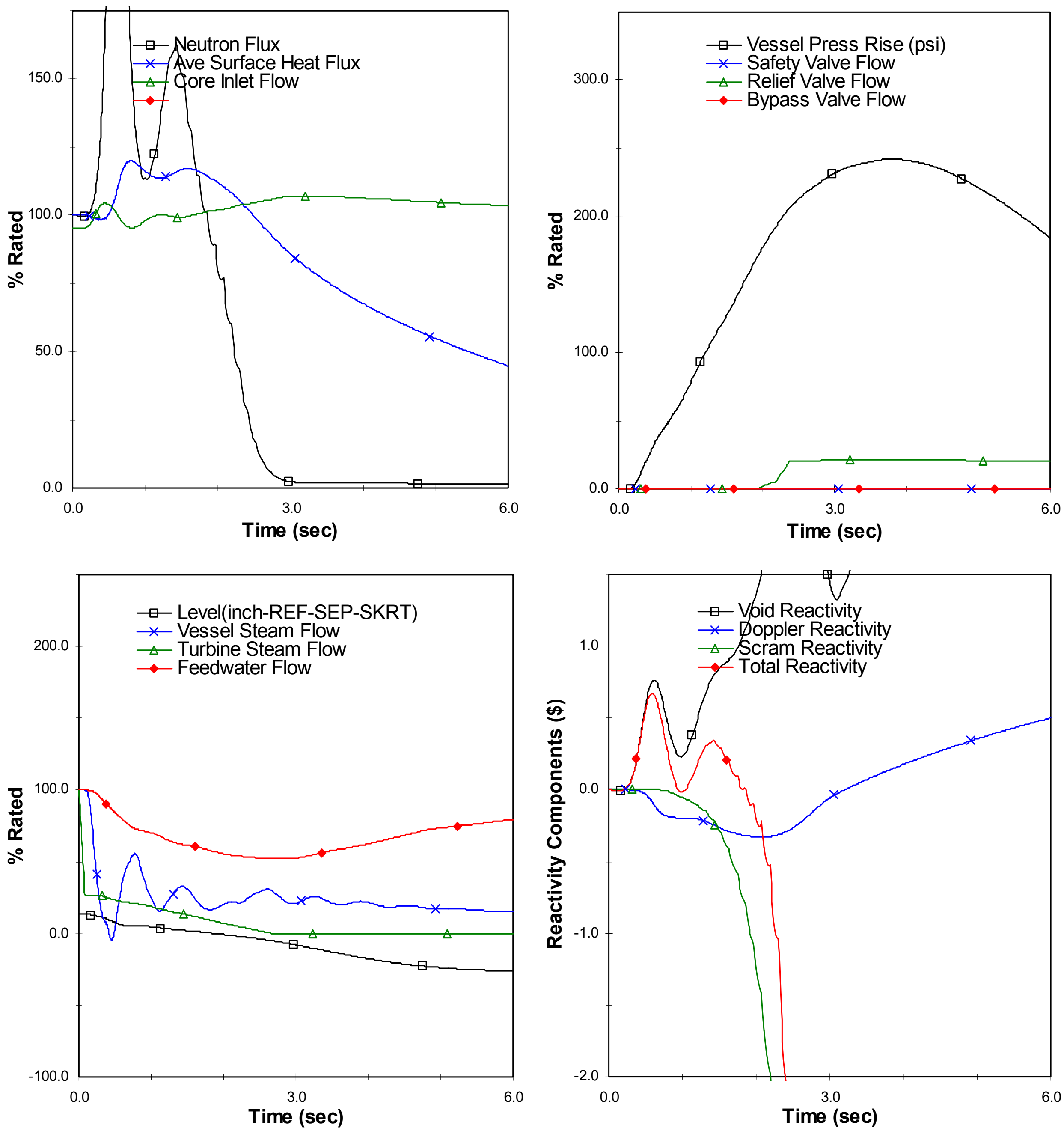


Figure 17 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 MELLLA_TCVSC-HBB)

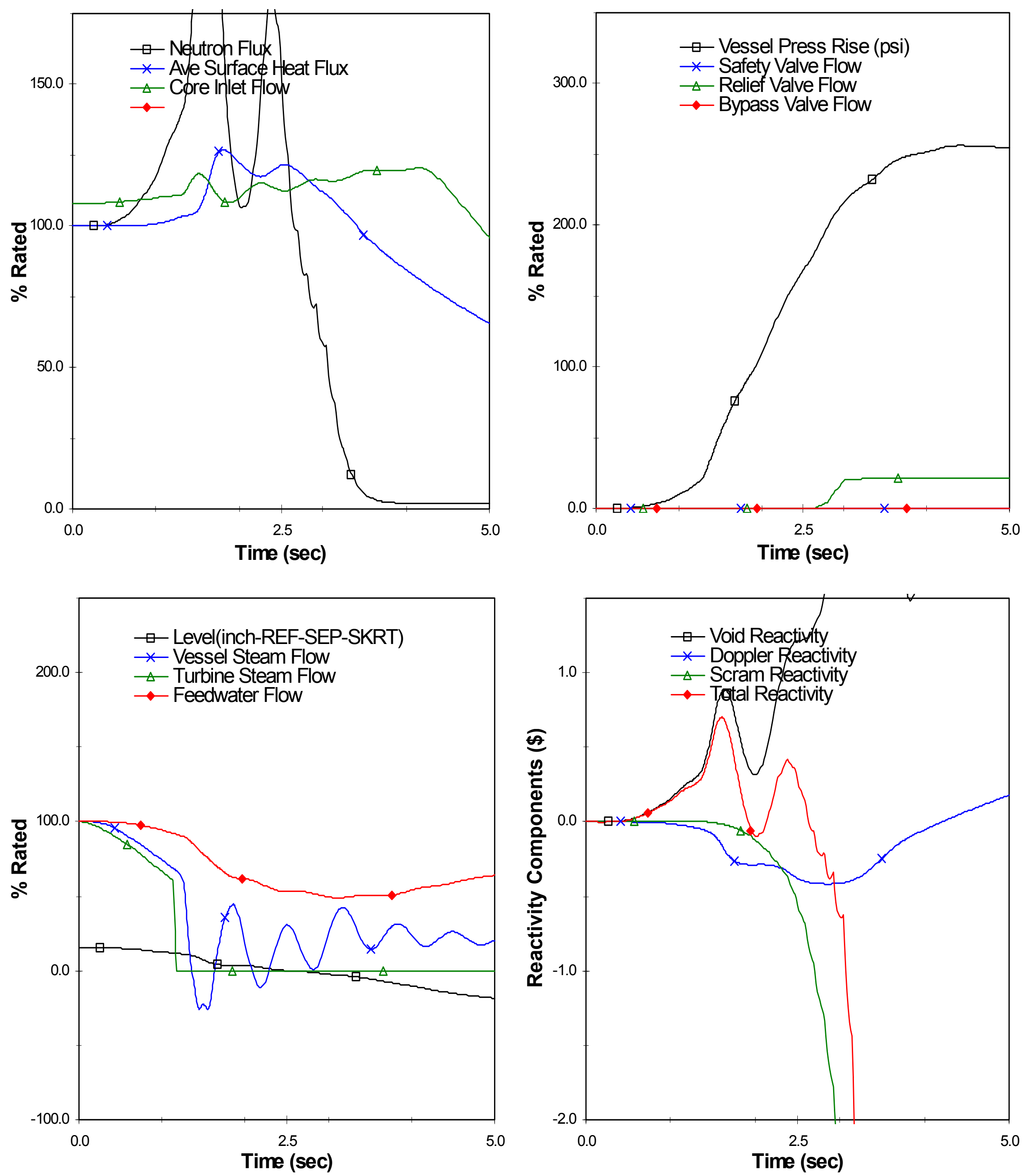


Figure 18 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 ICF_PLUOOS-HBB)

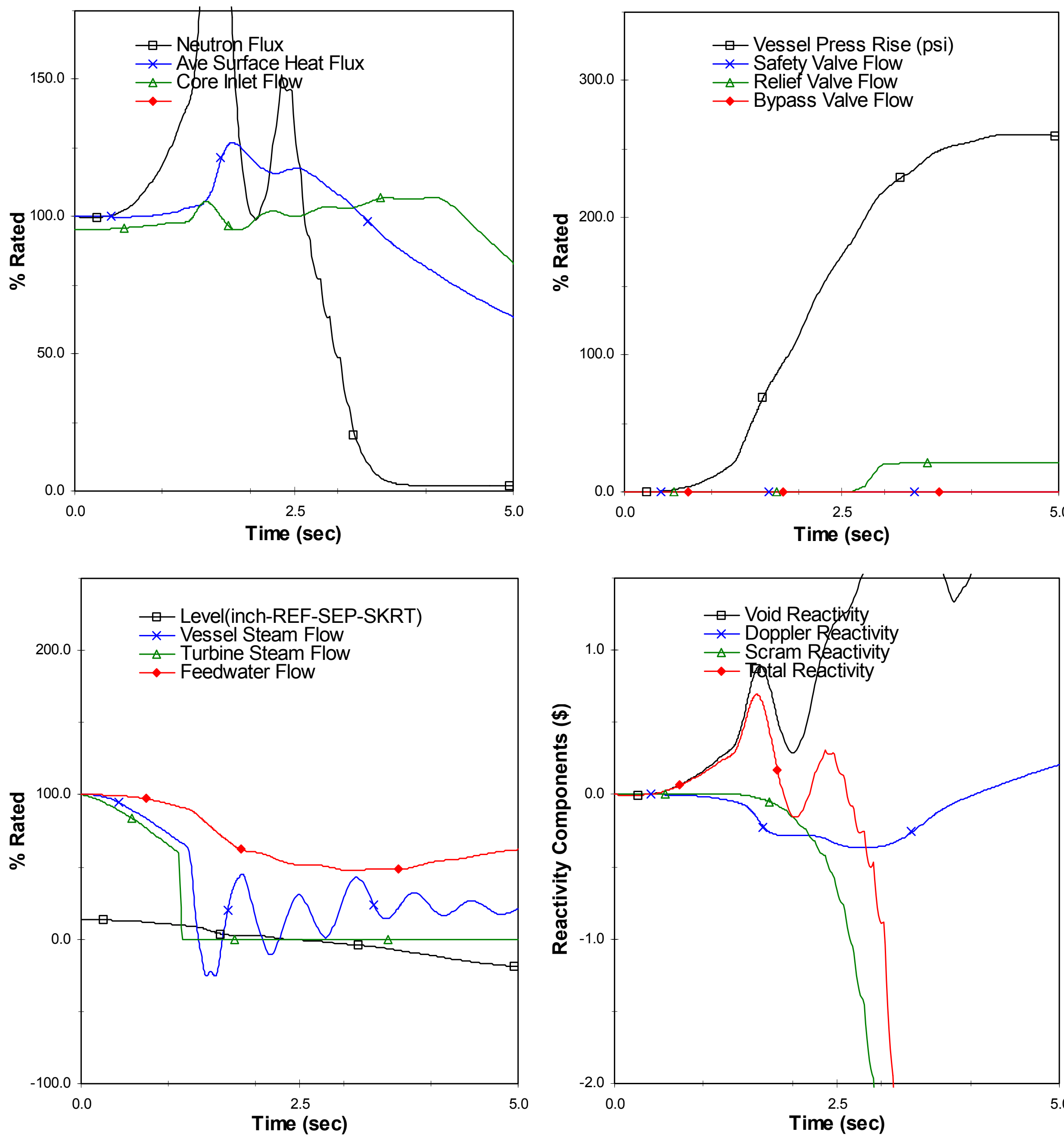


Figure 19 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 MELLLA_PLUOOS-HBB)

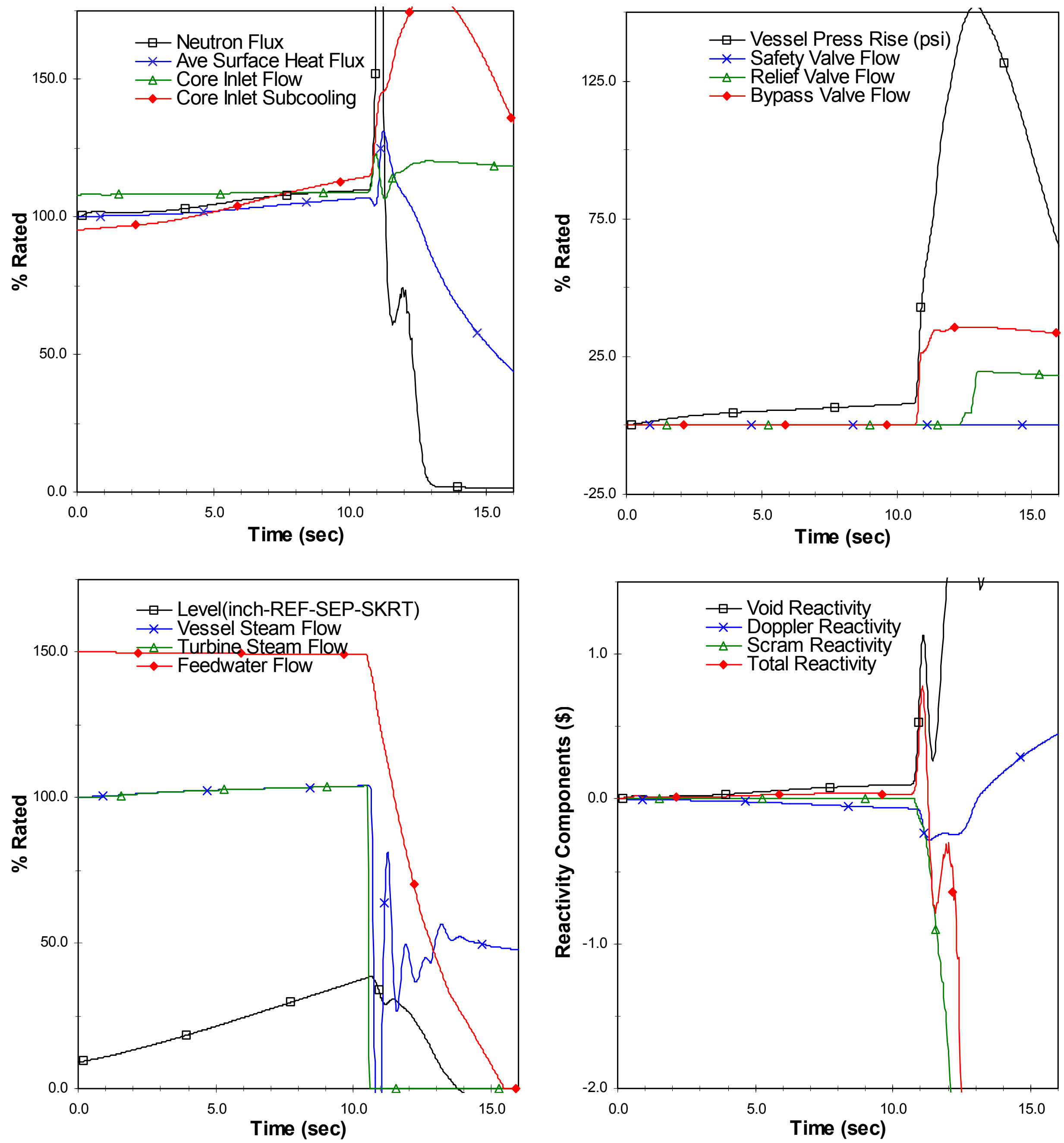


Figure 20 Plant Response to FW Controller Failure (BOC18 to EOC18 ICF-UDB)

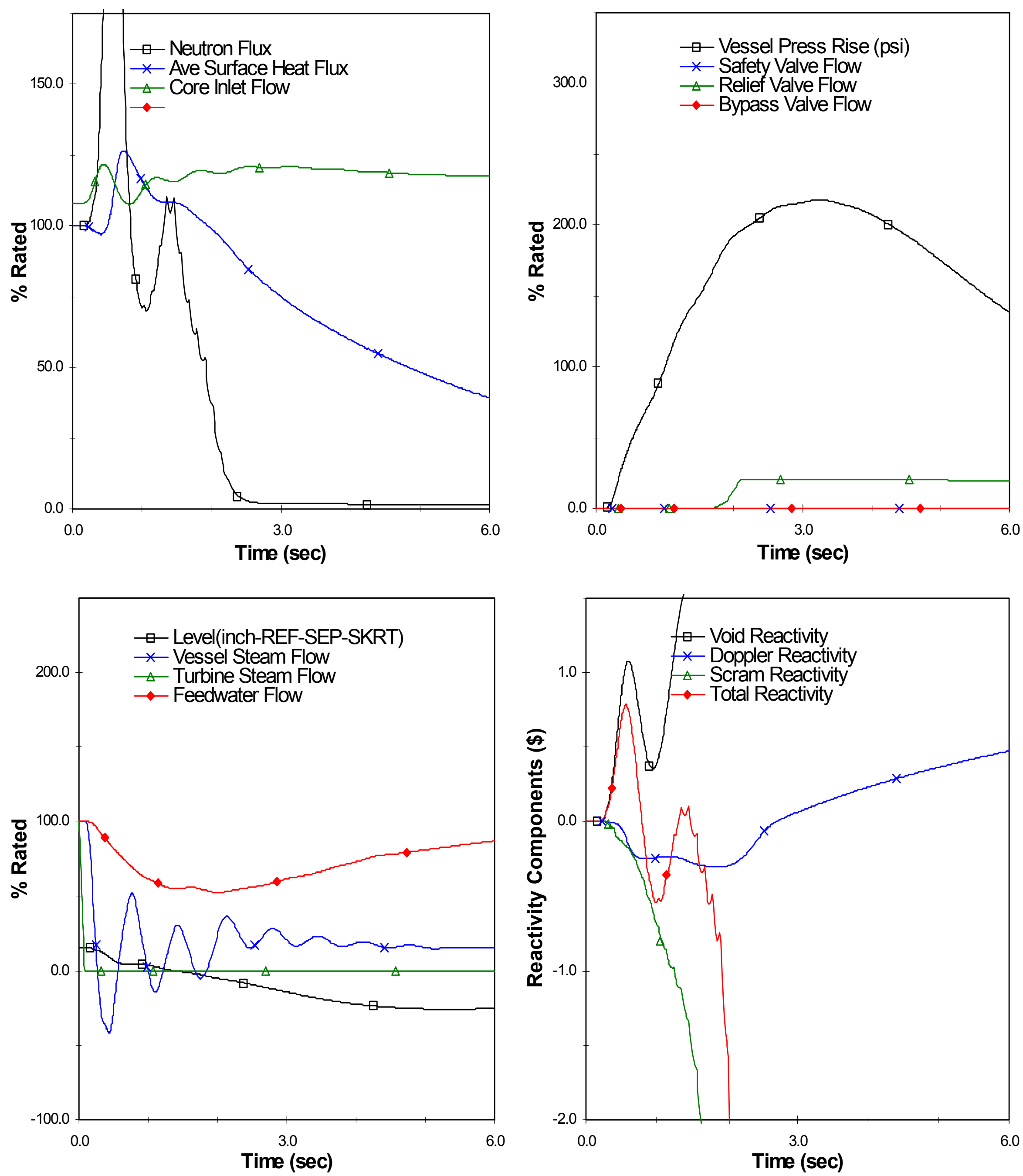


Figure 21 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 ICF-UDB)

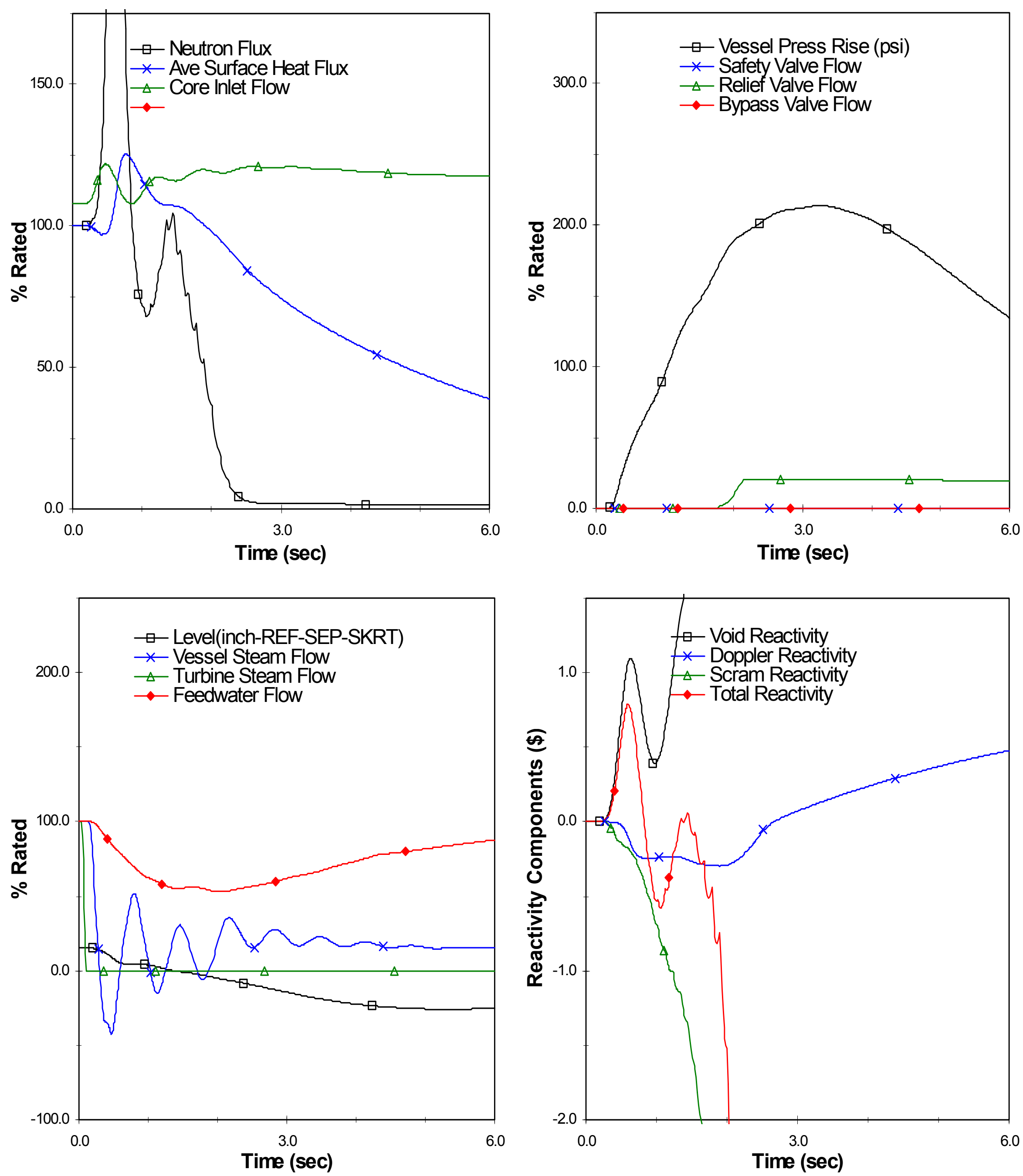


Figure 22 Plant Response to Turbine Trip w/o Bypass (BOC18 to EOC18 ICF-UDB)

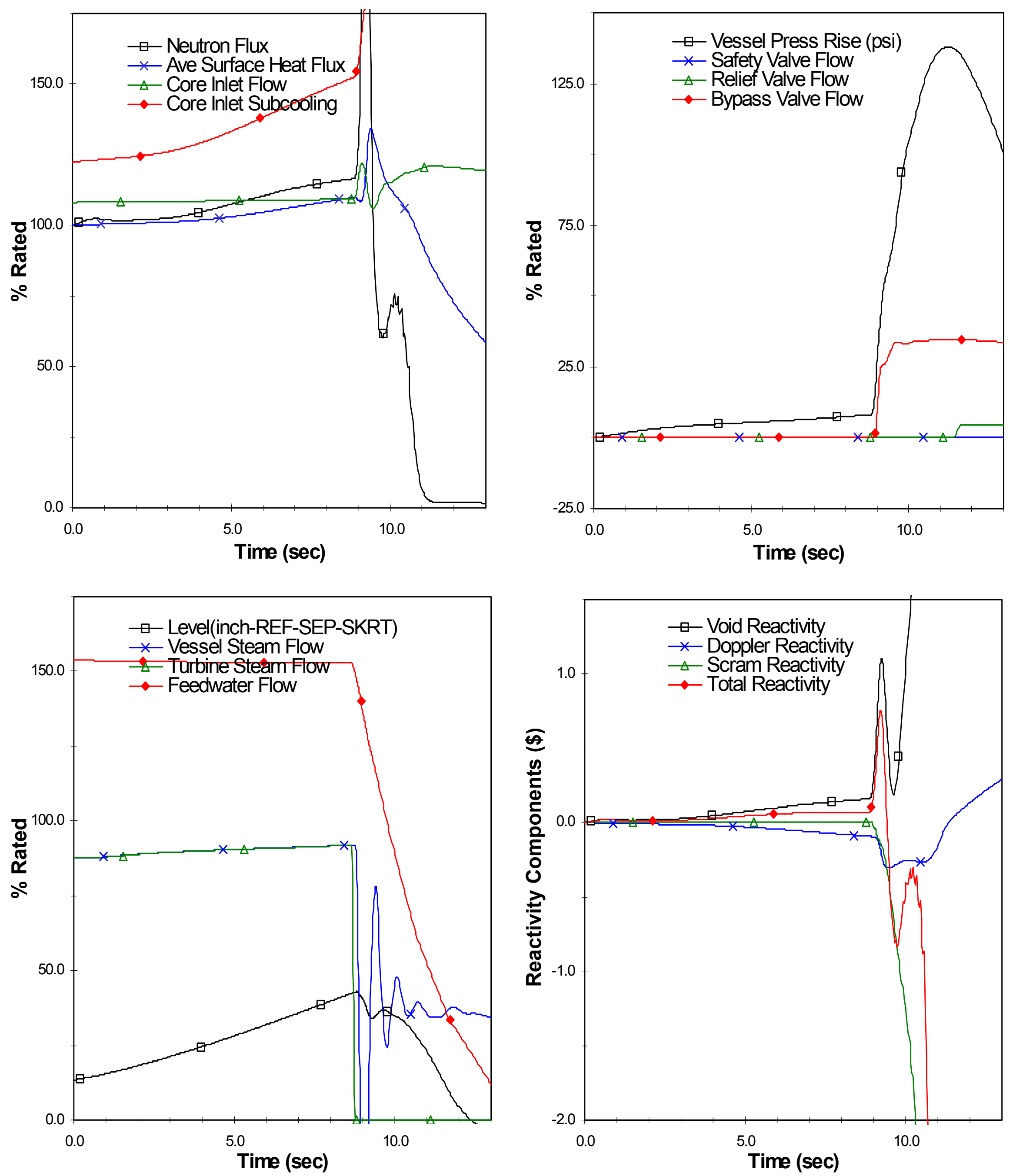


Figure 23 Plant Response to FW Controller Failure (BOC18 to EEOC18 ICF-FFWTR-UDB)

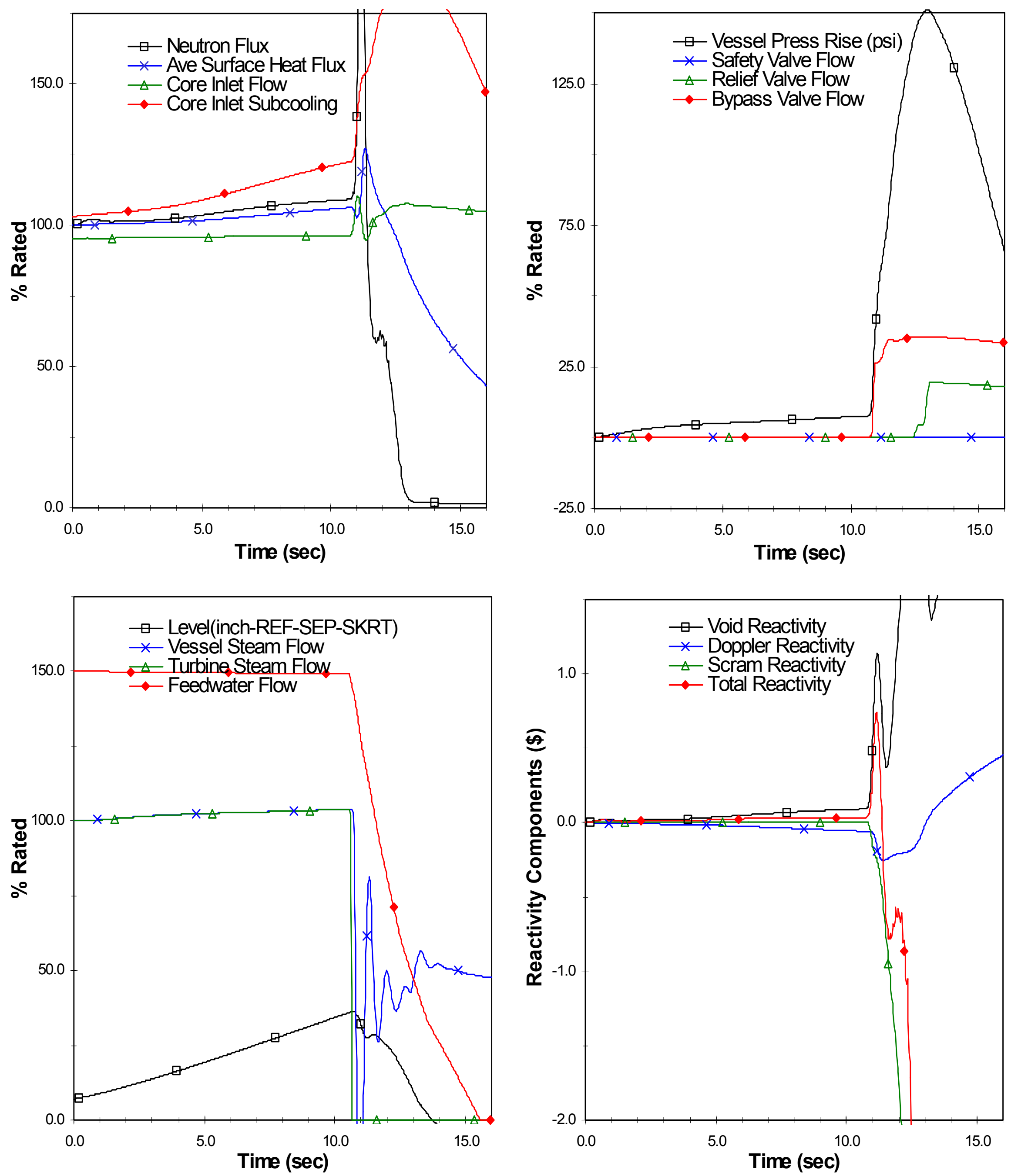


Figure 24 Plant Response to FW Controller Failure (EOR-1663 MWd/MT to EOC18 MELLLA-UDB)

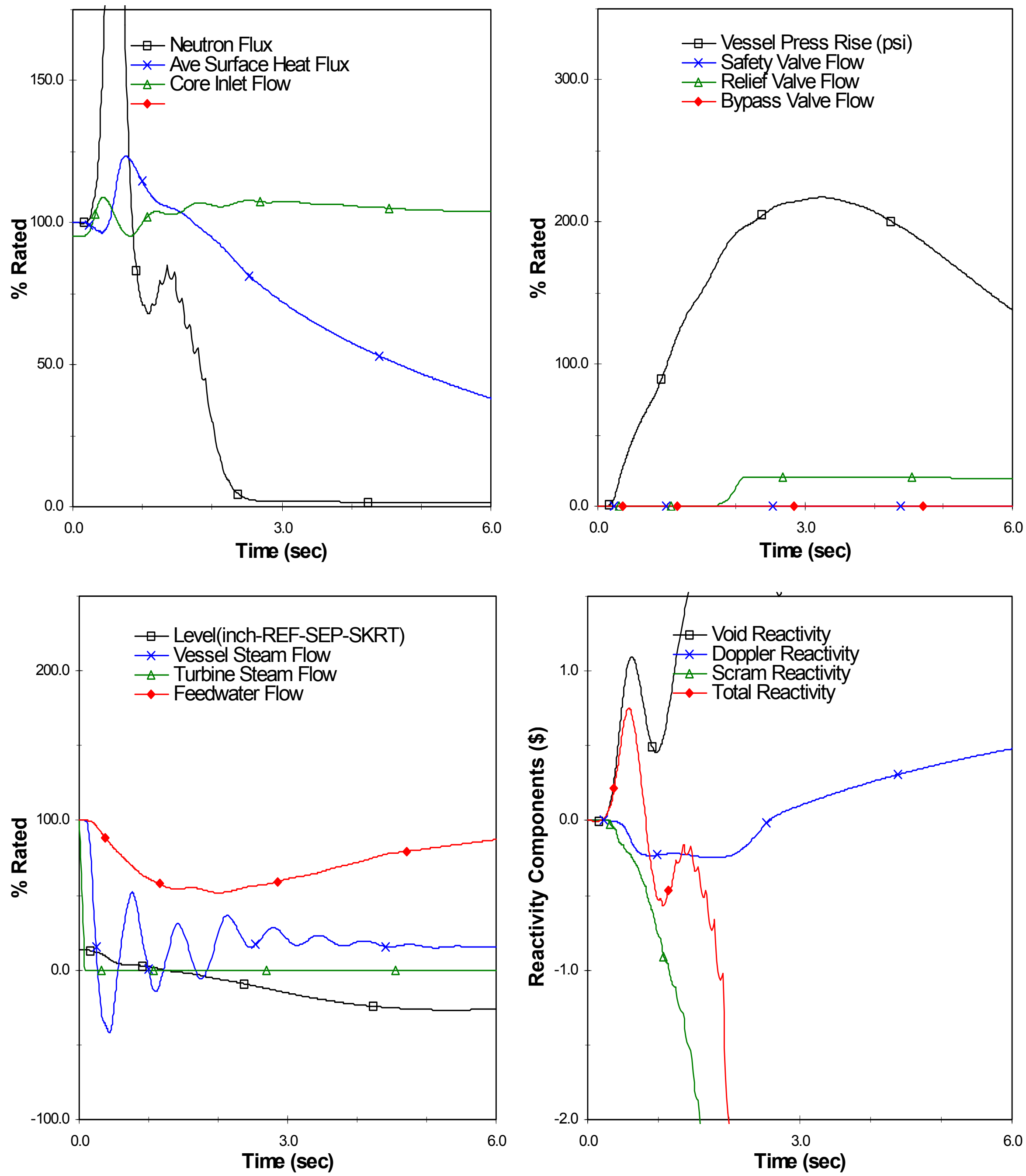


Figure 25 Plant Response to Load Reject w/o Bypass (EOR-1663 MWd/MT to EOC18 MELLLA-UDB)

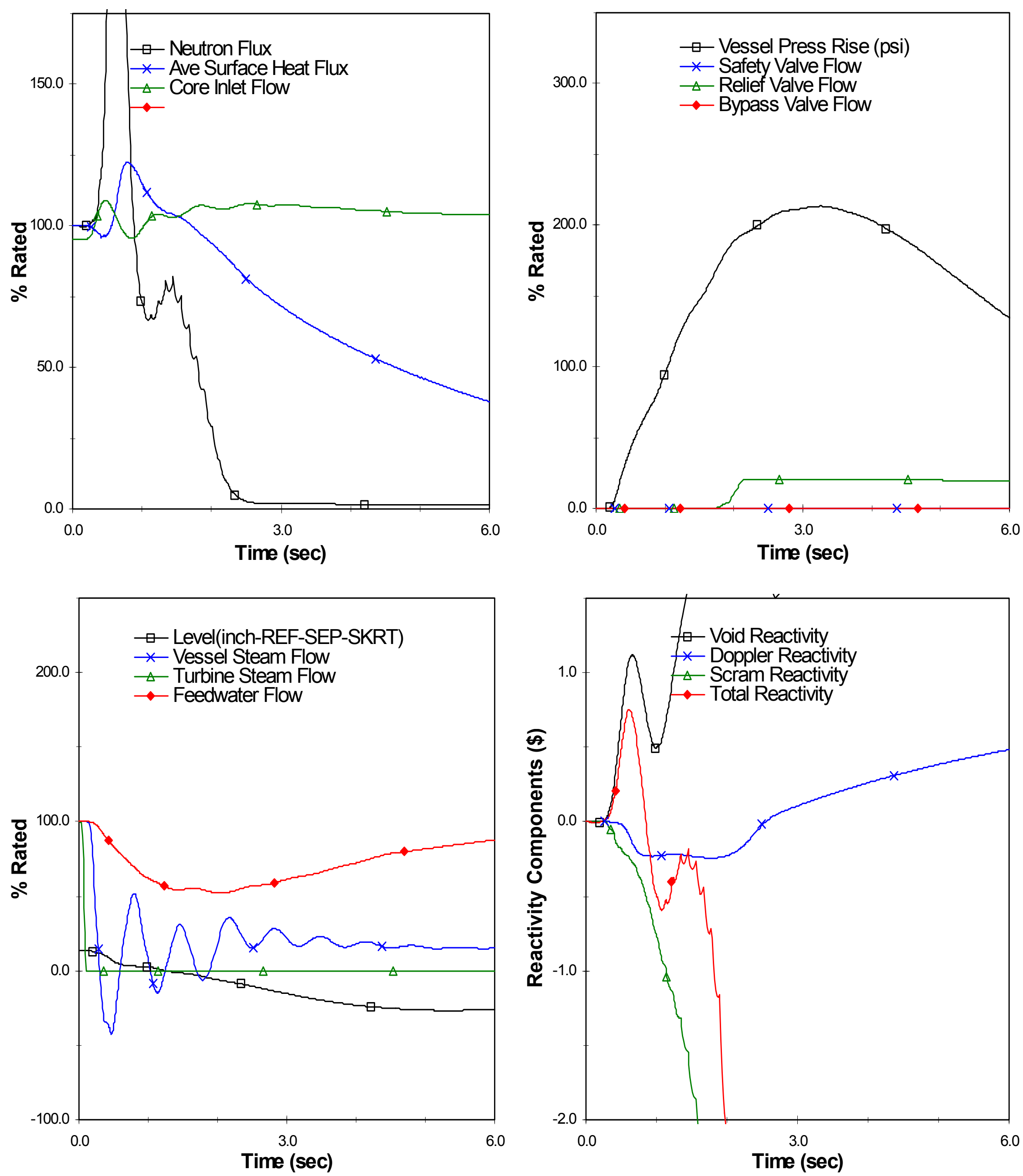


Figure 26 Plant Response to Turbine Trip w/o Bypass (EOR-1663 MWd/MT to EOC18 MELLLA-UDB)

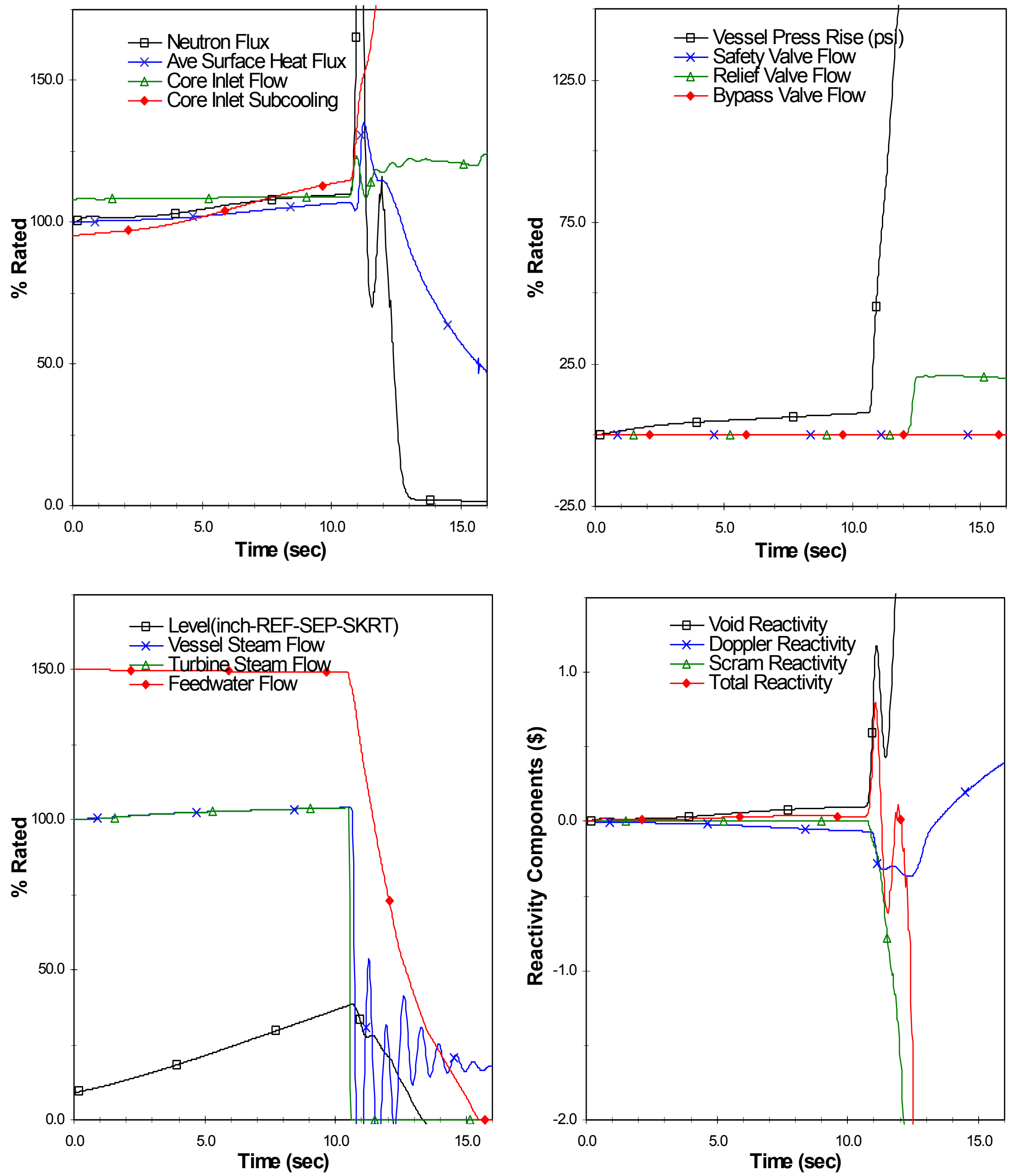


Figure 27 Plant Response to FW Controller Failure (BOC18 to EOC18 ICF_TBPOOS-UDB)

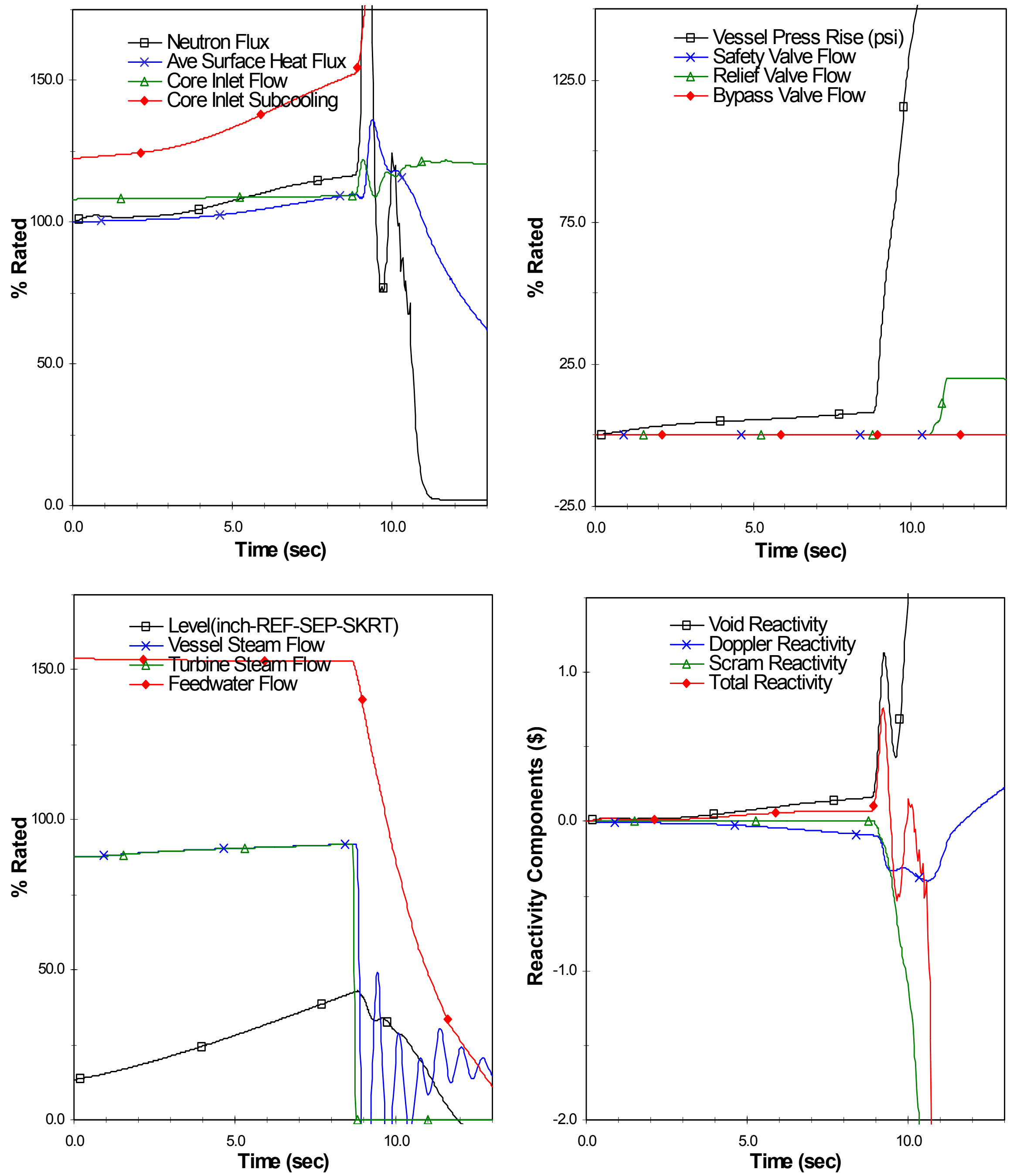


Figure 28 Plant Response to FW Controller Failure (BOC18 to EEOC18 ICF-FFWTR_TBPOOS-UDB)

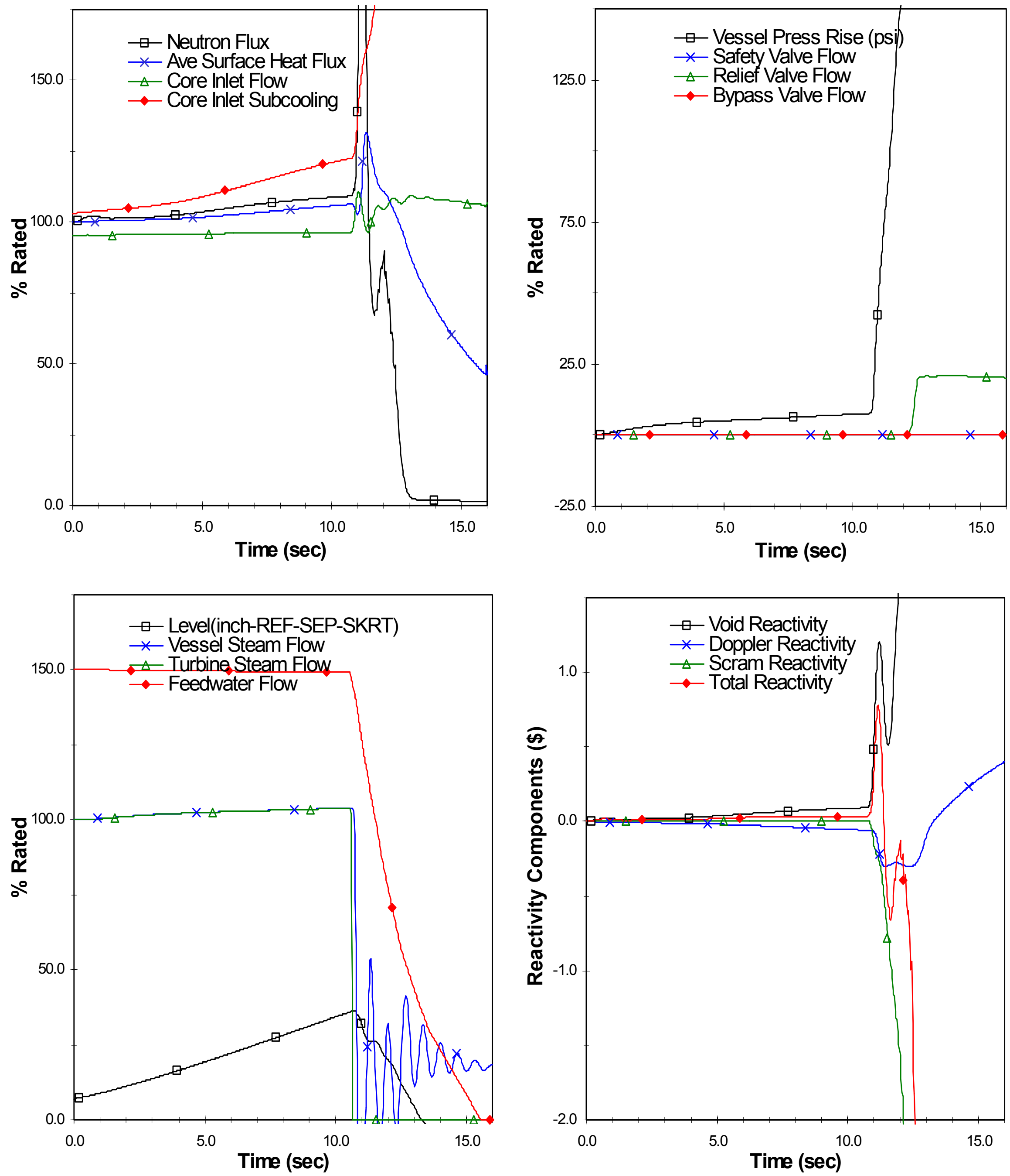


Figure 29 Plant Response to FW Controller Failure (BOC18 to EOC18 MELLLA_TBPOOS-UDB)

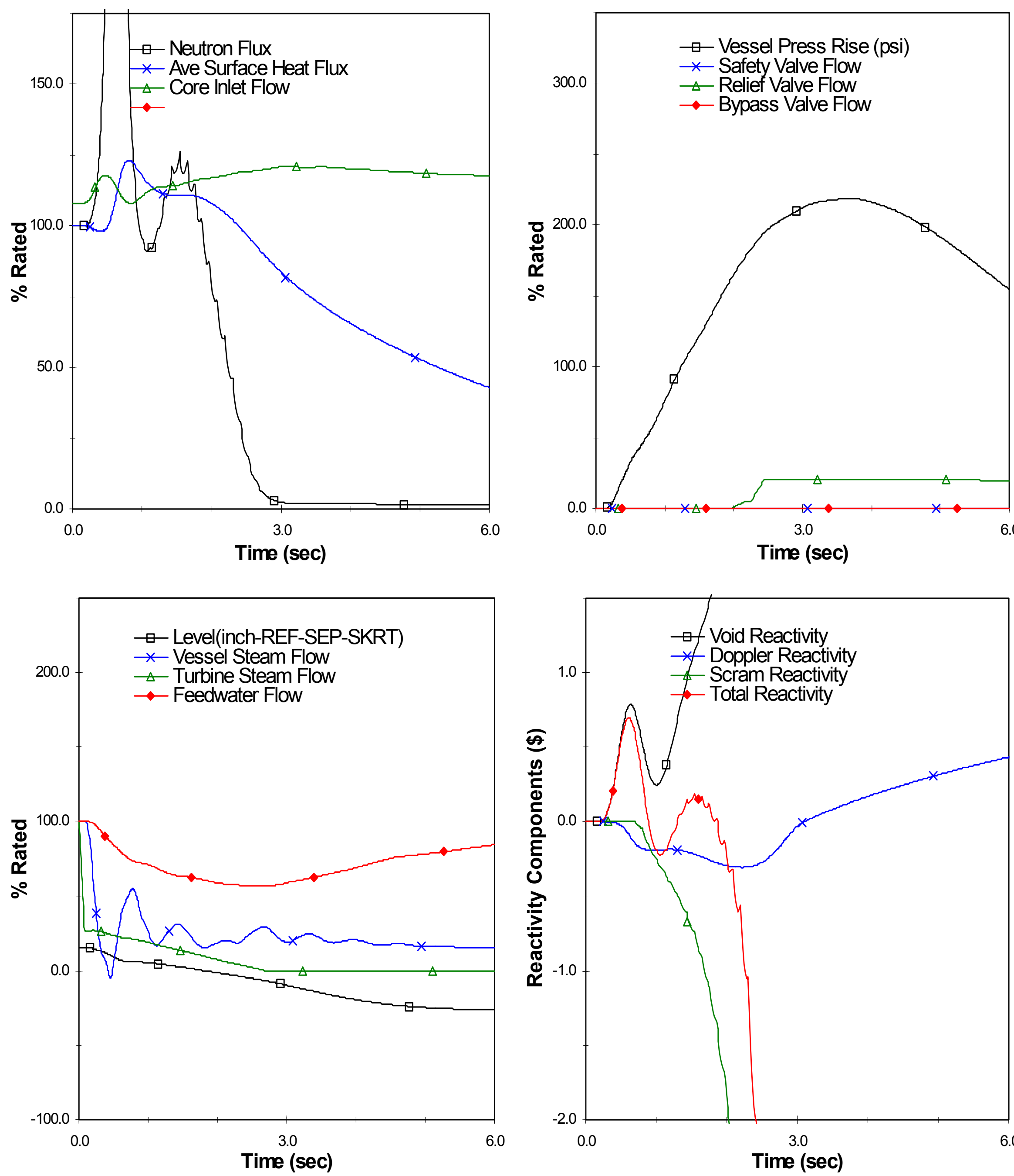


Figure 30 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 ICF_TCVSC-UDB)

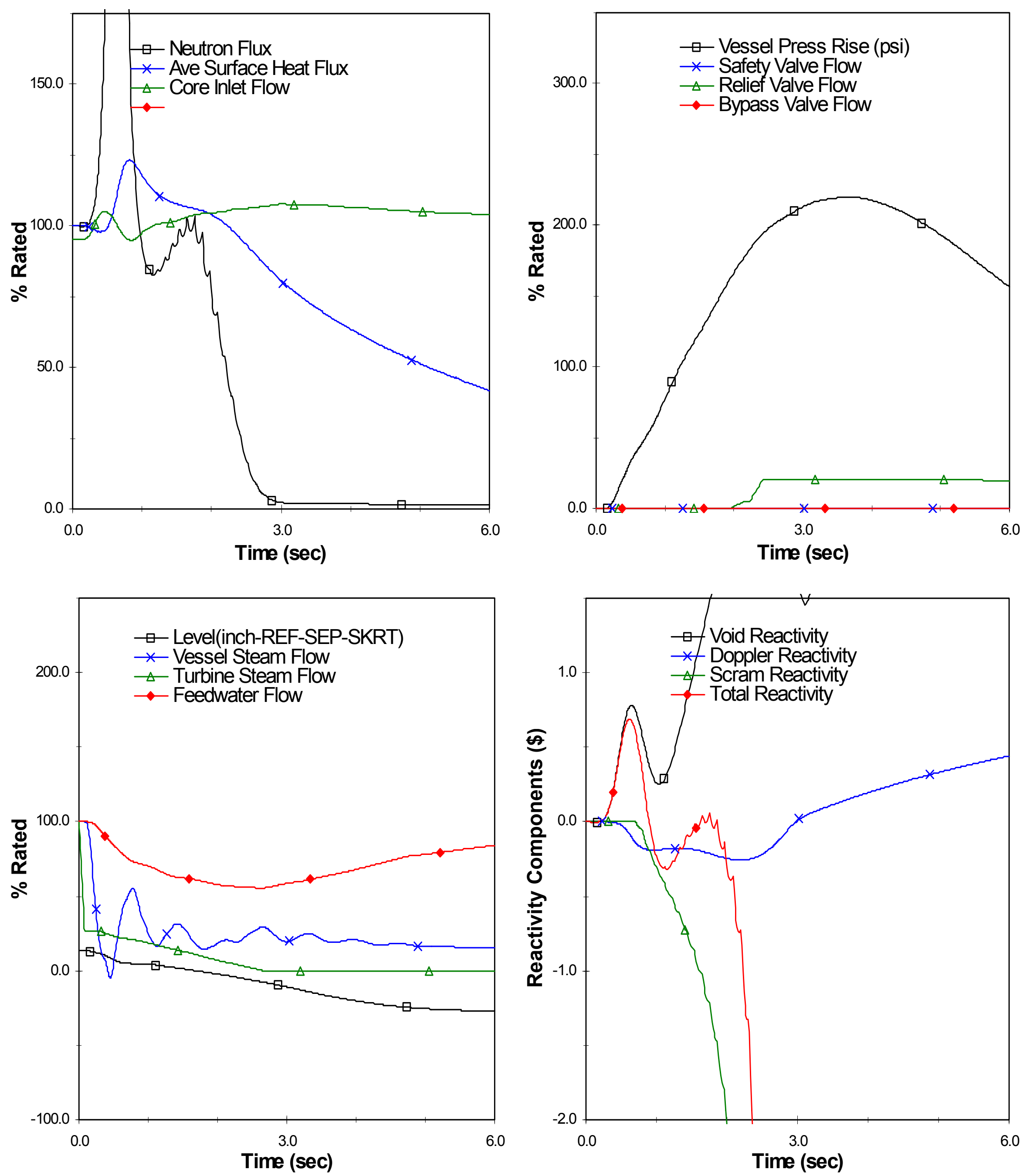


Figure 31 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 MELLLA_TCVSC-UDB)

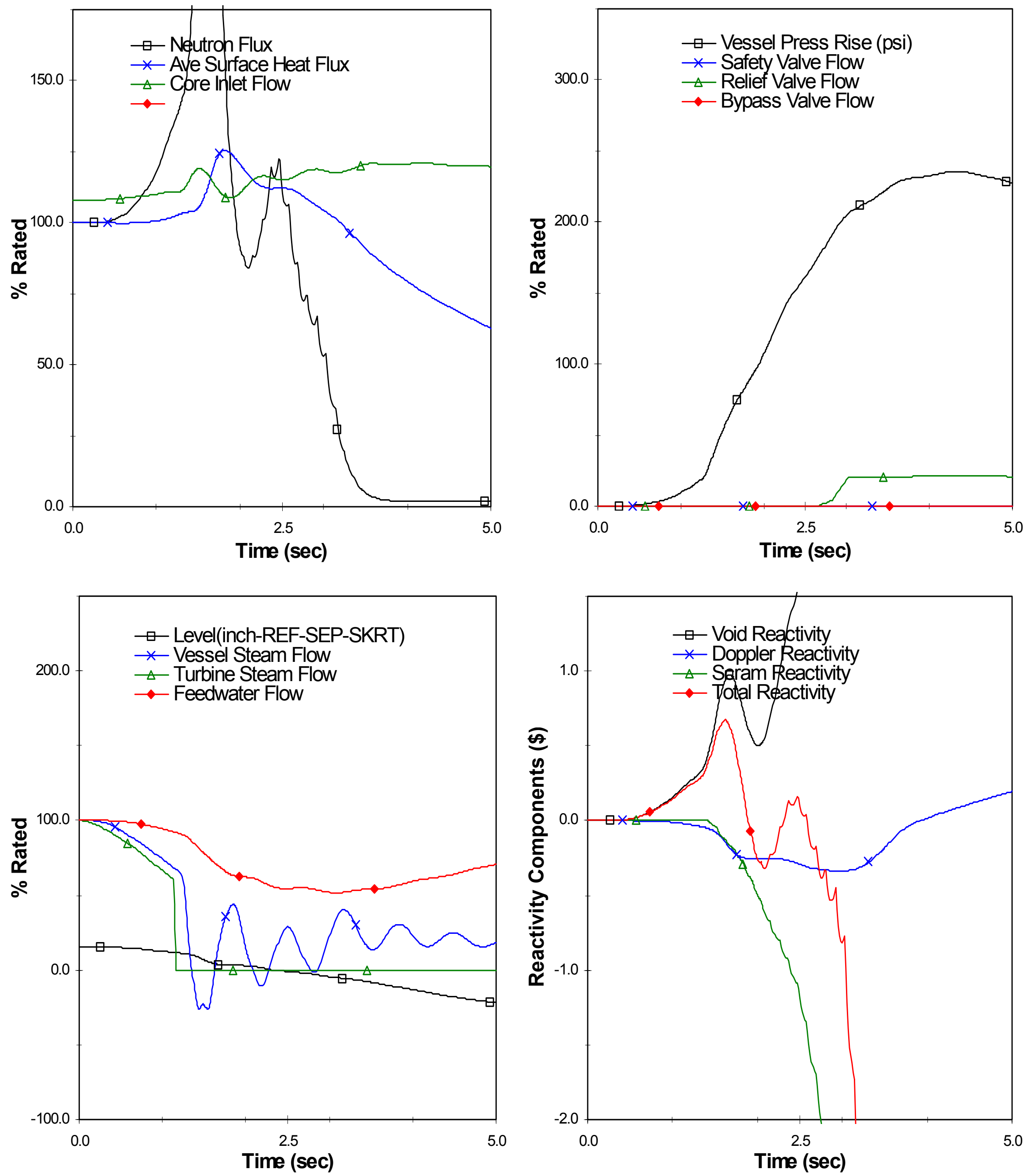


Figure 32 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 ICF_PLUOOS-UDB)

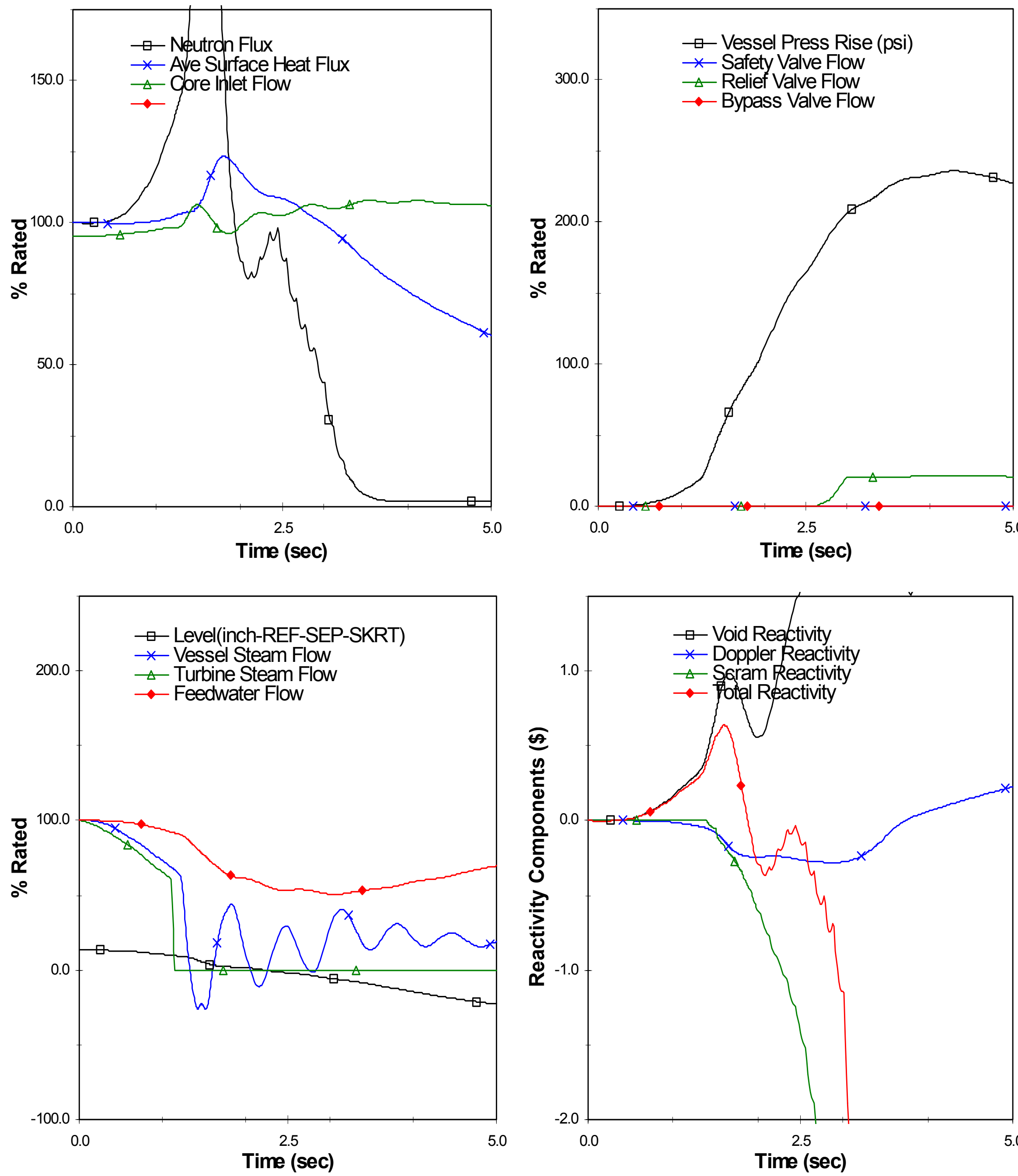


Figure 33 Plant Response to Load Reject w/o Bypass (BOC18 to EOC18 MELLLA_PLUOOS-UDB)

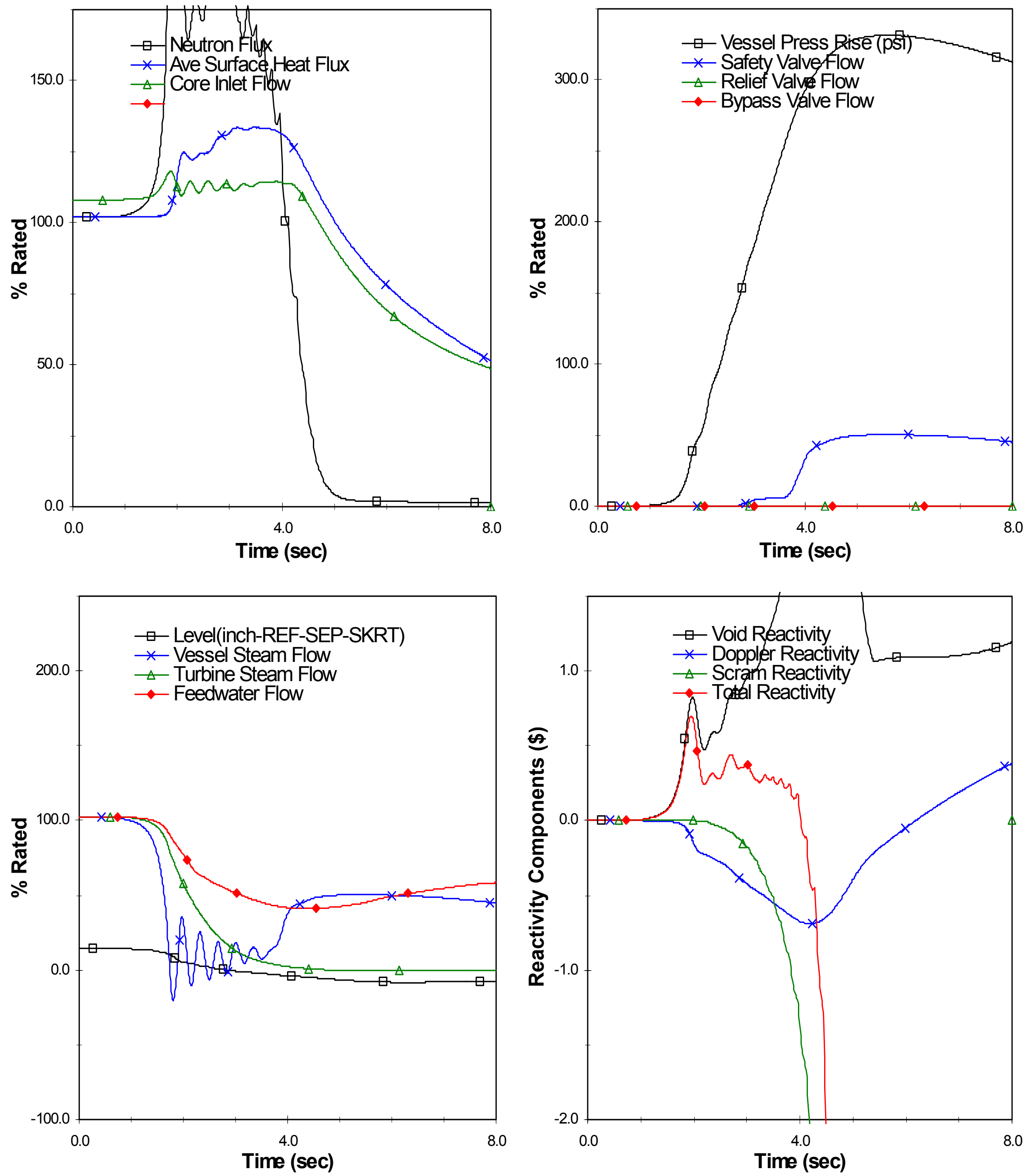


Figure 34 Plant Response to MSIV Closure (Flux Scram, ICF-HBB)

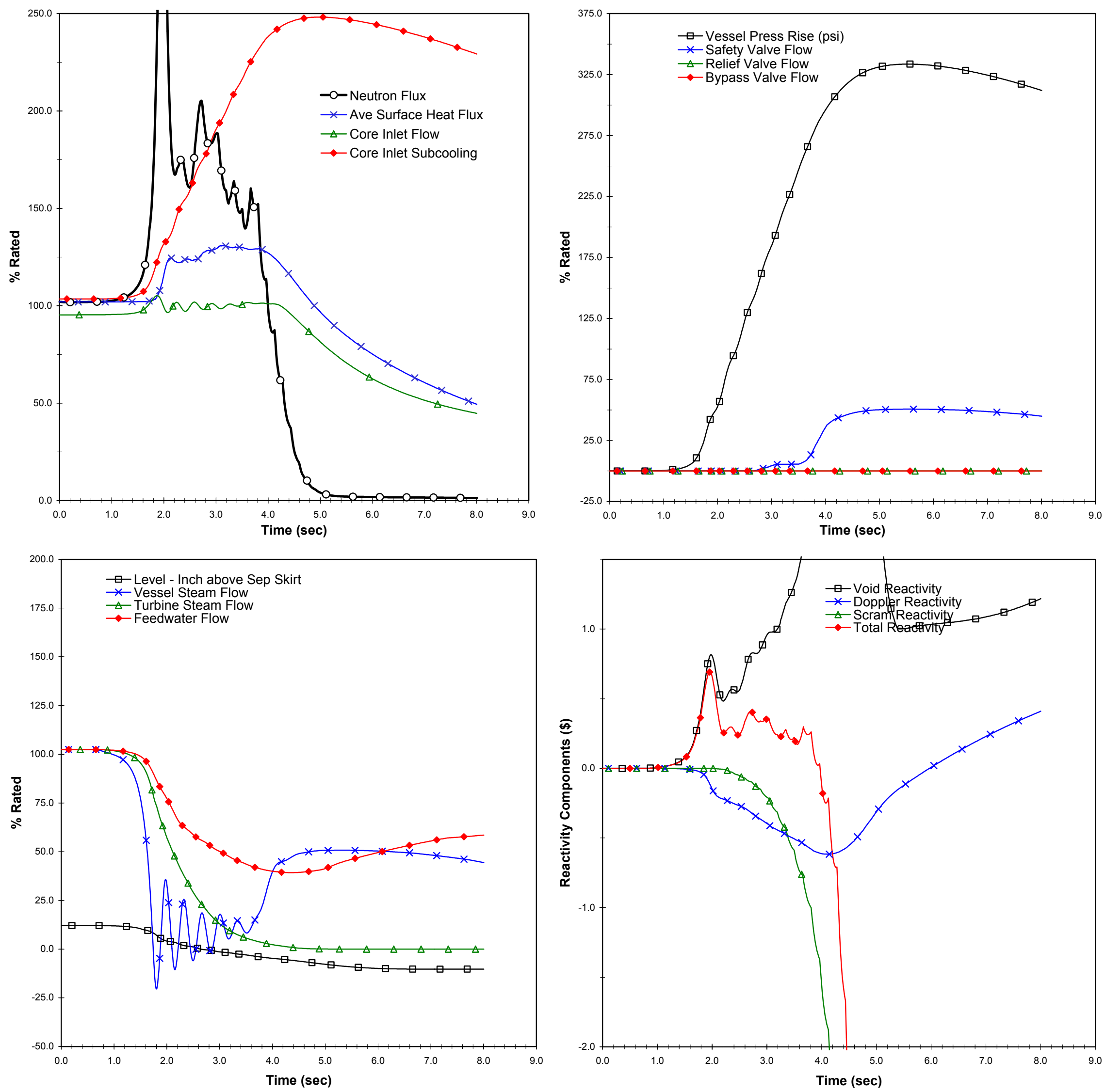


Figure 35 Plant Response to MSIV Closure (Flux Scram, MEL-HBB)

	2	6	10	14	18	22	26	30	34	38	42	46	50	54	58
59															
55															
51						0		0		0					
47															
43				0		0		0		30		0			
39									0						
35		0		0		0		0				0		0	
31															
27		0		0		0		0		0		0		0	
23															
19				0		0		0		0		0			
15															
11						0		0		0					
7															
3															

Notes: 1. Number indicates number of notches withdrawn out of 48. Blank is a fully withdrawn rod.
2. Error rod is (34,39).

Figure 36 Rod Withdrawal Error Limiting Rod Pattern

Appendix A
Analysis Conditions

To reflect actual plant parameters accurately, the values shown in Table A-1 were used this cycle. [10]

Table A-1

	Analysis Value ICF	Analysis Value MELLLA	Analysis Value ICF & FFWTR
Thermal power, MWt	2957.0	2957.0	2957.0
Core flow, Mlb/hr	105.8	93.4	105.8
Reactor pressure, psia	1036.6	1034.1	1008.4
Inlet enthalpy, BTU/lb	523.6	520.3	511.1
Non-fuel power fraction	0.036	0.036	0.036
Steam flow, Mlb/hr	11.73	11.71	10.26
Dome pressure, psig	1005.0	1005.0	978.2
Turbine pressure, psig	924.1	924.4	915.2
No. of Dual Mode S/R Valves	0	0	0
No. of Relief Valves	4	4	4
No. of Single Spring Safety Valves	8	8	8
Relief mode lowest setpoint, psig	1112.0	1112.0	1112.0
Safety mode lowest setpoint, psig	1147.0	1147.0	1147.0
Feedwater temperature, F	355.6	355.6	235.6

[10] These conditions are also applicable for all the equipment out of service options presented in Sections 6, 9 and 11.

Appendix B
Decrease in Core Coolant Temperature Events

The Dresden 3 Cycle 18 Loss of Feedwater Heating (LFWH) analysis was evaluated per the applicable GE internal technical design procedure at 100% rated power and 145^{o}F feedwater temperature reduction using the BWR simulator code. The use of this code is permitted by GESTAR II. The transient plots, neutron flux and heat flux values normally reported are not an output of the BWR simulator code; therefore, those items are not included in this document. The OLMCPR results are included in Section 11 for non-pressurization events.

The conclusion from the analysis is that the resulting operating limit minimum critical power ratio (OLMCPR) is 1.29 and is reported in Section 11.

In addition, the Inadvertent HPCI start-up event was shown to be bounded by the LFWH event in accordance with *Determination of Limiting Cold Water Event*, NEDC-32538P-A.

Appendix C
Operating Flexibility Options

The options depicted in Sections 7 and 8 are defined in the EOOS report (Reference C-1). The 15 psi pressure band (from normal FWT) is accounted for in Reference C-1 (the EOOS analysis report).
The basis for application of 120°F Final Feedwater Temperature Reduction is contained in Reference C-2.

The results of the validation analysis required by Reference C-1 Appendix A are as follows:

Results For MCPR(P) Verification

Power/Flow	Transient	Option B OLMCPR (GE14C/ATRM9)	Required K(p) (GE14C/ATRM9)	K(p) Limit (Ref. C-1)
38.5/108	FWCF	1.66/1.71	1.19/1.22	1.32
60/108	TCV slow closure 4S0F	2.00/1.92	1.43/1.37	1.45
60/42	TCV slow closure 4S0F	2.03/1.73	1.45/1.23	1.45

Results For LHGRFAC(P) Verification

Power/Flow	Transient	TOP (GE14C/ ATRM9)	MOP (GE14C/ ATRM9)	Required LHGRFAC(P) (GE14C/ ATRM9)	LHGRFAC(P) Limit (Ref. C-1)
38.5/108	FWCF	45.78 / 45.78	47.44 / 49.72	0.801 / 0.764	0.68
60/108	TCV 4S0F	50.25 / 54.31	54.82 / 63.59	0.693 / 0.598*	0.67
60/42	TCV 4S0F	25.18 / 29.77	30.50 / 35.97	1.000 / 1.000	0.67

*Since these values are bounded by the values in Table 2-15 of Reference C-1, (0.610/0.517), the LHGRFAC limit of 0.67 applies.

Results For LHGRFAC(F) Verification

Flow	Transient	TOP (GE14C/ ATRM9)	MOP (GE14C/ ATRM9)	Required LHGRFAC(F) (GE14C/ ATRM9)	LHGRFAC(F) Limit (Ref. C-1)
40%	Slow Flow Runout	86.62 / 86.62	87.87 / 87.87	0.6377 / 0.6377	0.64

*The ATRM9 TOP/MOP results are reported the same as that of GE14C since they have been demonstrated to be bounded by GE14C.

Reference C-3 documents the MSIVOOS evaluation for both units of Dresden and Quad Cities. This evaluation considered AOOs, Overpressure, ATWS, LOCA, Containment, Main Steam Line Piping and the operational aspects of operating with 1 MSIV closed (1 MSIV OOS). These evaluations document the acceptability of MSIV OOS operation at or below 75% power.

References:

C-1. Dresden 2 and 3 Quad Cities 1 and 2 Equipment Out-of-Service and Legacy Fuel Transient Analysis, GE-NE-J11-03912-00-01-R1, November 2001.

C-2. Dresden and Quad Cities Evaluation of Extended Final Feedwater Temperature Reduction, GE-NE-A13-00487-00-01P, Revision 1, August 2002.

C-3. Evaluation of Limiting Events with One Main Steam Line Out-of-Service for Dresden, Units 2 and 3 and Quad Cities Units 1 and 2, GE-Nuclear Energy, Letter NSA 02-350, July 2002.

Appendix D
Extended Power Uprate (EPU)

To provide Dresden Unit 3 with operating improvements, analyses were performed to increase the rated power from 2527 MWth to 2957 MWth.

Operation with power uprated to 2957 MWth was justified for Dresden Unit 3 in Reference D-1.

Reference:

D-1. Safety Analysis Report for Dresden 2 & 3 Extended Power Uprate, NEDC-32962P, December 2000.

Appendix E
Decay Ratio Calculations

This appendix summarizes the results of the ODYSY decay ratio calculations for seven power/flow points for Dresden 3 Cycle 18. The purpose of these calculations is to assess the effectiveness of the stability Interim Corrective Action (ICA) regions in preventing reactor instability, and to provide a cycle-to-cycle comparison of relative changes in stability performance. The seven analyzed power/flow state points are as follows:

1. Natural Circulation Line (NCL) at the 67.9% LPU load line,
2. NCL at the 84.9% LPU load line,
3. Two pump minimum pump speed line at the 67.9% Licensed Power Uprate (LPU) load line,
4. 50% core flow on the MELLLA upper boundary,
5. 40% core flow on the MELLLA upper boundary,
6. 45% core flow on the 91.7% LPU load line, and
7. 45% core flow on the MELLLA upper boundary.

The NRC-approved PANAC11/ODYSY05 (P11/O5) methodology (Reference E.1) is used in this evaluation. The decay ratios are calculated for Dresden 3 C18 based on the Reference Loading Pattern and customer-supplied information, including the power/flow map. Haling depletions are used in all cases except for the three Point 7 rodded exposure cases. Rated power/minimum flow Haling depletion is used for the High Flow Control Line (HFCL) cases while rated power/rated flow Haling depletion is used for the NCL cases. The decay ratios must meet the ODYSY stability criteria. The ODYSY criterion is essentially a 0.8 core decay ratio (DR).

Table E.1 below summarizes the case results for the NCL and HFCL cases. Table E.2 lists the exposure-dependent results for the Haling exposure points used in the scoping out the worst core decay ratios.

Table E.1. P11/O5 Case Results for C18 (EPU)

Case	% Rated Power	% Rated Core Flow	Core DR	Channel DR (GE14C)	Channel DR (ATRM9)
NCL	**35.8 (point 2)**	23	1.149	0.442	0.389
	28.1 (point 1)	22	0.839	0.323	0.284
	23.9 (point 8)	20.6	0.538	0.288	0.264
HFCL	**58.0 (point 5)**	40.0	0.707	0.309	0.272
	66.154 (point 4)	50.0	0.538	0.268	0.047
	55.2 (point 6)	45.0	0.525	0.279	0.008
	35.9 (point 3)	36.0	0.383	0.015	-
	62.106 (point 7)	45.0	0.598	0.284	0.268
	62.106 (point 7, BOC)	45.0	0.232	0.289	0.322
	62.106 (point 7, MOC)	45.0	0.258	0.304	0.305
	62.106 (point 7, EOC)	45.0	0.688	0.295	0.279

Table E.2. Exposure-Dependent Results for Haling Cases

	NCL (3623)		**HFL (5840)**	
Exposure (MWD/ST)	Calculated Core DR	Channel DR	Calculated Core DR	Channel DR
15540	**1.149**	**0.442**	**0.707**	**0.309**
14540	1.125	0.462	0.681	0.313
13540	1.098	0.492	0.671	0.315
12540	1.058	0.502	0.650	0.319

For the HFCL cases, the EOC case is the most limiting. For the NCL cases, the EOC case is the most limiting. Hence, these exposure state points will be used as the bases for finding the decay ratios. Figure E.1 plots the decay ratio results against the ODYSY stability criteria. It is concluded that the existing Interim Corrective Action (ICA) stability regions are sufficient for D3C18 operation because the core decay ratios are all less than 0.8, except on the natural circulation line. An additional point (point 8) shows that at the ICA lowest boundary, the core decay ratio is less than 0.80. It is recommended that for a two-pump trip to natural circulation at load line higher than 59.5% LPU, the operators should exit the Controlled Entry region immediately.

Reference:

E.1. NEDC-32992P-A, Licensing Topical Report, ODYSY Application for Stability Licensing Calculations, July 2001.

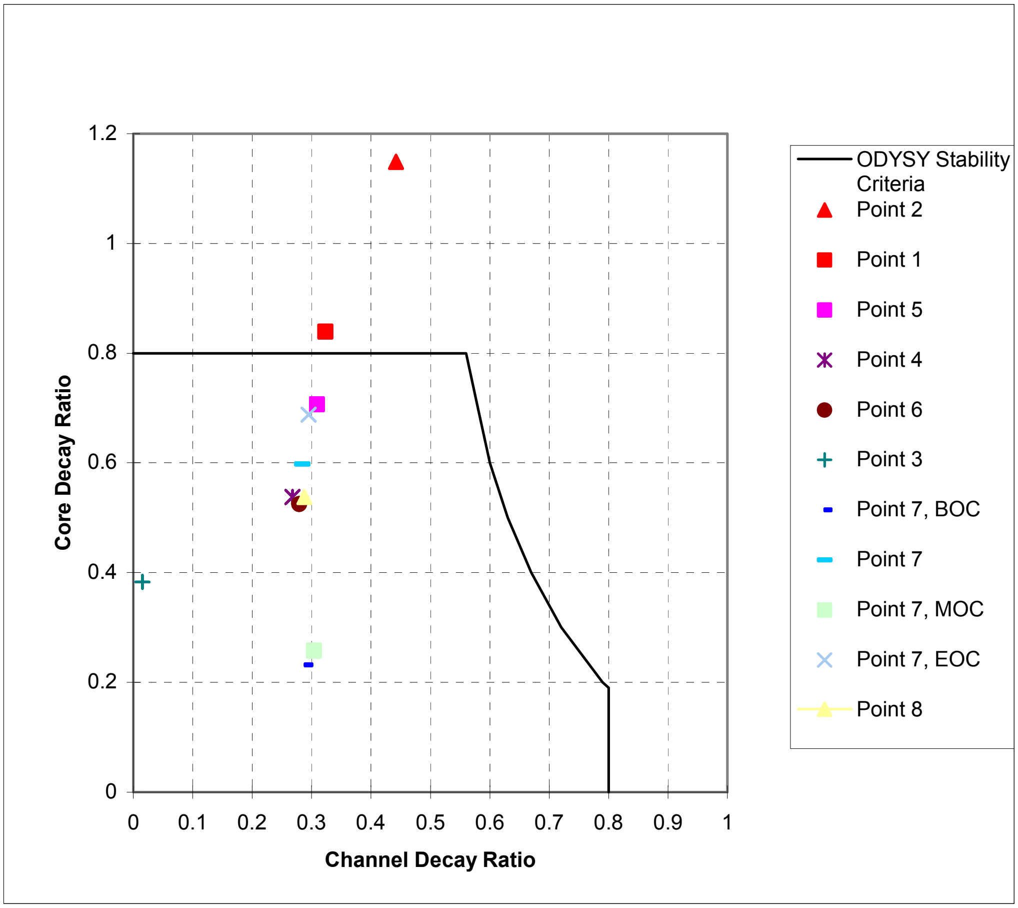


Figure E.1. Calculated Decay Ratios versus the ODYSY Stability Criteria

Appendix F
Legacy Fuel Licensing Applicability

Thermal hydraulic and GEXL evaluations were performed to demonstrate the acceptability of the GE14 fuel compatibility with the Exelon legacy fuel (ANF ATRIUM-9B). The results of these evaluations support the conclusion that GE14 fuel and the legacy fuel can be safely and acceptably operated together at Dresden Unit 3 Cycle 18. These evaluations are described in References F-1 and F-2.

References:

F-1. GE14 Thermal Hydraulic Compatibility with Commonwealth Edison Legacy Fuel, Revision 1, September 2000 (DRF # J11-03723-06).

F-2. GEXL96 Correlation for ATRIUM-9B Fuel, NEDC-32981P, Revision 0, September 2000.

Appendix G
COLR INPUTS

MCPR Option A Based Operating Limits Dresden-3 Cycle 18

EOOS Combination	Fuel Type	Cycle Exposure	
		<15,000 MWd/MT	≥15,000 MWd/MT
Base Case	GE14	1.53	1.65
	ATRIUM-9B	1.52	1.61
Base Case SLO	GE14	1.54	1.66
	ATRIUM-9B	1.53	1.62
TBPOOS*	GE14	1.73	1.75+
	ATRIUM-9B	1.67	1.69+
TBPOOS SLO*	GE14	1.74	1.76+
	ATRIUM-9B	1.68	1.70+
TCV Slow Closure	GE14	1.63	1.65
	ATRIUM-9B	1.58	1.61
TCV Slow Closure SLO	GE14	1.64	1.66
	ATRIUM-9B	1.59	1.62
PLUOOS	GE14	1.68	1.68
	ATRIUM-9B	1.63	1.63
PLUOOS SLO	GE14	1.69	1.69
	ATRIUM-9B	1.64	1.64
TCV Stuck Closed	GE14	1.53	1.65
	ATRIUM-9B	1.52	1.61
TCV Stuck Closed SLO	GE14	1.54	1.66
	ATRIUM-9B	1.53	1.62

*TBPOOS cases include a +0.03 penalty for operation below analysis basis dome pressure per page 24 of Reference G-1.
+These cases also include a +0.02 penalty for TBPOOS during coastdown per page 22 of Reference G-1.

MCPR Option B Based Operating Limits Dresden-3 Cycle 18

EOOS Combination	**Fuel Type**	**Cycle Exposure**	
		<15,000 MWd/MT	**≥15,000 MWd/MT**
Base Case	GE14	1.42	1.48
	ATRIUM-9B	1.41	1.44
Base Case SLO	GE14	1.43	1.49
	ATRIUM-9B	1.42	1.45
TBPOOS*	GE14	1.56	1.58+
	ATRIUM-9B	1.50	1.52+
TBPOOS SLO*	GE14	1.57	1.59+
	ATRIUM-9B	1.51	1.53+
TCV Slow Closure	GE14	1.46	1.48
	ATRIUM-9B	1.41	1.44
TCV Slow Closure SLO	GE14	1.47	1.49
	ATRIUM-9B	1.42	1.45
PLUOOS	GE14	1.51	1.51
	ATRIUM-9B	1.46	1.46
PLUOOS SLO	GE14	1.52	1.52
	ATRIUM-9B	1.47	1.47
TCV Stuck Closed	GE14	1.42	1.48
	ATRIUM-9B	1.41	1.44
TCV Stuck Closed SLO	GE14	1.43	1.49
	ATRIUM-9B	1.42	1.45

*TBPOOS cases include +0.03 penalty for operation below analysis basis dome pressure per page 24 of Reference G-1.
+These cases also include a +0.02 penalty for TBPOOS during coastdown per page 22 of Reference G-1.

MCPR(P) / K(P) for GE and SPC Fuel

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)								
		0	25	38.5	38.5	45	60	70	70	100
		Operating Limit MCPR			Operating Limit MCPR Multiplier, K_P					
Base Case (Option A or Option B)[1]	≤ 60	3.16	2.58	2.27	1.32	1.28	1.15	N/A	N/A	1.00
	> 60	3.77	2.99	2.56						
Base Case SLO (Option A or Option B)[2]	≤ 60	3.17	2.59	2.28	1.32	1.28	1.15	N/A	N/A	1.00
	> 60	3.78	3.00	2.57						
TBPOOS (Option A or Option B)[3]	≤ 60	5.55	3.77	2.82	1.37	1.28	1.15	N/A	N/A	1.00
	> 60	6.79	4.62	3.45						
TBPOOS SLO (Option A or Option B)[4]	≤ 60	5.56	3.78	2.83	1.37	1.28	1.15	N/A	N/A	1.00
	> 60	6.80	4.63	3.46						
TCV Slow Closure (Option A or Option B)[5]	≤ 60	5.55	3.77	2.82	1.64	N/A	1.45	1.26	1.11	1.00
	> 60	6.79	4.62	3.45						
TCV Slow Closure SLO (Option A or Option B)[6]	≤ 60	5.56	3.78	2.83	1.64	N/A	1.45	1.26	1.11	1.00
	> 60	6.80	4.63	3.46						
PLUOOS (Option A or Option B)[7]	≤ 60	5.55	3.77	2.82	1.64	N/A	1.45	1.26	1.11	1.00
	> 60	6.79	4.62	3.45						
PLUOOS SLO (Option A or Option B)[8]	≤ 60	5.56	3.78	2.83	1.64	N/A	1.45	1.26	1.11	1.00
	> 60	6.80	4.63	3.46						
TCV Stuck Closed (Option A or Option B)[9]	≤ 60	3.16	2.58	2.27	1.32	1.28	1.15	N/A	N/A	1.00
	> 60	3.77	2.99	2.56						
TCV Stuck Closed SLO (Option A or Option B)[10]	≤ 60	3.17	2.59	2.28	1.32	1.28	1.15	N/A	N/A	1.00
	> 60	3.78	3.00	2.57						

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power multiplier K_P should be applied.
- Allowable EOOS conditions are listed in Reference 1, Section 2.1.
- For single-loop operation, the MCPR operating limit is 0.01 greater than the two-loop value.
- N/A indicates data intentionally omitted at the request of the customer since it is redundant and can be obtained by the core monitoring system.

[1] MCPR(P)/ K(P) based on Reference G-1, Figure 2-1.
[2] MCPR(P) Based on Reference G-1, Figure 2-1 with SLO scaling defined in Section 2.3.9 of Reference 1. SLO K(P) is the same as TLO K(P).
[3] MCPR(P) / K(P) based on Reference G-1, Figure 2-3.
[4] MCPR(P) Based on Reference G-1, Figure 2-3 with SLO scaling defined in Section 2.3.9 of Reference 1. SLO K(P) is the same as TLO K(P).
[5] MCPR(P) / K(P) based on Reference G-1, Figure 2-5.
[6] MCPR(P) Based on Reference G-1, Figure 2-5 with SLO scaling defined in Section 2.3.9 of Reference 1. SLO K(P) is the same as TLO K(P).
[7] MCPR(P) / K(P) based on Reference G-1, Figure 2-5.
[8] MCPR(P) Based on Reference G-1, Figure 2-5 with SLO scaling defined in Section 2.3.9 of Reference 1. SLO K(P) is the same as TLO K(P).
[9] MCPR(P) / K(P) based on Reference G-1, Figure 2-1.
[10] MCPR(P) Based on Reference G-1, Figure 2-1 with SLO scaling defined in Section 2.3.9 of Reference 1. SLO K(P) is the same as TLO K(P).

MCPR(F) limits for GE and SPC Fuel are to be determined by Exelon.

LHGR limits are to be determined by Exelon.

LHGRFAC(P) for GE and SPC Fuel

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)							
		0	25	38.5	38.5	70	70	80	100
		LHGRFAC(P) multiplier							
Base Case[1]	≤ 60	0.50	0.56	0.59	0.68	N/A	N/A	0.86	1.00
	> 60								
Base Case SLO[2]	≤ 60	0.50	0.56	0.59	0.68	N/A	N/A	0.86	1.00
	> 60								
TBP OOS[3]	≤ 60	0.22	0.39	0.48	0.54	N/A	N/A	N/A	1.00
	> 60	0.33		0.42					
TBP OOS SLO[4]	≤ 60	0.22	0.39	0.48	0.54	N/A	N/A	N/A	1.00
	> 60	0.33		0.42					
TCV Slow Closure[5]	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78	N/A	1.00
	> 60	0.33		0.42					
TCV Slow Closure SLO[6]	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78	N/A	1.00
	> 60	0.33		0.42					
PLUOOS[7]	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78	N/A	1.00
	> 60	0.33		0.42					
PLUOOS SLO[8]	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78	N/A	1.00
	> 60	0.33		0.42					
TCV Stuck Closed[1]	≤ 60	0.50	0.56	0.59	0.68	N/A	N/A	0.86	1.00
	> 60								
TCV Stuck Closed SLO[2]	≤ 60	0.50	0.56	0.59	0.68	N/A	N/A	0.86	1.00
	> 60								

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power LHGRFAC(P) should be applied.
- Allowable EOOS conditions are listed in Reference G.1, Section 2.1.
- N/A indicates data intentionally omitted at the request of Exelon since it is redundant and can be obtained by the core monitoring system.

1 LHGRFAC(P) based on Reference G-1, Figure 2-2.
2 LHGRFAC(P) based on Reference G-1, Figure 2-2 (no change from Two Loop Operation).
3 LHGRFAC(P) based on Reference G-1, Figure 2-4.
4 LHGRFAC(P) based on Reference G-1, Figure 2-4 (no change from Two Loop Operation).
5 LHGRFAC(P) based on Reference G-1, Figure 2-6.
6 LHGRFAC(P) based on Reference G-1, Figure 2-6 (no change from Two Loop Operation).
7 LHGRFAC(P) based on Reference G-1, Figure 2-6.
8 LHGRFAC(P) based on Reference G-1, Figure 2-6 (no change from Two Loop Operation).

LHGRFAC(F) multipliers[1]

Flow (% rated)	LHGRFAC(F)
30	0.55
40	0.64
50	0.77
80	1.00
100	1.00
110	1.00

LHGRFAC(F) multipliers for
Turbine Control Valve Stuck Closed[2]

Flow (% rated)	LHGRFAC(F)
30	0.41
40	0.50
50	0.63
80	0.86
98.3	1.00
100	1.00
110	1.00

[1] Reference G-1, Figure 3-3.
[2] Reference G-1, Table 2-17.

Allowed Modes of Operation

The Allowed Modes of Operation with combinations of Equipment Out-of-Service are as described below:

	----------OPERATING REGION---------			
Equipment Out of Service Options	**Standard**	**MELLLA**	**Coastdown**	**ICF**
Base Case, Option A	Yes	Yes	Yes	No
Base Case SLO, Option A	Yes	Yes	Yes	No
TBPOOS, Option A	Yes	Yes	Yes	No
TBPOOS SLO, Option A	Yes	Yes	Yes	No
TCV Slow Closure, Option A	Yes	Yes	Yes	No
TCV Slow Closure SLO, Option A	Yes	Yes	Yes	No
PLUOOS, Option A	Yes	Yes	Yes	No
PLUOOS SLO, Option A	Yes	Yes	Yes	No
TCV Stuck Closed, Option A	Yes	Yes	Yes	No
TCV Stuck Closed SLO, Option A	Yes	Yes	Yes	No
Base Case, Option B	Yes	Yes	Yes	No
Base Case SLO, Option B	Yes	Yes	Yes	No
TBPOOS, Option B	Yes	Yes	Yes	No
TBPOOS SLO, Option B	Yes	Yes	Yes	No
TCV Slow Closure, Option B	Yes	Yes	Yes	No
TCV Slow Closure SLO, Option B	Yes	Yes	Yes	No
PLUOOS, Option B	Yes	Yes	Yes	No
PLUOOS SLO, Option B	Yes	Yes	Yes	No
TCV Stuck Closed, Option B	Yes	Yes	Yes	No
TCV Stuck Closed SLO, Option B	Yes	Yes	Yes	No

Reference:

G-1. Dresden 2 and 3 Quad Cities 1 and 2 Equipment Out-of-Service and Legacy Fuel Transient Analysis, GE-NE-J11-03912-00-01-R1, Revision 1, November 2001.