10 CFR 50.90
10 CFR 50, Appendix K

September 15, 2017

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

Peach Bottom Atomic Power Stations, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Measurement Uncertainty Recapture Power Uprate License Amendment Request – Supplement 5, Supplemental Reload Licensing Report

Reference: Exelon letter to the NRC, "Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated February 17, 2017 (ADAMS Accession No. ML17048A444)

In accordance with 10 CFR 50.90, Exelon Generation Company, LLC (Exelon) requested amendments to Renewed Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively, in the referenced letter. Specifically, the proposed changes would revise the Renewed Operating Licenses to implement an increase in rated thermal power from 3951 Megawatts-Thermal (MWt) to 4016 MWt.

This supplement provides a copy of the Supplemental Reload Licensing Report (SRLR) for PBAPS Unit 3, Cycle 22, in accordance with Section 1.2.1 of Attachment 5 of the referenced license amendment request. The only differences between the SRLR at the requested uprated conditions for each unit will be typical unit-specific differences unrelated to the implementation of the uprate license amendment.

Exelon has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the U.S. Nuclear Regulatory Commission in the referenced letter. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. Further, the additional information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), Exelon is notifying the Commonwealth of Pennsylvania and the State of Maryland of this application for license amendment by transmitting a copy of this letter and its attachments to the designated State Officials.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this request, please contact Mr. David Neff at (610) 765-5631.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 15th day of September 2017.

Respectfully,

David T. Gudger
Manager - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachment: Supplemental Reload Licensing Report for Peach Bottom Unit 3 Reload 21 Cycle 22

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, PBAPS
USNRC Project Manager, PBAPS
R. R. Janati, Pennsylvania Bureau of Radiation Protection
S. T. Gray, State of Maryland

Global Nuclear Fuel
A Joint Venture of GE, Toshiba, & Hitachi

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Supplemental Reload Licensing Report
for
Peach Bottom Unit 3
Reload 21 Cycle 22

Important Notice Regarding Contents of This Report

Please Read Carefully

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 Rachel Shapiro. This document has been verified by Jin Su.

Table of Contents

The basis for this report is *General Electric Standard Application for Reactor Fuel*, NEDE-24011-P-A-25, August 2017; and the U.S. Supplement, NEDE-24011-P-A-25-US, August 2017.

A proprietary *Fuel Bundle Information Report* (FBIR) supplements this licensing report. The FBIR references the thermal-mechanical linear heat generation rate limits and also provides a description of the fuel bundles to be loaded. The document number for this report is 003N1453.

1. Plant Unique Items

Appendix A: Analysis Conditions
Appendix B: Thermal-Mechanical Compliance
Appendix C: Decrease in Core Coolant Temperature Event
Appendix D: Off-Rated Limits
Appendix E: TRACG04 AOO Supplementary Information
Appendix F: Interim Methods LTR (NEDC-33173P-A Revision 4) Supplemental Information
Appendix G: MELLLA+ LTR (NEDC-33006P-A Revision 3) Supplemental Information
Appendix H: Application to Current Licensed Thermal Power (CLTP)
Appendix I: Peach Bottom Unit 3 Cycle 22 Contingency TCV/TSV Delay Analysis
Appendix J: End of Cycle Power Coastdown Restrictions
Appendix K: List of Acronyms

2. Reload Fuel Bundles

Fuel Type	Cycle Loaded	Number
Irradiated:		
GNF2-P10DG2B400-13GZ-100T2-150-T6-4232 (GNF2)	20	28
GNF2-P10DG2B393-4G8.0/8G7.0/2G6.0-100T2-150-T6-4233 (GNF2)	20	24
GNF2-P10DG2B393-15GZ-100T2-150-T6-4235 (GNF2)	20	16
GNF2-P10DG2B403-8G7.0/4G6.0-100T2-150-T6-4236 (GNF2)	20	40
GNF2-P10DG2B417-12G7.0-100T2-150-T6-4366 (GNF2)	21	64
GNF2-P10DG2B402-15GZ-100T2-150-T6-4367 (GNF2)	21	144
GNF2-P10DG2B424-12G7.0-100T2-150-T6-4368 (GNF2)	21	32
GNF2-P10DG2B408-14GZ-100T2-150-T6-4369 (GNF2)	21	16
GNF2-P10DG2B403-14GZ-100T2-150-T6-4370 (GNF2)	21	16
GNF2-P10DG2B409-14GZ-100T2-150-T6-4365 (GNF2)	21	72
New:		
GNF2-P10DG2B403-14GZ-100T2-150-T6-4505 (GNF2)	22	88
GNF2-P10DG2B419-15GZ-100T2-150-T6-4507 (GNF2)	22	64
GNF2-P10DG2B406-14G6.0-100T2-150-T6-4506 (GNF2)	22	48
GNF2-P10DG2B404-6G7.0/8G6.0-100T2-150-T6-4504 (GNF2)	22	112
Total:		**764**

3. Reference Core Loading Pattern

	Core Average Exposure	Cycle Exposure
Nominal previous end-of-cycle exposure:	36017 MWd/MT (32674 MWd/ST)	19843 MWd/MT (18002 MWd/ST)
Minimum previous end-of-cycle exposure (for cold shutdown considerations):	35687 MWd/MT (32374 MWd/ST)	19513 MWd/MT (17702 MWd/ST)
Assumed reload beginning-of-cycle exposure:	16683 MWd/MT (15134 MWd/ST)	0 MWd/MT (0 MWd/ST)
Assumed reload end-of-cycle exposure (rated conditions):	34292 MWd/MT (31109 MWd/ST)	17609 MWd/MT (15975 MWd/ST)
Reference core loading pattern:	Figure 1	

4. Calculated Core Effective Multiplication and Control System Worth

Beginning of Cycle, $k_{effective}$	
Uncontrolled (20°C)	1.102
Fully controlled (20°C)	0.942
Strongest control rod out (most reactive condition, 60°C)	0.979
R, Maximum increase in strongest rod out reactivity during the cycle (Δk)	0.001
Cycle exposure at which R occurs	15432 MWd/MT (14000 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	0.032

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

Operating domain: ICF (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GNF2	1.0	1.38	1.32	0.97	7.304	118.6	1.64

Operating domain: ICF and FWTR (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GNF2	1.0	1.43	1.37	0.96	7.517	116.6	1.66

Operating domain: MELLLA+ (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GNF2	1.0	1.38	1.25	0.97	7.301	91.3	1.45

Operating domain: MELLLA (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)

	Peaking Factors						
Fuel Design	**Local**	**Radial**	**Axial**	**R-Factor**	**Bundle Power (MWt)**	**Bundle Flow (1000 lb/hr)**	**Initial MCPR**
GNF2	1.0	1.47	1.26	0.97	7.778	105.5	1.46

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

Operating domain: MELLLA and FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.41	1.37	0.96	7.395	107.6	1.63

Operating domain: ICF (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.33	1.24	0.96	6.966	121.9	1.73

Operating domain: ICF and FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.33	1.26	0.96	7.012	122.3	1.76

Operating domain: ICF (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.34	1.37	0.97	7.065	123.1	1.58

Operating domain: ICF and FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.32	1.35	0.96	6.938	124.7	1.68

Operating domain: MELLLA+ (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.32	1.23	0.96	6.941	92.4	1.57

Operating domain: MELLLA+ (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.36	1.32	0.98	7.174	92.8	1.41

Operating domain: MELLLA (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.32	1.23	0.96	6.922	110.2	1.69

Operating domain: MELLLA and FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.33	1.25	0.96	6.973	112.4	1.73

Operating domain: MELLLA (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.35	1.35	0.97	7.110	110.8	1.53

Operating domain: MELLLA and FWTR (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)							
	Peaking Factors						
Fuel Design	Local	Radial	Axial	R-Factor	Bundle Power (MWt)	Bundle Flow (1000 lb/hr)	Initial MCPR
GNF2	1.0	1.33	1.34	0.97	6.975	114.1	1.62

7. Selected Margin Improvement Options [2]

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

Table 7-1 Cycle Exposure Range Designation

Name	Exposure Range [3]
BOC to MOC	BOC22 to EOR22 – 4316 MWd/MT (3915 MWd/ST)
MOC to EOC	EOR22 – 4316 MWd/MT (3915 MWd/ST) to EOC22
BOC to EOC	BOC22 to EOC22

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

8. Operating Flexibility Options [4] [5] [6]

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 Plus (MELLLA+)	
Minimum core flow at rated power:	85.2 %
Increased Core Flow:	Yes
Flow point analyzed throughout cycle:	110.0 %
Feedwater Temperature Reduction:	Yes
Feedwater temperature reduction during cycle:	55.0°F
Final feedwater temperature reduction:	90.0°F
ARTS Program:	Yes
Single Loop Operation:	Yes
Equipment Out of Service:	
Safety/relief valves Out of Service: (credit taken for 10 valves)	Yes
1 MSIVOOS	Yes
1 TCV and/or 1 TSVOOS	Yes
1 SRVOOS	Yes
2 TBVOOS	Yes
TBSOOS	Yes
RPTOOS	Yes
PROOS	Yes
PLUOOS	Yes

[4] Refer to the GESTAR basis document identified at the beginning of this report for the operating flexibility options currently supported therein.
[5] Single Loop Operation is prohibited in the MELLLA+ domain.
[6] Feedwater Temperature Reduction is prohibited in the MELLLA+ domain.

9. Core-wide AOO Analysis Results [7] [8]

Methods used: TRACG04, GEXL-PLUS

Operating domain: ICF and FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	307.0	114.4	0.185	2

Operating domain: MELLLA+ (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Load Rejection w/o Bypass	243.8	106.1	0.161	3

Operating domain: MELLLA and FWTR (HBB) Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	290.4	113.6	0.183	4

Operating domain: ICF and FWTR with TBSOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	346.8	115.7	0.206	5

[7] Exposure range designation is defined in Table 7-1. Application condition number is defined in Section 11.
[8] The Heat Flux (Q/A) (% rated) output is not available from TRACG04, so the Simulated Thermal Power (STP) (% rated) is shown.

Operating domain: MELLLA+ with TBSOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Inadvertent HPCI /L8	238.1	117.8	0.180	6

Operating domain: MELLLA and FWTR with TBSOOS (HBB) Exposure range : BOC to MOC (Application Condition: 2)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	330.3	115.0	0.205	7

Operating domain: ICF and FWTR with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 3)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	397.0	116.3	0.208	8

Operating domain: MELLLA+ with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 3)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Load Rejection w/o Bypass	293.3	107.6	0.165	9

Operating domain: MELLLA and FWTR with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 3)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	358.4	115.2	0.199	10

Operating domain: ICF with PROOS and/or PLUOOS (HBB) Exposure range : BOC to MOC (Application Condition: 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Pressure Regulator Failure Downscale	141.5	105.2	0.113	11

Operating domain: MELLLA+ with PROOS and/or PLUOOS (HBB) Exposure range : BOC to MOC (Application Condition: 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Pressure Regulator Failure Downscale	140.4	104.5	0.108	12

Operating domain: MELLLA with PROOS and/or PLUOOS (HBB) Exposure range : BOC to MOC (Application Condition: 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Pressure Regulator Failure Downscale	140.8	104.7	0.108	13

Operating domain: ICF and FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	332.8	115.4	0.193	14

Operating domain: MELLLA+ (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Load Rejection w/o Bypass	301.4	108.2	0.181	15

Operating domain: MELLLA and FWTR (UB) **Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	313.7	114.8	0.194	16

Operating domain: ICF and FWTR with TBSOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	369.3	116.8	0.213	17

Operating domain: MELLLA+ with TBSOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Inadvertent HPCI /L8	293.5	118.9	0.196	18

Operating domain: MELLLA and FWTR with TBSOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	367.8	116.2	0.214	19

Operating domain: ICF and FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 3)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	415.2	117.2	0.214	20

Operating domain: MELLLA+ with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 3)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Load Rejection w/o Bypass	319.7	108.2	0.177	21

Operating domain: MELLLA and FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 3)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
FW Controller Failure	378.6	116.3	0.208	22

Operating domain: ICF and FWTR with PROOS and/or PLUOOS (UB) **Exposure range : MOC to EOC (Application Condition: 4)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Pressure Regulator Failure Downscale	139.3	106.2	0.162	23

Operating domain: MELLLA+ with PROOS and/or PLUOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 4)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Pressure Regulator Failure Downscale	142.5	105.8	0.131	24

Operating domain: MELLLA and FWTR with PROOS and/or PLUOOS (UB) **Exposure range : MOC to EOC (Application Condition: 4)**				
			Uncorrected ΔCPR/ICPR	
Event	**Flux (% rated)**	**STP (% rated)**	**GNF2**	**Fig.**
Pressure Regulator Failure Downscale	139.0	105.4	0.152	25

10. Rod Withdrawal Error AOO Summary

The Rod Withdrawal Error (RWE) event was analyzed in the GE BWR Licensing Report *Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottoms Atomic Power Station Unit 2 and 3*, NEDC-32162P, Rev. 2, March 1995.

RWE Results:

Base, Base + RPTOOS, Base + PROOS and/or PLUOOS	
RBM Setpoint (%)	**ΔCPR**
110.0	0.21
113.0	0.23
115.5	0.28
118.5	0.33

Base + TBSOOS	
RBM Setpoint (%)	**ΔCPR**
110.0	0.28
113.0	0.29
115.5	0.29
118.5	0.33

The more limiting of the cycle specific and the generic ΔCPR values are reported in the table above. The RWE OLMCPR is determined by adding the ΔCPR for the desired RBM setpoint from the table above to the SLMCPR in Section 11.

The RBM setpoints provided in the table above are for an unfiltered RBM response.

The ARTS RWE analysis validated that the following MCPR values provide the required margin for full withdrawal of any control rod during this cycle:

For Power < 90%: MCPR $\geq$ 1.83

For Power $\geq$ 90%: MCPR $\geq$ 1.50

The RBM operability requirements have been evaluated and shown to be sufficient to ensure that the SLMCPR and cladding strain criteria will not be exceeded in the event of a RWE.

11. Cycle SLMCPR and OLMCPR Summary [9] [10] [11]

Two Loop Operation (TLO) safety limit:	1.15
Single Loop Operation (SLO) safety limit:	1.15
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 (113.0 % RBM Setpoint)	1.38 (Base, Base + RPTOOS, Base + PROOS and/or PLUOOS) 1.44 (Base + TBSOOS)
Loss of Feedwater Heating	1.32
Fuel Loading Error (Mislocated)	Not Limiting
Fuel Loading Error (Misoriented)	1.34
Rated Equivalent SLO Pump Seizure [12]	1.43

[9] Exposure range designation is defined in Table 7-1.
[10] For SLO, the MCPR operating limit is 0.03 greater than the two loop value.
[11] The safety limit values presented include a 0.02 adder in accordance with Interim Methods LTR Safety Evaluation Report Limitation and Condition 9.5, as noted in Appendix F.
[12] The cycle-independent OLMCPR for the recirculation pump seizure event for GNF2 is 1.60 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 1.43. This limit does not require an adjustment for the SLO SLMCPR.

Limiting Pressurization Events OLMCPR Summary Table: [13] [14]

Appl. Cond.	Exposure Range	Option A	Option B
		GNF2	GNF2
1	**Base (1MSIVOOS, 1TCV and/or 1TSVOOS, 1SRVOOS, 2TBVOOS)**		
	BOC to MOC	1.48	1.40
	MOC to EOC	1.50	1.42
2	**Base + TBSOOS**		
	BOC to MOC	1.53	1.44
	MOC to EOC	1.56	1.47
3	**Base + RPTOOS**		
	BOC to MOC	1.60	1.43
	MOC to EOC	1.62	1.45
4	**Base + PROOS and/or PLUOOS**		
	BOC to MOC	1.48	1.40
	MOC to EOC	1.50	1.42

Pressurization Events: [15]

Operating domain: ICF and FWTR (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)

	Option A	Option B
	GNF2	GNF2
FW Controller Failure	1.45	1.37

Operating domain: MELLLA+ (HBB)
Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)

	Option A	Option B
	GNF2	GNF2
Load Rejection w/o Bypass	1.46	1.38

[13] 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.

[14] Note that Base (Base Case) includes 1 MSIVOOS, 1 TCV/TSVOOS, 1 SRVOOS, 2 TBVOOS, and FWHOOS/FFWTR. These Base Case EOOS conditions are included in all other application conditions. Refer to Appendix D for power levels supported for 1 MSIVOOS and 1 TCV/TSVOOS.

[15] 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: MELLLA and FWTR (HBB) **Exposure range : BOC to MOC (Application Condition: 1, 2, 3, 4)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.48	1.40

Operating domain: ICF and FWTR with TBSOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.50	1.41

Operating domain: MELLLA+ with TBSOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GNF2	**GNF2**
Inadvertent HPCI /L8	1.50	1.41

Operating domain: MELLLA and FWTR with TBSOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 2)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.53	1.44

Operating domain: ICF and FWTR with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 3)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.58	1.41

Operating domain: MELLLA+ with RPTOOS (HBB) **Exposure range : BOC to MOC (Application Condition: 3)**		
	Option A	**Option B**
	GNF2	**GNF2**
Load Rejection w/o Bypass	1.55	1.38

Operating domain: MELLLA and FWTR with RPTOOS (HBB) Exposure range : BOC to MOC (Application Condition: 3)		
	Option A	Option B
	GNF2	GNF2
FW Controller Failure	1.60	1.43

Operating domain: ICF with PROOS and/or PLUOOS (HBB) Exposure range : BOC to MOC (Application Condition: 4)		
	Option A	Option B
	GNF2	GNF2
Pressure Regulator Failure Downscale	1.36	1.24

Operating domain: MELLLA+ with PROOS and/or PLUOOS (HBB) Exposure range : BOC to MOC (Application Condition: 4)		
	Option A	Option B
	GNF2	GNF2
Pressure Regulator Failure Downscale	1.40	1.28

Operating domain: MELLLA with PROOS and/or PLUOOS (HBB) Exposure range : BOC to MOC (Application Condition: 4)		
	Option A	Option B
	GNF2	GNF2
Pressure Regulator Failure Downscale	1.39	1.27

Operating domain: ICF and FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)		
	Option A	Option B
	GNF2	GNF2
FW Controller Failure	1.46	1.38

Operating domain: MELLLA+ (HBB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)		
	Option A	Option B
	GNF2	GNF2
Load Rejection w/o Bypass	1.49	1.41

Operating domain: MELLLA and FWTR (UB) Exposure range : MOC to EOC (Application Condition: 1, 2, 3, 4)		
	Option A	Option B
	GNF2	GNF2
FW Controller Failure	1.50	1.42

Operating domain: ICF and FWTR with TBSOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.51	1.42

Operating domain: MELLLA+ with TBSOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GNF2	**GNF2**
Inadvertent HPCI /L8	1.53	1.44

Operating domain: MELLLA and FWTR with TBSOOS (UB) **Exposure range : MOC to EOC (Application Condition: 2)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.56	1.47

Operating domain: ICF and FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 3)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.59	1.42

Operating domain: MELLLA+ with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 3)**		
	Option A	**Option B**
	GNF2	**GNF2**
Load Rejection w/o Bypass	1.58	1.41

Operating domain: MELLLA and FWTR with RPTOOS (UB) **Exposure range : MOC to EOC (Application Condition: 3)**		
	Option A	**Option B**
	GNF2	**GNF2**
FW Controller Failure	1.62	1.45

Operating domain: ICF and FWTR with PROOS and/or PLUOOS (UB) **Exposure range : MOC to EOC (Application Condition: 4)**		
	Option A	**Option B**
	GNF2	**GNF2**
Pressure Regulator Failure Downscale	1.44	1.32

Operating domain: MELLLA+ with PROOS and/or PLUOOS (HBB) **Exposure range : MOC to EOC (Application Condition: 4)**		
	Option A	**Option B**
	GNF2	**GNF2**
Pressure Regulator Failure Downscale	1.45	1.33

Operating domain: MELLLA and FWTR with PROOS and/or PLUOOS (UB) **Exposure range : MOC to EOC (Application Condition: 4)**		
	Option A	**Option B**
	GNF2	**GNF2**
Pressure Regulator Failure Downscale	1.46	1.34

12. Overpressurization Analysis Summary[16]

Event	Pdome (psig)	Pv (psig)	Plant Response
MSIV Closure (Flux Scram) - ICF (HBB)	1322	1352	Figure 26
MSIV Closure (Flux Scram) – MELLLA+ (HBB)	1324	1349	Figure 27
MSIV Closure (Flux Scram) – MELLLA (HBB)	1323	1351	Figure 28

[16] Overpressure calculated at an initial dome pressure of 1035 psig.

13. Fuel Loading Error Results

Variable water gap misoriented bundle analysis: Yes [17]

Misoriented Fuel Bundle	ΔCPR
GNF2-P10DG2B404-6G7.0/8G6.0-100T2-150-T6-4504 (GNF2)	0.15
GNF2-P10DG2B406-14G6.0-100T2-150-T6-4506 (GNF2)	0.14
GNF2-P10DG2B419-15GZ-100T2-150-T6-4507 (GNF2)	0.16
GNF2-P10DG2B403-14GZ-100T2-150-T6-4505 (GNF2)	0.13
GNF2-P10DG2B417-12G7.0-100T2-150-T6-4366 (GNF2)	0.14
GNF2-P10DG2B402-15GZ-100T2-150-T6-4367 (GNF2)	0.19
GNF2-P10DG2B424-12G7.0-100T2-150-T6-4368 (GNF2)	0.12
GNF2-P10DG2B408-14GZ-100T2-150-T6-4369 (GNF2)	0.19
GNF2-P10DG2B403-14GZ-100T2-150-T6-4370 (GNF2)	0.19
GNF2-P10DG2B409-14GZ-100T2-150-T6-4365 (GNF2)	0.17

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-US.

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

15. Stability Analysis Results

Peach Bottom Unit 3 is licensed to operate in the MELLLA+ operating domain. Implementation of MELLLA+ operating domain requires the use of the Detect and Suppress Solution – Confirmation Density (DSS-CD) stability solution. Stability results for operation at EPU with MELLLA+ and DSS-CD are contained in this section.

15.1 Stability DSS-CD Solution

Peach Bottom Unit 3 implements the stability DSS-CD solution using the Oscillation Power Range Monitor (OPRM) as described in Reference 1 in Section 15.4. Plant-specific analyses for the DSS-CD solution are provided in Reference 2 in Section 15.4. The Detect and Suppress function of the DSS-CD solution based on the OPRM system relies on the Confirmation Density Algorithm (CDA), which constitutes the licensing basis. The Backup Stability Protection (BSP) solution may be used by the plant in the event that the OPRM system is declared inoperable.

The CDA enabled through the OPRM system and the BSP solution described in Reference 1 in Section 15.4 provide the stability licensing bases for Peach Bottom Unit 3 Cycle 22. The safety evaluation report for Reference 1 in Section 15.4 concluded that the DSS-CD solution is acceptable subject to certain cycle-specific limitations and conditions. These cycle-specific limitations and conditions are met for Peach Bottom Unit 3 Cycle 22.

15.2 Detect and Suppress Evaluation

A reload DSS-CD evaluation has been performed in accordance with the licensing methodology described in Reference 1 in Section 15.4 to confirm the established Amplitude Discriminator Setpoint (S_{AD}) of the CDA in Reference 2 in Section 15.4. The Cycle 22 DSS-CD evaluation and the results for the DSS-CD Reload Confirmation Applicability Checklist documented in Table 15-1 demonstrate that: 1) the DSS-CD Solution is applicable to Peach Bottom Unit 3 Cycle 22; and, 2) the established S_{AD}=1.10 in Reference 2 in Section 15.4 is confirmed for operation of Peach Bottom Unit 3 Cycle 22.

The S_{AD}=1.10 setpoint is applicable to TLO and to SLO.

The S_{AD}=1.10 setpoint is adequate to bound a variation in normal feedwater temperature of ±10.0 °F in the MELLLA+ domain per Reference 2 in Section 15.4.

Table 15-1 DSS-CD Reload Confirmation Applicability Checklist

Parameter	DSS-CD Criterion	Peach Bottom 3 Cycle 22	Acceptance
BWR Product Line	BWR/3-6 design	BWR/4	Confirmed
Fuel Product Line	Atrium10XM, GNF2, GE14, and earlier GE designs	GNF2	Confirmed
Operating Domain (TLO)	≤ TPO/MELLLA+ including currently licensed operational flexibility features	TPO/MELLLA+ including currently licensed operational flexibility features	Confirmed
Operating Domain (SLO)	≤ TPO/MELLLA including currently licensed operational flexibility features	TPO/MELLLA including currently licensed operational flexibility features	Confirmed
Rated T_{FW} Reduction	≤ 120 °F (TPO/MELLLA) No T_{FW} Reduction (MELLLA+ Extension)	90°F Reduction (TPO/MELLLA)	Confirmed
Margin for TLO	TLO DSS-CD Licensing Basis MCPR Margin criterion in Reference 2 in Section 15.4	Cycle 22 Results ≥ DSS-CD Criterion	Confirmed
Margin for SLO	SLO DSS-CD Licensing Basis MCPR Margin criterion in Reference 2 in Section 15.4	Cycle 22 Results ≥ DSS-CD Criterion	Confirmed

15.3 Backup Stability Protection

Reference 1 in Section 15.4 describes two BSP options that are based on selected elements from three distinct constituents: BSP Manual Regions, BSP Boundary, and Automated BSP (ABSP) setpoints.

The Manual BSP region boundaries and the BSP Boundary are calculated for Peach Bottom Unit 3 Cycle 22 for normal feedwater temperature operation and reduced feedwater temperature. The endpoints of the regions are defined in Table 15-2 and Table 15-3. The Scram Region boundary, the Controlled Entry Region boundary, and the BSP Boundary are shown in Figure 29 and in Figure 30 for the normal and reduced feedwater temperature, respectively. The Manual BSP region boundary endpoints are connected using the Modified Shape Function (MSF).

The ABSP Average Power Range Monitor (APRM) Simulated Thermal Power (STP) setpoints associated with the ABSP Scram Region are confirmed for Cycle 22 and are defined in Table 15-4. These ABSP setpoints are applicable to both TLO and SLO.

The BSP Boundary and the Manual BSP region boundaries for normal feedwater temperature operation are adequate to bound a variation in normal feedwater temperature of ±10.0 °F. The regions currently implemented at Peach Bottom Unit 3 (Reference 3 in Section 15.4) are bounding of the Cycle 22 proposed regions.

Table 15-2 BSP Endpoints for Normal Feedwater Temperature

Endpoint	Power (%)	Flow (%)	Definition
A1	73.1	49.2	Scram Region Boundary, HFCL
B1	40.0	31.0	Scram Region Boundary, NCL
A2	63.5	50.0	Controlled Entry Region Boundary, HFCL
B2	27.6	30.1	Controlled Entry Region Boundary, NCL

Note: The BSP Boundary for Normal Feedwater Temperature is defined by the MELLLA boundary line, per Reference 1 in Section 15.4.

Table 15-3 BSP Endpoints for Reduced Feedwater Temperature

Endpoint	Power (%)	Flow (%)	Definition
A1'	63.0	49.4	Scram Region Boundary, HFCL
B1'	33.8	30.6	Scram Region Boundary, NCL
A2'	·65.3	52.4	Controlled Entry Region Boundary, HFCL
B2'	27.6	30.1	Controlled Entry Region Boundary, NCL

Note: The BSP Boundary for Reduced Feedwater Temperature is defined by the MELLLA boundary line, per Reference 1 in Section 15.4.

Table 15-4 ABSP setpoints for the Scram Region

Parameter	Symbol	Value
Slope of ABSP APRM flow-biased trip linear segment.	m_{TRIP}	1.37
ABSP APRM flow-biased trip setpoint power intercept. Constant Power Line for Trip from zero Drive Flow to Flow Breakpoint value.	$P_{BSP-TRIP}$	39.3 %RTP[1]
ABSP APRM flow-biased trip setpoint drive flow intercept. Constant Flow Line for Trip.	$W_{BSP-TRIP}$	46.5 %RDF[2]
Flow Breakpoint value	$W_{BSP-BREAK}$	20.0 %RDF[2]

1. RTP – Rated Thermal Power
2. RDF – Recirculation Drive Flow

15.4 References

1. *GE Hitachi Boiling Water Reactor, Detect and Suppress Solution – Confirmation Density*, NEDC-33075P-A, Revision 8, November 2013.

2. *Project Task Report: Exelon Nuclear, LLC, Peach Bottom Power Station Units 2 and 3, Thermal Power Optimization Project, Task T0202: Thermal Hydraulic Stability*, 003N6203, Revision 1, December 2016.

3. *DIR Transmittal of APRM Flow-Biased STP Scram SLO Setpoints and EPU+TPO Manual BSP Regions*, ES1700004, Revision 1, March 2017.

16. Loss-of-Coolant Accident Results

16.1 10CFR50.46 Licensing Results

The ECCS-LOCA analysis is based on the SAFER/PRIME ECCS-LOCA methodology. NRC approval of the PRIME methodology is found in the Final Safety Evaluation of the PRIME model Licensing Topical Report (Reference 2 for GNF2 in Section 16.4).

The licensing results applicable to the GNF2 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 (%)
GNF2	1920	< 4.00	< 0.10

The SAFER/PRIME ECCS-LOCA analysis results for the GNF2 fuel type are documented in Reference 1 for GNF2 in Section 16.4.

16.2 10CFR50.46 Notification Letters

The 10CFR50.46 Notification Letters applicable to the GNF2 Licensing Basis PCT are shown in the following table.

Table 16.2-1 Impact on Licensing Basis Peak Cladding Temperature for GNF2

10CFR50.46 Notification Letters		
Number	**Subject**	**PCT Impact (°F)**
2014-01	SAFER04A E4 Revision-Code Changes of Neutral Impact	0
2014-02	SAFER04A E4 Revision-Mass Non-Conservatism	+10
2014-03	SAFER04A E4 Revision-Minimum Core DP Model	-10
2014-04	SAFER04A E4 Revision-Lower Plenum CCFL Restriction	+5
2017-01	GNF2 Lower Tie Plate-Finger Spring Removal and Bypass Flow Hole Change	0
2017-02	Fuel rod plenum temperature modeling update, 10x10 geometry and getter removal	0
	Total PCT Adder (°F)	+5

After accounting for the 10CFR50.46 Notification Letters impact, the GNF2 Licensing Basis PCT with the total PCT adder remains below the 10CFR50.46 limit of 2200 °F.

16.3 ECCS-LOCA Operating Limits

The ECCS-LOCA MAPLHGR operating limits for all fuel bundles in this cycle are shown in the following table.

Table 16.3-1 MAPLHGR Limits

Bundle Type(s): GNF2-P10DG2B404-6G7.0/8G6.0-100T2-150-T6-4504 (GNF2)
GNF2-P10DG2B406-14G6.0-100T2-150-T6-4506 (GNF2)
GNF2-P10DG2B419-15GZ-100T2-150-T6-4507 (GNF2)
GNF2-P10DG2B403-14GZ-100T2-150-T6-4505 (GNF2)
GNF2-P10DG2B400-13GZ-100T2-150-T6-4232 (GNF2)
GNF2-P10DG2B393-4G8.0/8G7.0/2G6.0-100T2-150-T6-4233 (GNF2)
GNF2-P10DG2B393-15GZ-100T2-150-T6-4235 (GNF2)
GNF2-P10DG2B403-8G7.0/4G6.0-100T2-150-T6-4236 (GNF2)
GNF2-P10DG2B417-12G7.0-100T2-150-T6-4366 (GNF2)
GNF2-P10DG2B402-15GZ-100T2-150-T6-4367 (GNF2)
GNF2-P10DG2B424-12G7.0-100T2-150-T6-4368 (GNF2)
GNF2-P10DG2B408-14GZ-100T2-150-T6-4369 (GNF2)
GNF2-P10DG2B403-14GZ-100T2-150-T6-4370 (GNF2)
GNF2-P10DG2B409-14GZ-100T2-150-T6-4365 (GNF2)

Average Planar Exposure		MAPLHGR Limit
GWd/MT	GWd/ST	kW/ft
0.00	0.00	13.78
19.31	17.52	13.78
67.00	60.78	7.50
70.00	63.50	6.69

The power and flow dependent LHGR multipliers are sufficient to provide adequate protection for the off-rated conditions from an ECCS-LOCA analysis perspective. The MAPLHGR multipliers can either be set to unity or set equal to the LHGR multipliers, which remain compliant with the basis of the ECCS-LOCA analysis with no loss of ECCS-LOCA margin.

The single loop operation multiplier on LHGR and MAPLHGR and the ECCS-LOCA analytical initial MCPR value applicable to the GNF2 fuel type in the new cycle core are shown in the following table.

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
GNF2	1.25	0.73

The GNF2 SLO multiplier applies to the MELLLA/EPU operating domain only, and SLO operation in the MELLLA+ domain is not permitted.

16.4 References

The SAFER/PRIME ECCS-LOCA analysis basis reports applicable to the new cycle core are:

References for GNF2

1. *Project Task Report, Exelon Generation Company LLC, Peach Bottom Atomic Power Station, Units 2 & 3 MELLLA+ Task T0407: ECCS-LOCA Performance*, 0000-0162-2354-R0, Revision 0, (PLM 000N0296 Revision 0), December 2013.

2. *The PRIME Model for Analysis of Fuel Rod Thermal-Mechanical Performance*, Part 1 - Technical Bases - NEDC-33256P-A, Revision 1, Part 2 - Qualification - NEDC-33257P-A, Revision 1, and Part 3 - Application Methodology - NEDC-33258P-A, Revision 1, September 2010.

60									25	26	3	3	26	25	3	3	25	29	3	3	26	25								
58								25	29	38	36	32	32	32	38	38	32	32	32	36	38	29	25							
56						3	30	26	32	35	32	36	33	7	32	32	7	33	36	32	35	32	26	30	3					
54						26	34	36	7	7	7	7	7	6	6	6	6	7	7	7	7	7	36	34	26					
52					25	35	36	7	7	6	34	6	35	5	34	34	5	35	6	34	6	7	7	36	35	25				
50			25	26	35	33	9	6	6	31	9	34	9	37	9	9	37	9	34	9	31	6	6	9	33	35	26	25		
48			29	34	36	9	34	9	31	9	35	5	34	9	35	35	9	34	5	35	9	31	9	34	9	36	34	29		
46		25	29	36	7	6	9	31	9	34	5	39	9	31	5	5	31	9	39	5	34	9	31	9	6	7	36	29	25	
44	3	25	32	7	7	6	31	9	31	9	35	9	35	5	31	31	5	35	9	35	9	31	9	31	6	7	7	32	25	3
42	26	38	35	7	6	31	9	34	9	35	5	34	5	35	5	5	35	5	34	5	35	9	34	9	31	6	7	35	38	26
40	30	36	32	7	34	9	35	5	35	5	31	5	37	5	39	39	5	37	5	31	5	35	5	35	9	34	7	32	36	30
38	3	32	36	7	6	34	5	39	9	34	5	35	5	31	5	5	31	5	35	5	34	9	39	5	34	6	7	36	32	3
36	3	32	33	7	35	9	34	9	35	5	37	5	34	5	35	35	5	34	5	37	5	35	9	34	9	35	7	33	32	3
34	3	32	7	6	5	37	9	31	5	35	5	31	5	33	5	5	33	5	31	5	35	5	31	9	37	5	6	7	32	3
32	29	38	32	6	34	9	35	5	31	5	39	5	35	5	31	31	5	35	5	39	5	31	5	35	9	34	6	32	38	26
30	26	38	32	6	34	9	35	5	31	5	39	5	35	5	31	31	5	35	5	39	5	31	5	35	9	34	6	32	38	26
28	3	32	7	6	5	37	9	31	5	35	5	31	5	33	5	5	33	5	31	5	35	5	31	9	37	5	6	7	32	3
26	3	32	33	7	35	9	34	9	35	5	37	5	34	5	35	35	5	34	5	37	5	35	9	34	9	35	7	33	32	3
24	3	32	36	7	6	34	5	39	9	34	5	35	5	31	5	5	31	5	35	5	34	9	39	5	34	6	7	36	32	3
22	30	36	32	7	34	9	35	5	35	5	31	5	37	5	39	39	5	37	5	31	5	35	5	35	9	34	7	32	36	30
20	26	38	35	7	6	31	9	34	9	35	5	34	5	35	5	5	35	5	34	5	35	9	34	9	31	6	7	35	38	26
18	3	25	32	7	7	6	31	9	31	9	35	9	35	5	31	31	5	35	9	35	9	31	9	31	6	7	7	32	25	3
16		25	29	36	7	6	9	31	9	34	5	39	9	31	5	5	31	9	39	5	34	9	31	9	6	7	36	29	25	
14			29	34	36	9	34	9	31	9	35	5	34	9	35	35	9	34	5	35	9	31	9	34	9	36	34	29		
12			25	26	35	33	9	6	6	31	9	34	9	37	9	9	37	9	34	9	31	6	6	9	33	35	26	25		
10					25	35	36	7	7	6	34	6	35	5	34	34	5	35	6	34	6	7	7	36	35	25				
8						26	34	36	7	7	7	7	7	6	6	6	6	7	7	7	7	7	36	34	26					
6						3	30	26	32	35	32	36	33	7	32	32	7	33	36	32	35	32	26	30	3					
4								25	29	38	36	32	32	32	38	38	32	32	32	36	38	29	25							
2									25	26	3	3	29	25	3	3	25	29	3	3	26	25								
	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59

Fuel Type			
3=GNF2-P10DG2B403-8G7.0/4G6.0-100T2-150-T6-4236	(Cycle 20)	31=GNF2-P10DG2B409-14GZ-100T2-150-T6-4365	(Cycle 21)
5=GNF2-P10DG2B404-6G7.0/8G6.0-100T2-150-T6-4504	(Cycle 22)	32=GNF2-P10DG2B417-12G7.0-100T2-150-T6-4366	(Cycle 21)
6=GNF2-P10DG2B406-14G6.0-100T2-150-T6-4506	(Cycle 22)	33=GNF2-P10DG2B417-12G7.0-100T2-150-T6-4366	(Cycle 21)
7=GNF2-P10DG2B419-15GZ-100T2-150-T6-4507	(Cycle 22)	34=GNF2-P10DG2B402-15GZ-100T2-150-T6-4367	(Cycle 21)
9=GNF2-P10DG2B403-14GZ-100T2-150-T6-4505	(Cycle 22)	35=GNF2-P10DG2B402-15GZ-100T2-150-T6-4367	(Cycle 21)
25=GNF2-P10DG2B400-13GZ-100T2-150-T6-4232	(Cycle 20)	36=GNF2-P10DG2B424-12G7.0-100T2-150-T6-4368	(Cycle 21)
26=GNF2-P10DG2B393-4G8.0/8G7.0/2G6.0-100T2-150-T6-4233	(Cycle 20)	37=GNF2-P10DG2B408-14GZ-100T2-150-T6-4369	(Cycle 21)
29=GNF2-P10DG2B393-15GZ-100T2-150-T6-4235	(Cycle 20)	38=GNF2-P10DG2B403-14GZ-100T2-150-T6-4370	(Cycle 21)
30=GNF2-P10DG2B403-8G7.0/4G6.0-100T2-150-T6-4236	(Cycle 20)	39=GNF2-P10DG2B409-14GZ-100T2-150-T6-4365	(Cycle 21)

Figure 1 Reference Core Loading Pattern

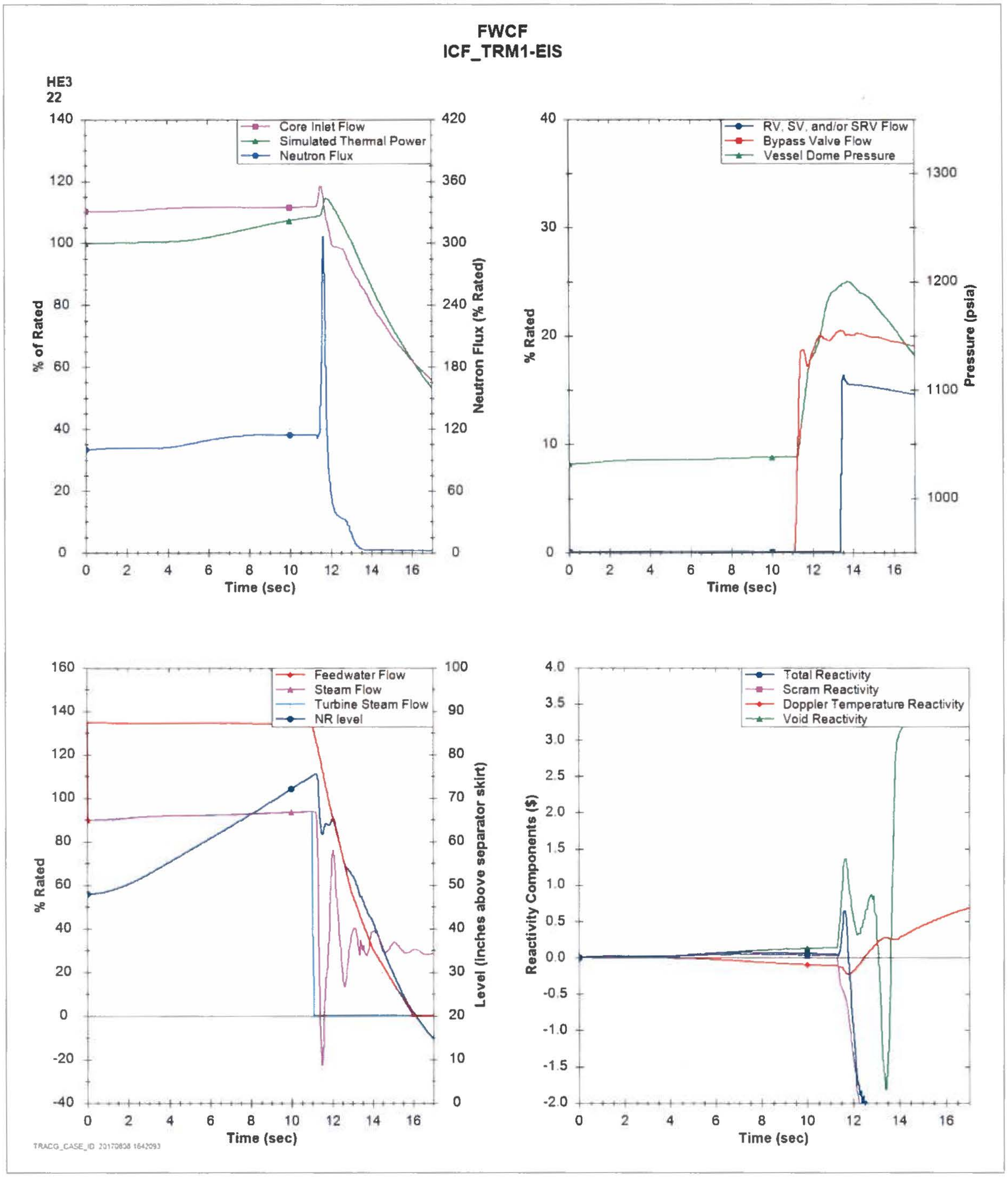

Figure 2 Plant Response to FW Controller Failure (MOC ICF and FWTR (HBB))

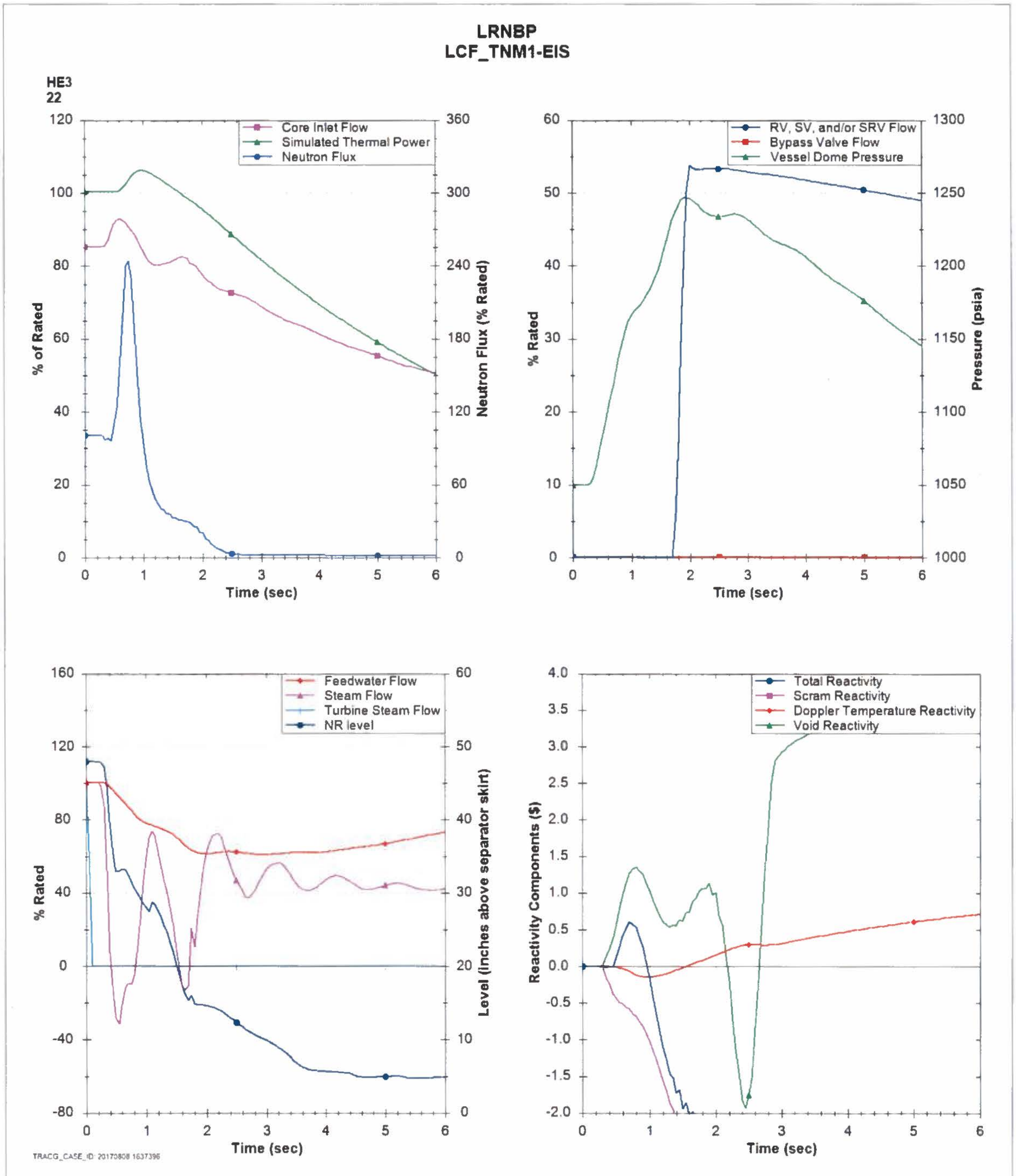

Figure 3 Plant Response to Load Rejection w/o Bypass (MOC MELLLA+ (HBB))

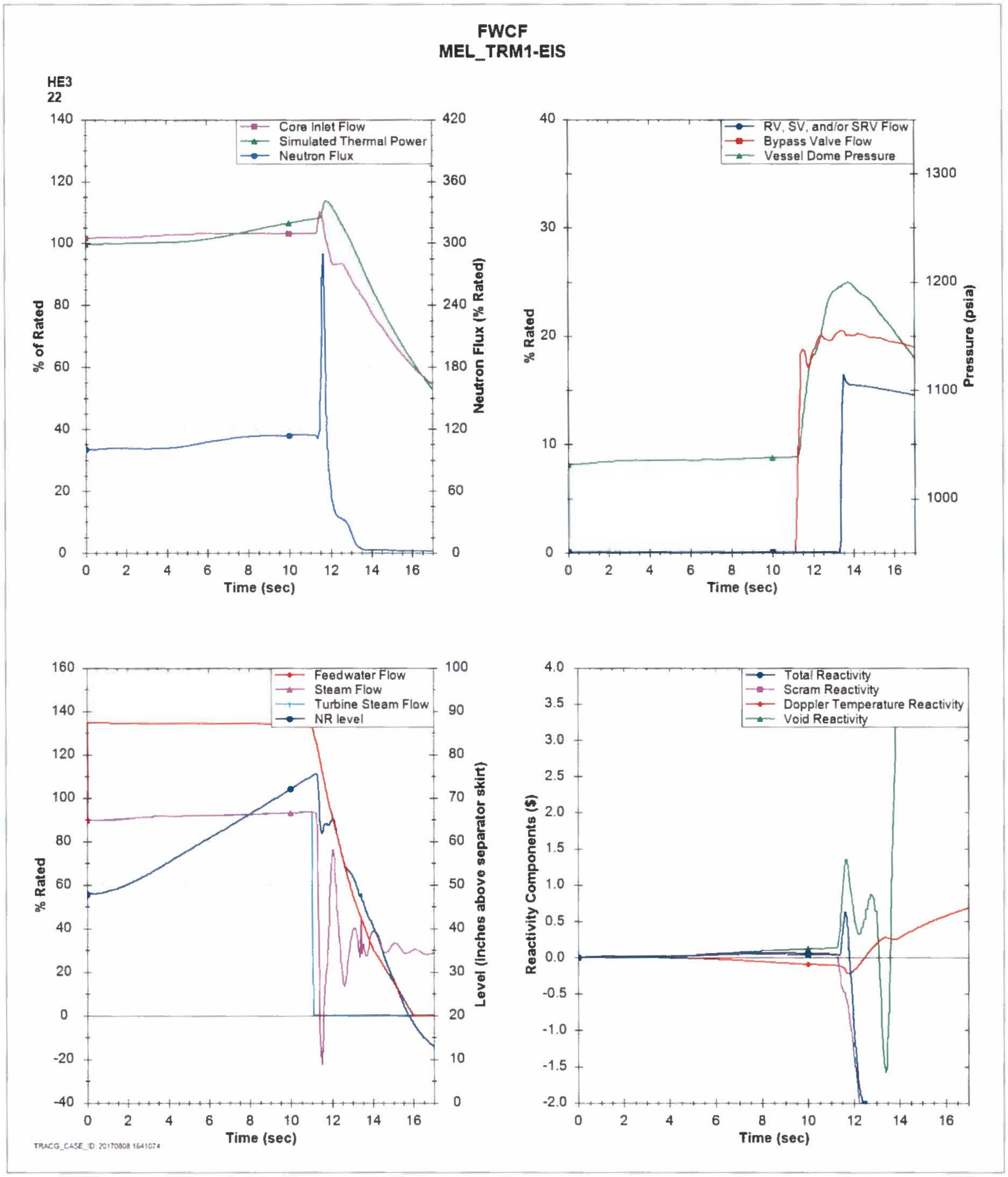

Figure 4 Plant Response to FW Controller Failure (MOC MELLLA and FWTR (HBB))

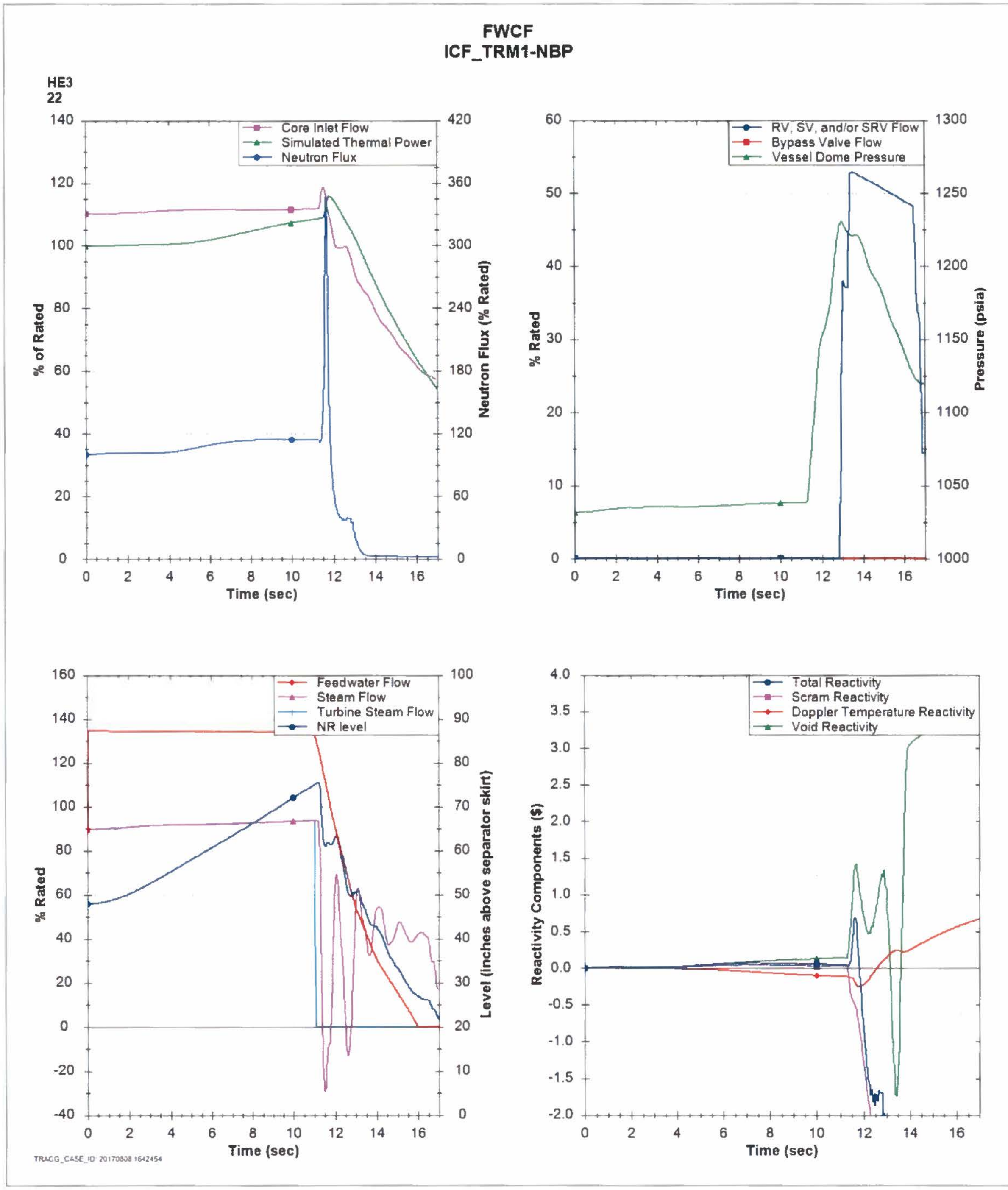

Figure 5 Plant Response to FW Controller Failure (MOC ICF and FWTR with TBSOOS (HBB))

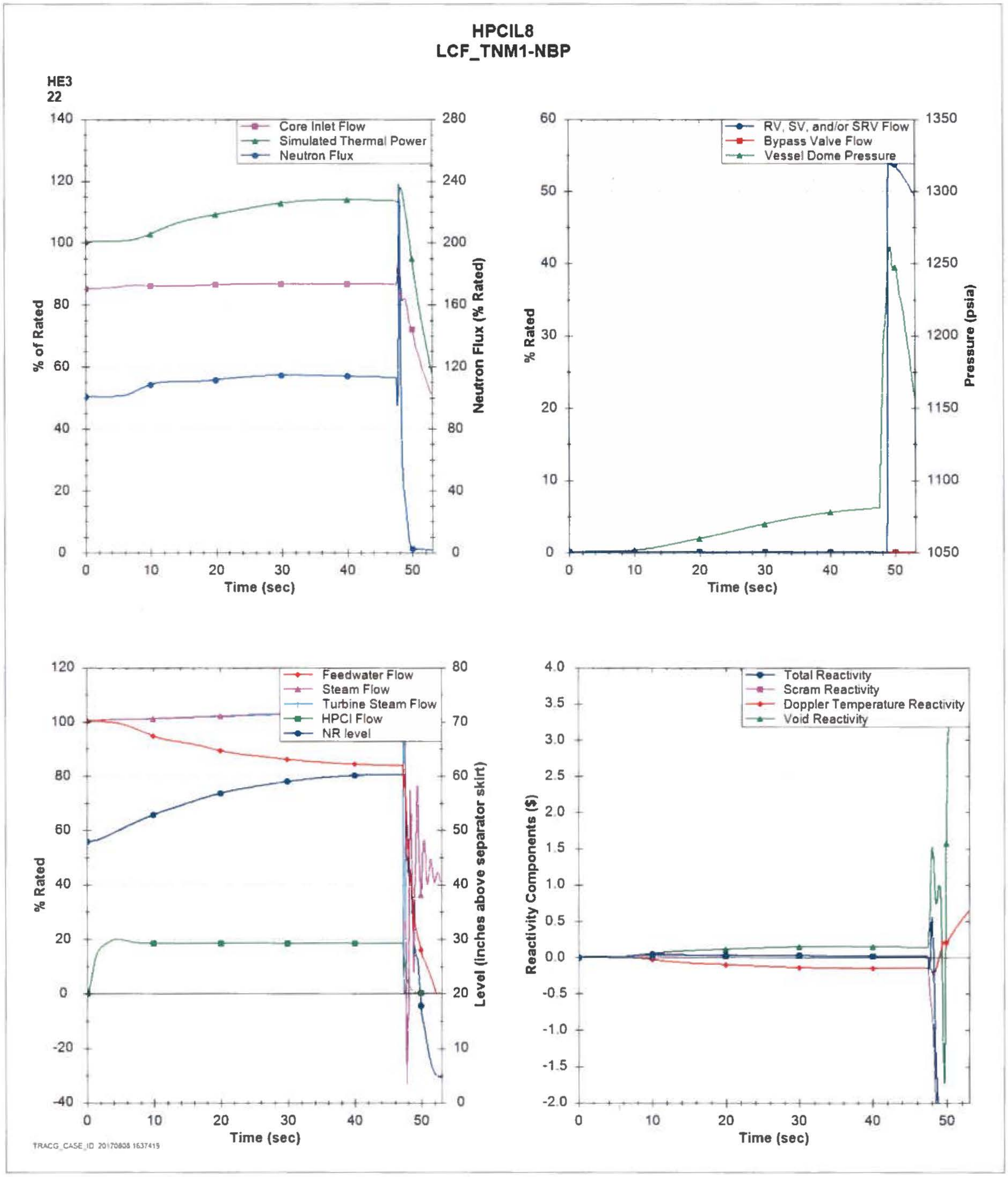

Figure 6 Plant Response to Inadvertent HPCI /L8
(MOC MELLLA+ with TBSOOS (HBB))

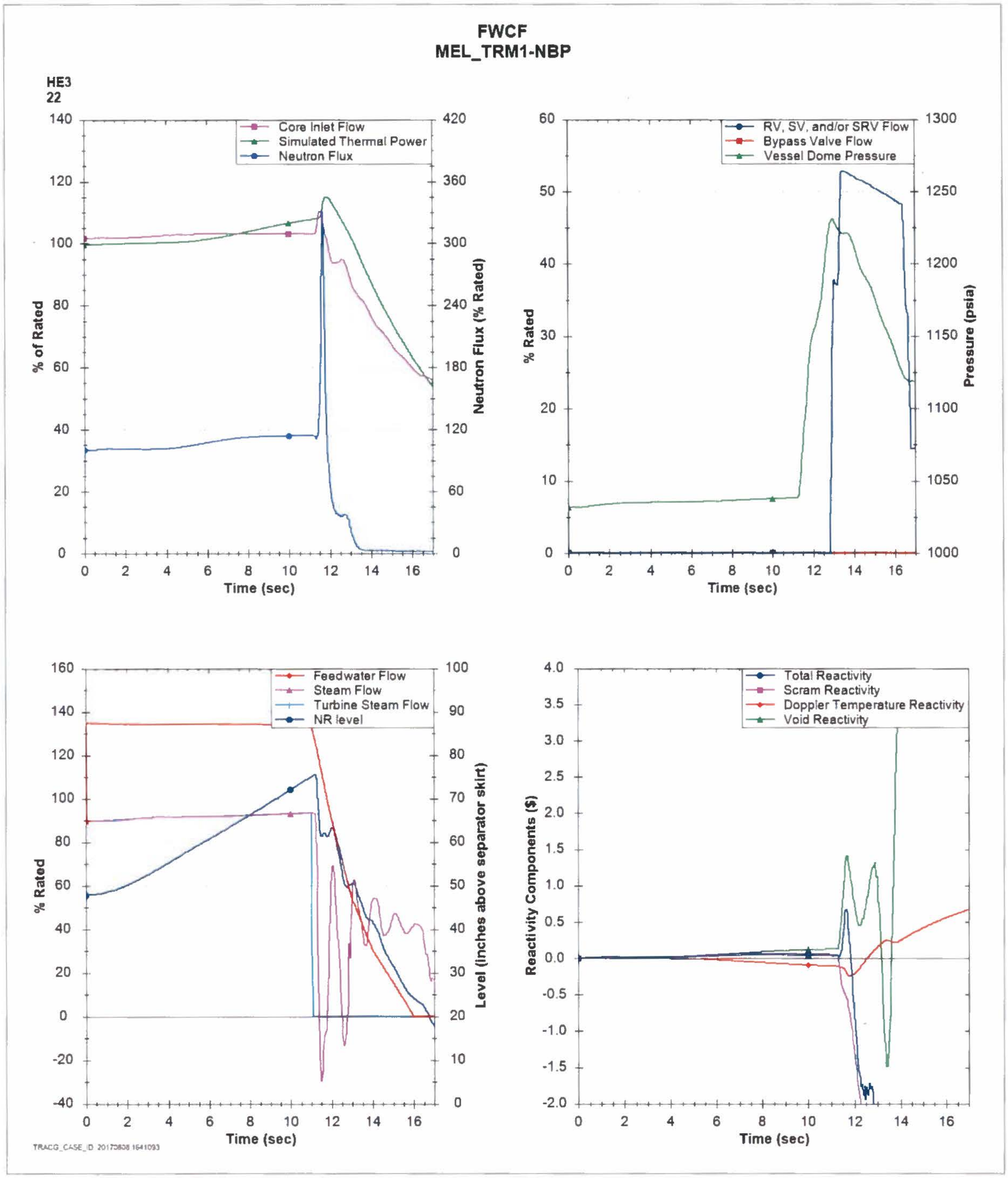

Figure 7 Plant Response to FW Controller Failure
(MOC MELLLA and FWTR with TBSOOS (HBB))

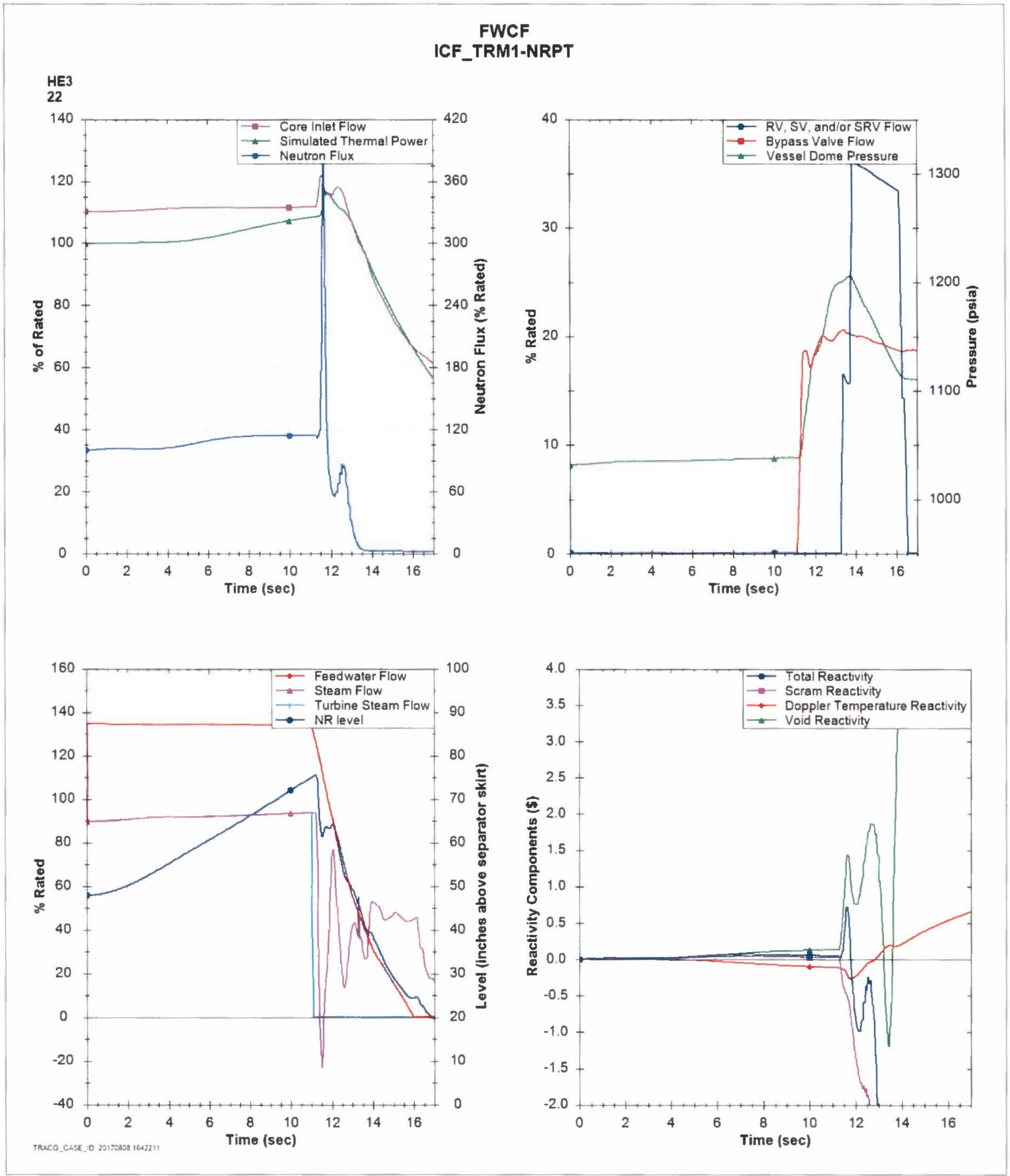

Figure 8 Plant Response to FW Controller Failure (MOC ICF and FWTR with RPTOOS (HBB))

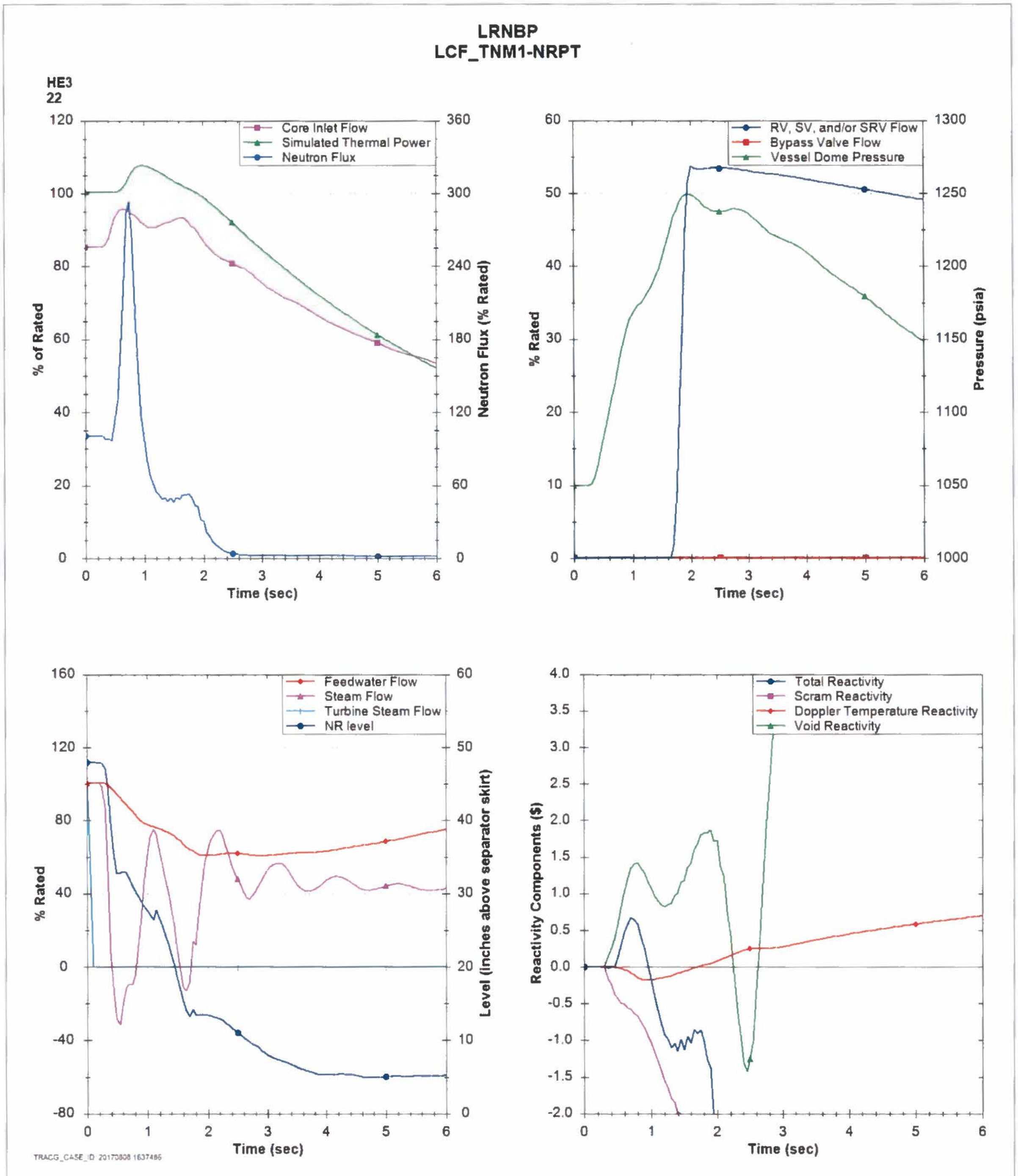

Figure 9 Plant Response to Load Rejection w/o Bypass (MOC MELLLA+ with RPTOOS (HBB))

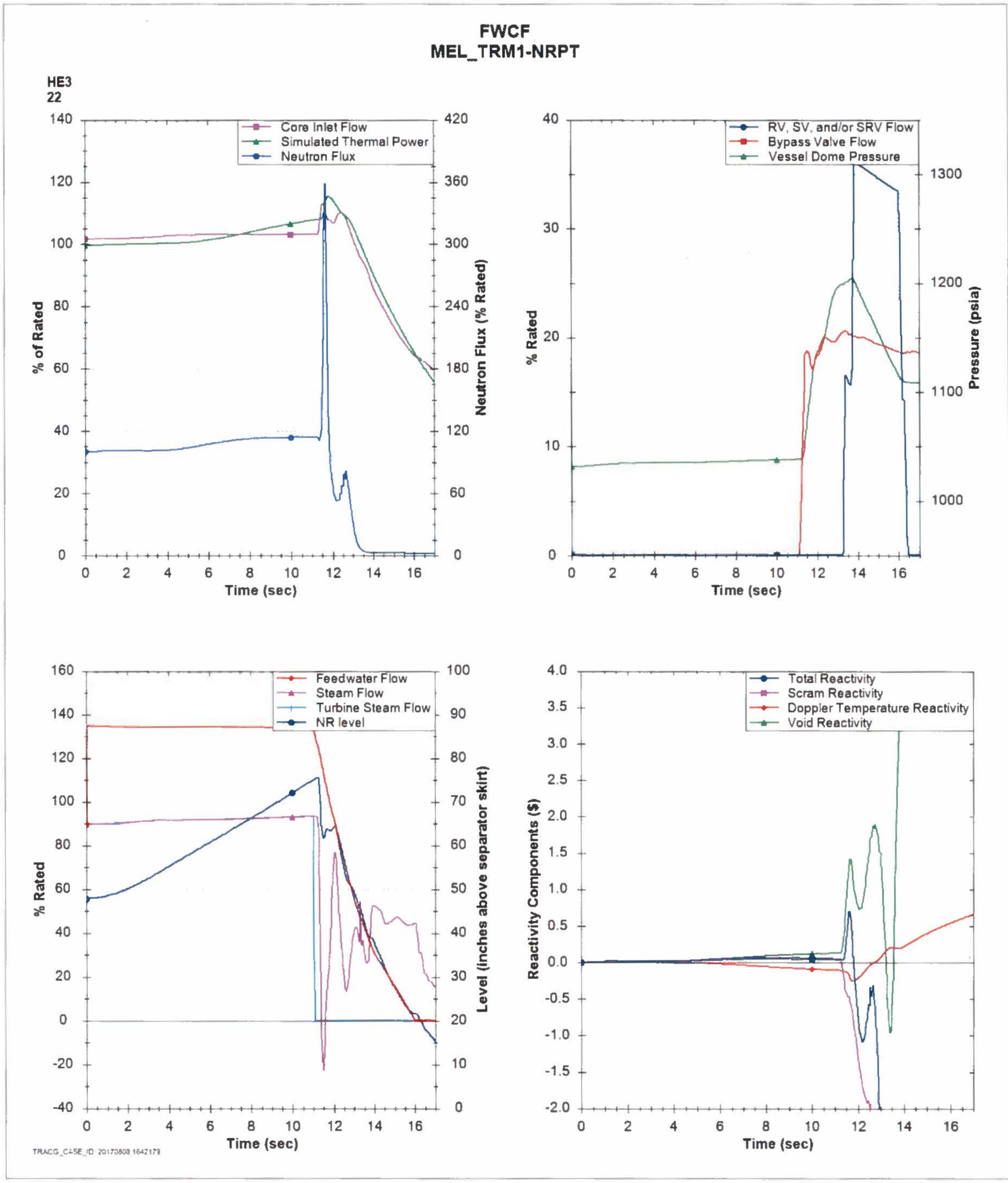

Figure 10 Plant Response to FW Controller Failure
(MOC MELLLA and FWTR with RPTOOS (HBB))

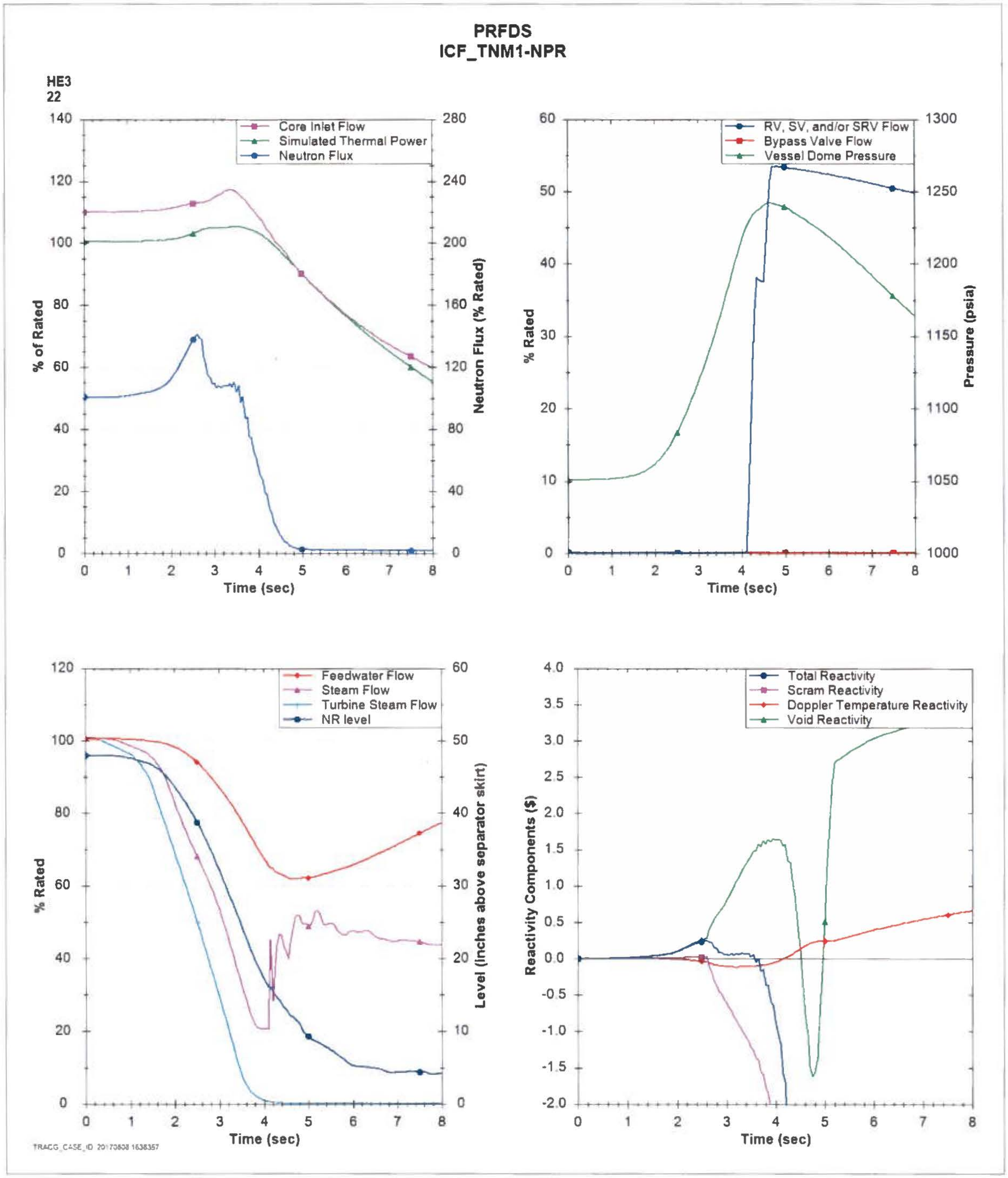

Figure 11 Plant Response to Pressure Regulator Failure Downscale (MOC ICF with PROOS and/or PLUOOS (HBB))

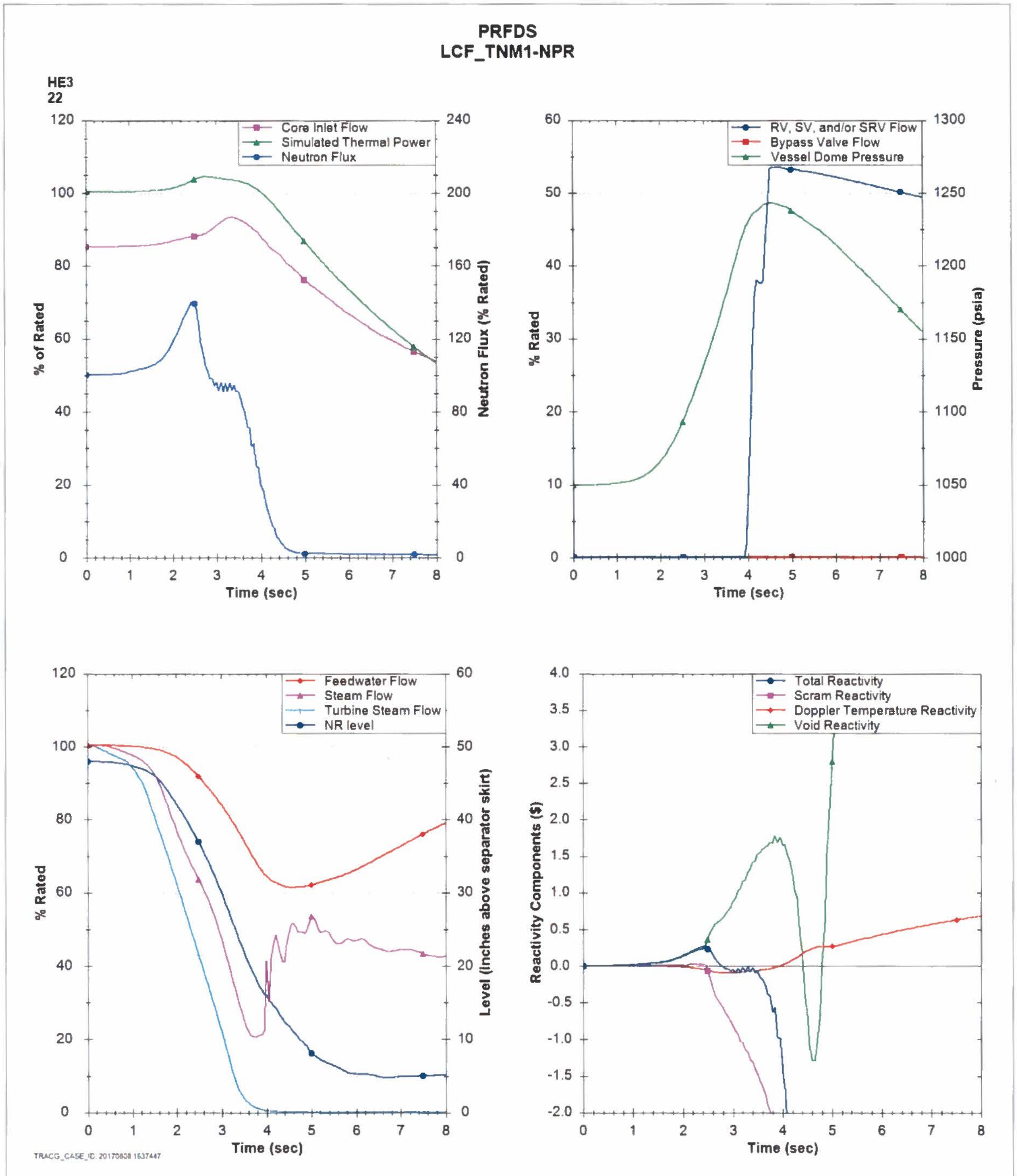

Figure 12 Plant Response to Pressure Regulator Failure Downscale (MOC MELLLA+ with PROOS and/or PLUOOS (HBB))

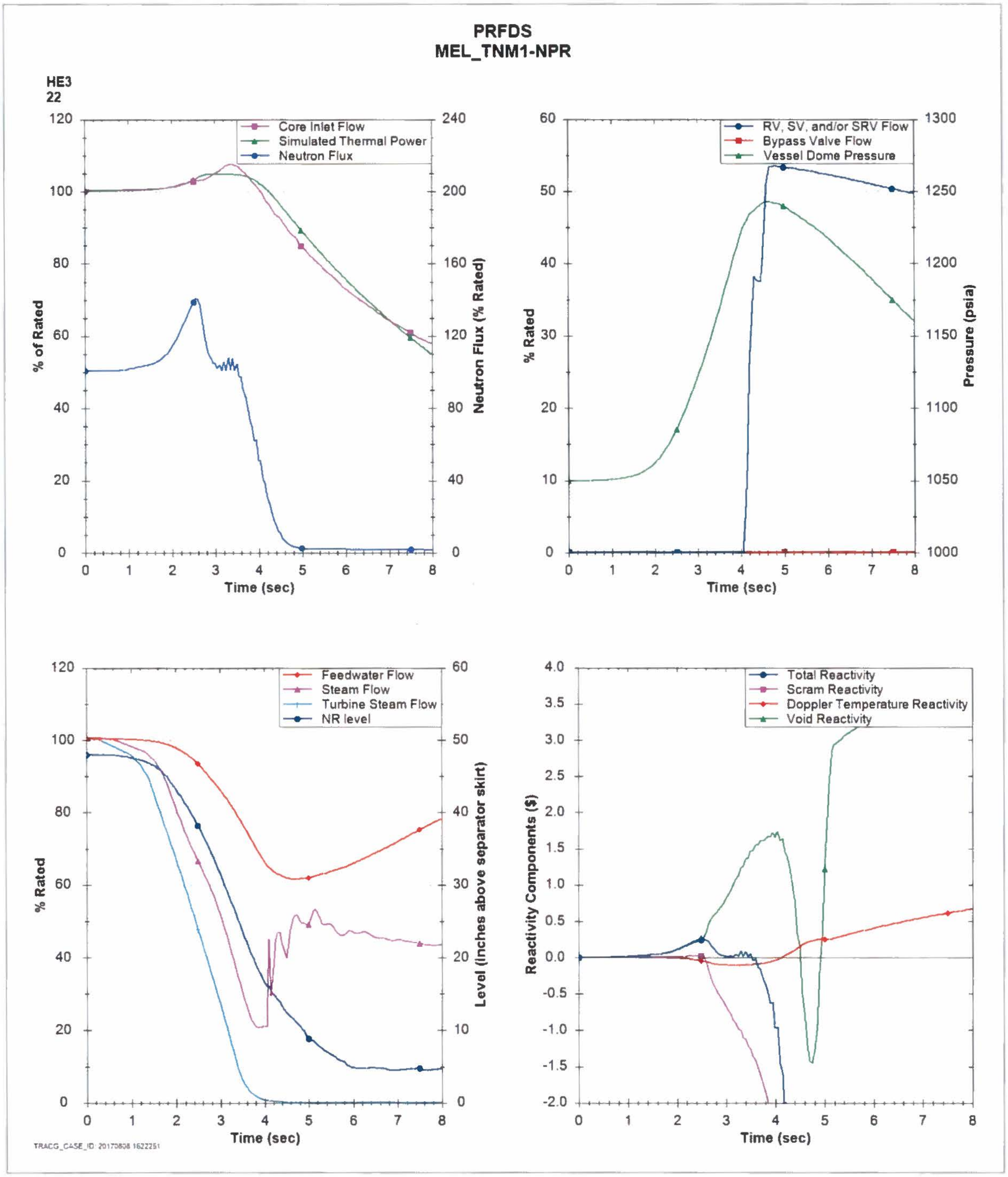

Figure 13 Plant Response to Pressure Regulator Failure Downscale (MOC MELLLA with PROOS and/or PLUOOS (HBB))

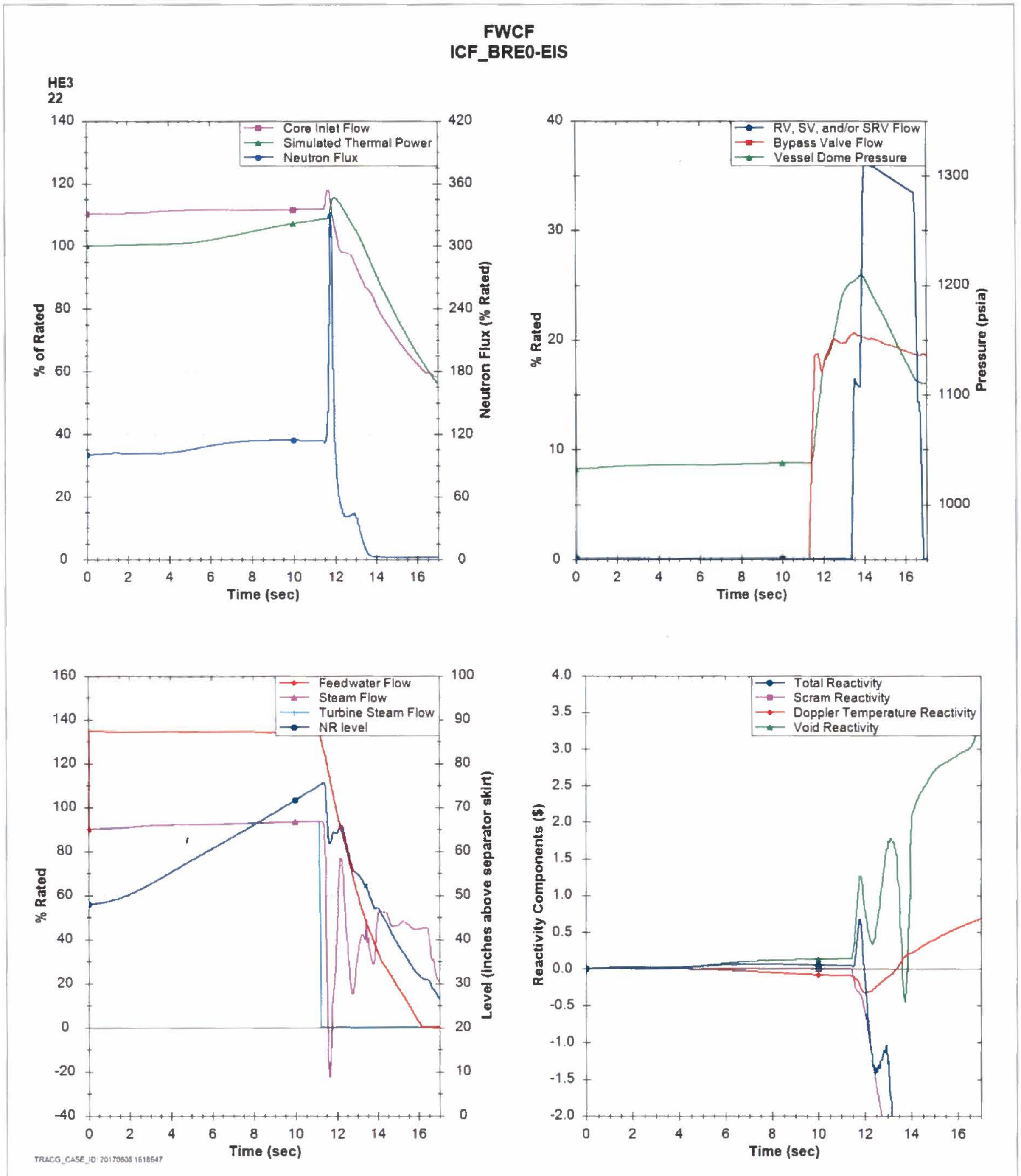

Figure 14 Plant Response to FW Controller Failure (EOC ICF and FWTR (UB))

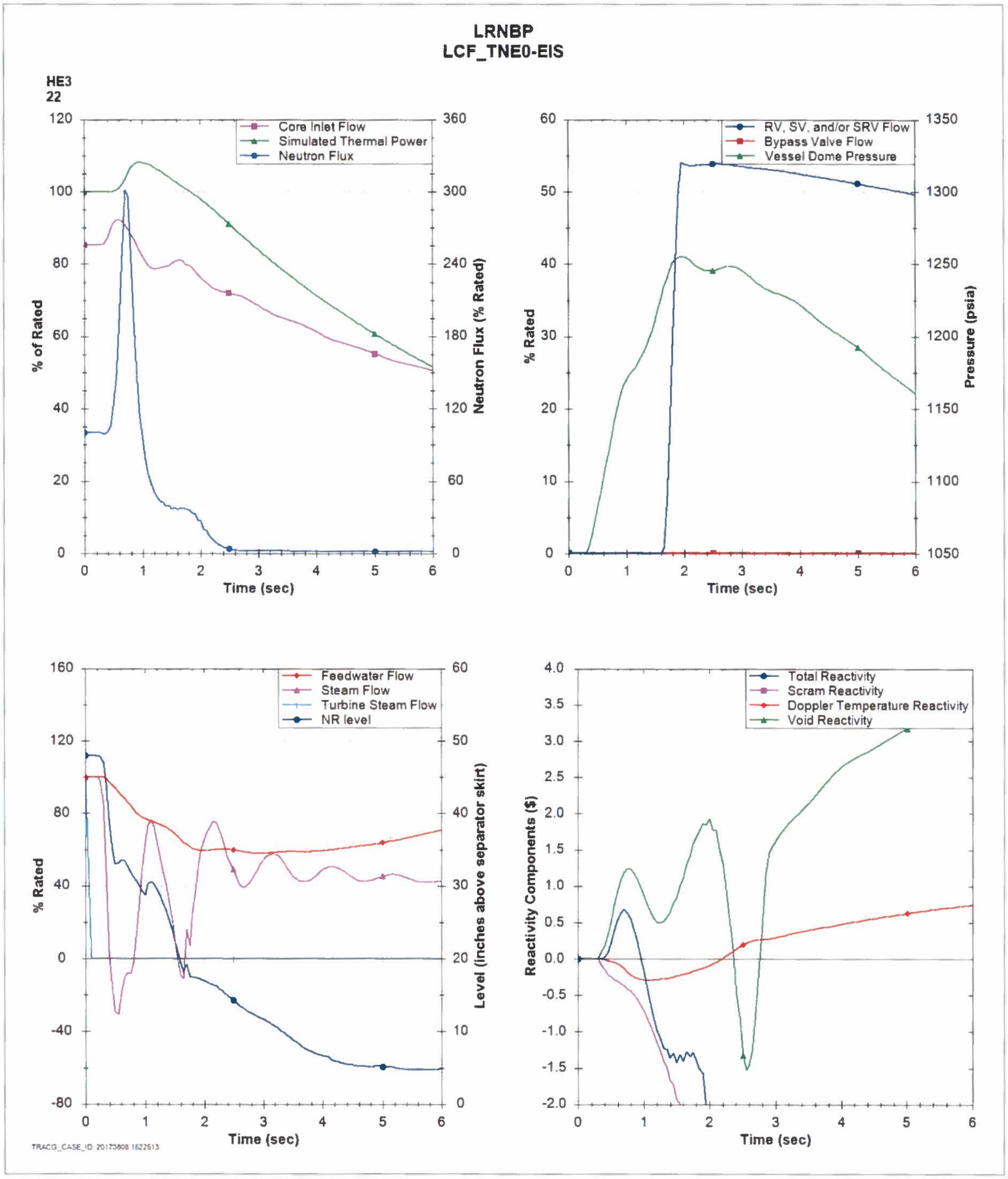

Figure 15 Plant Response to Load Rejection w/o Bypass (EOC MELLLA+ (HBB))

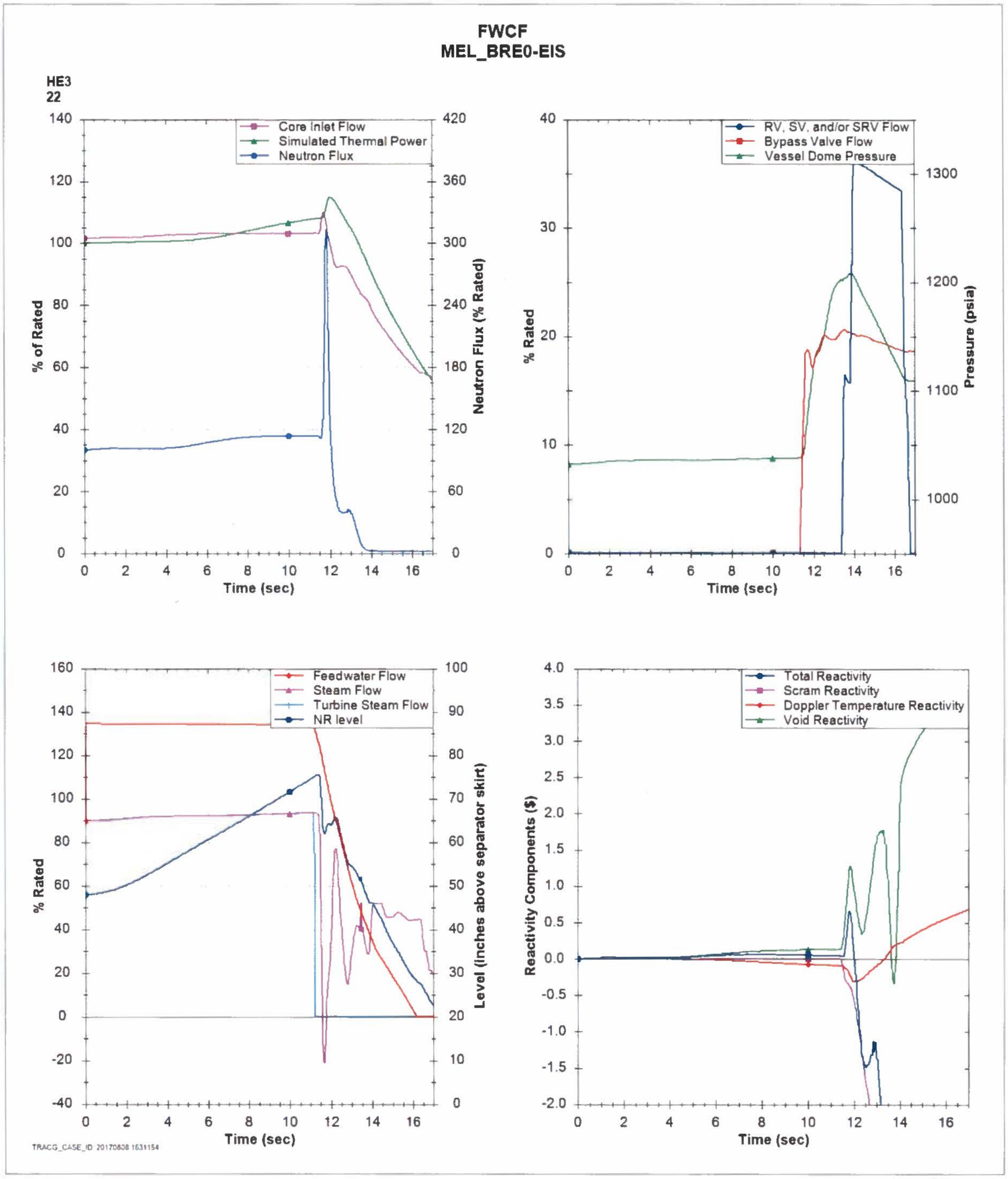

Figure 16 Plant Response to FW Controller Failure (EOC MELLLA and FWTR (UB))

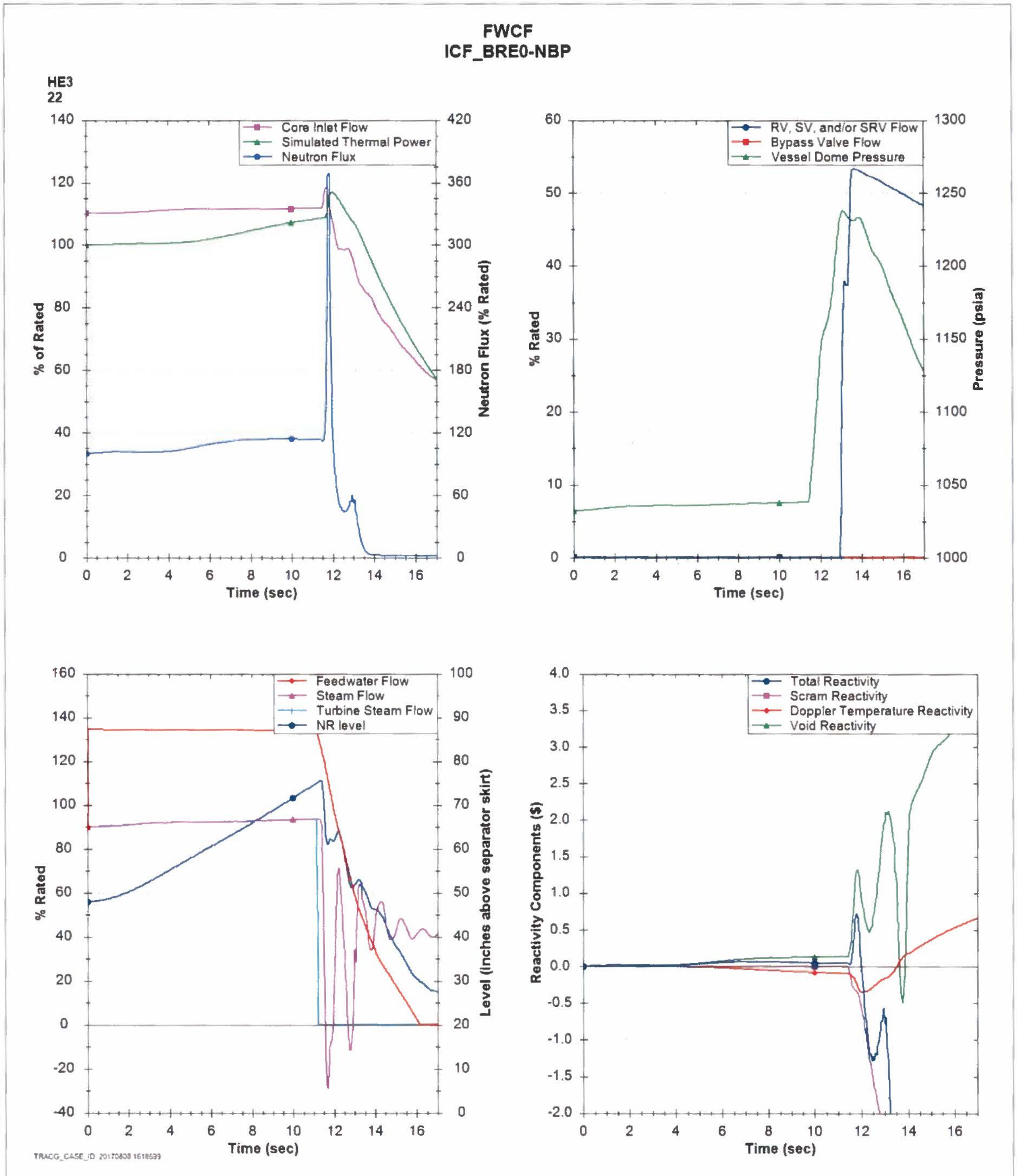

Figure 17 Plant Response to FW Controller Failure (EOC ICF and FWTR with TBSOOS (UB))

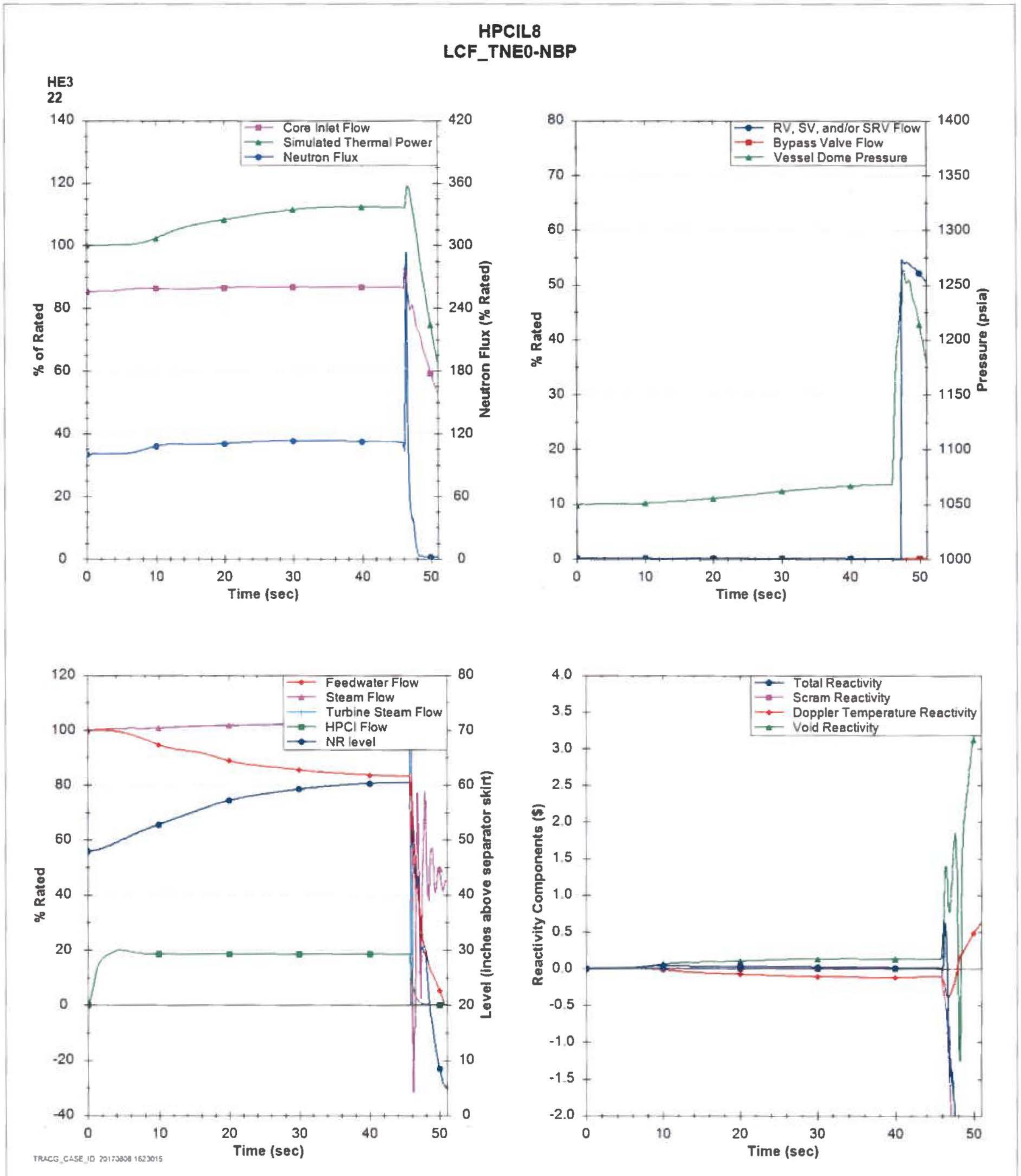

Figure 18 Plant Response to Inadvertent HPCI /L8 (EOC MELLLA+ with TBSOOS (HBB))

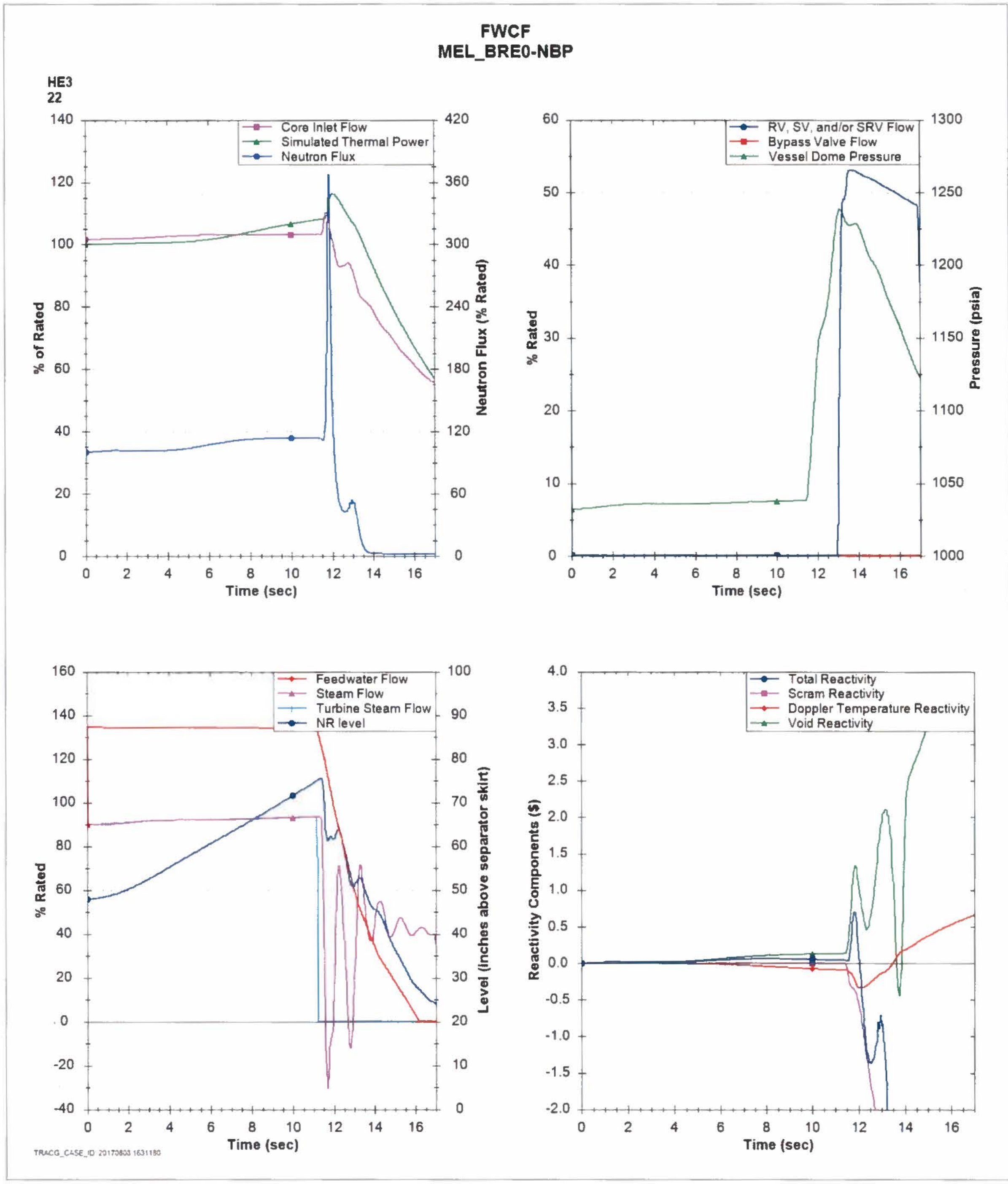

Figure 19 Plant Response to FW Controller Failure
(EOC MELLLA and FWTR with TBSOOS (UB))

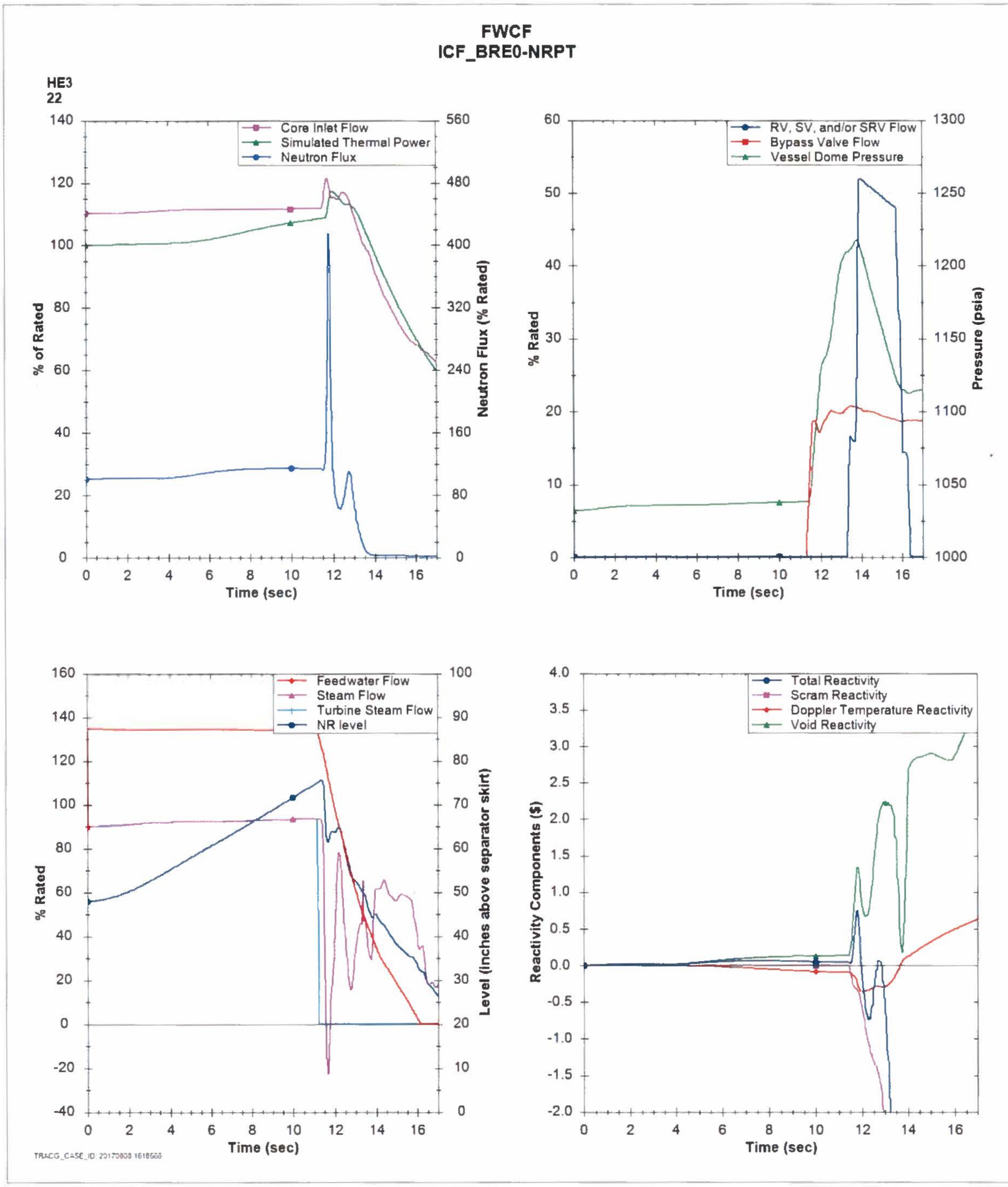

Figure 20 Plant Response to FW Controller Failure (EOC ICF and FWTR with RPTOOS (UB))

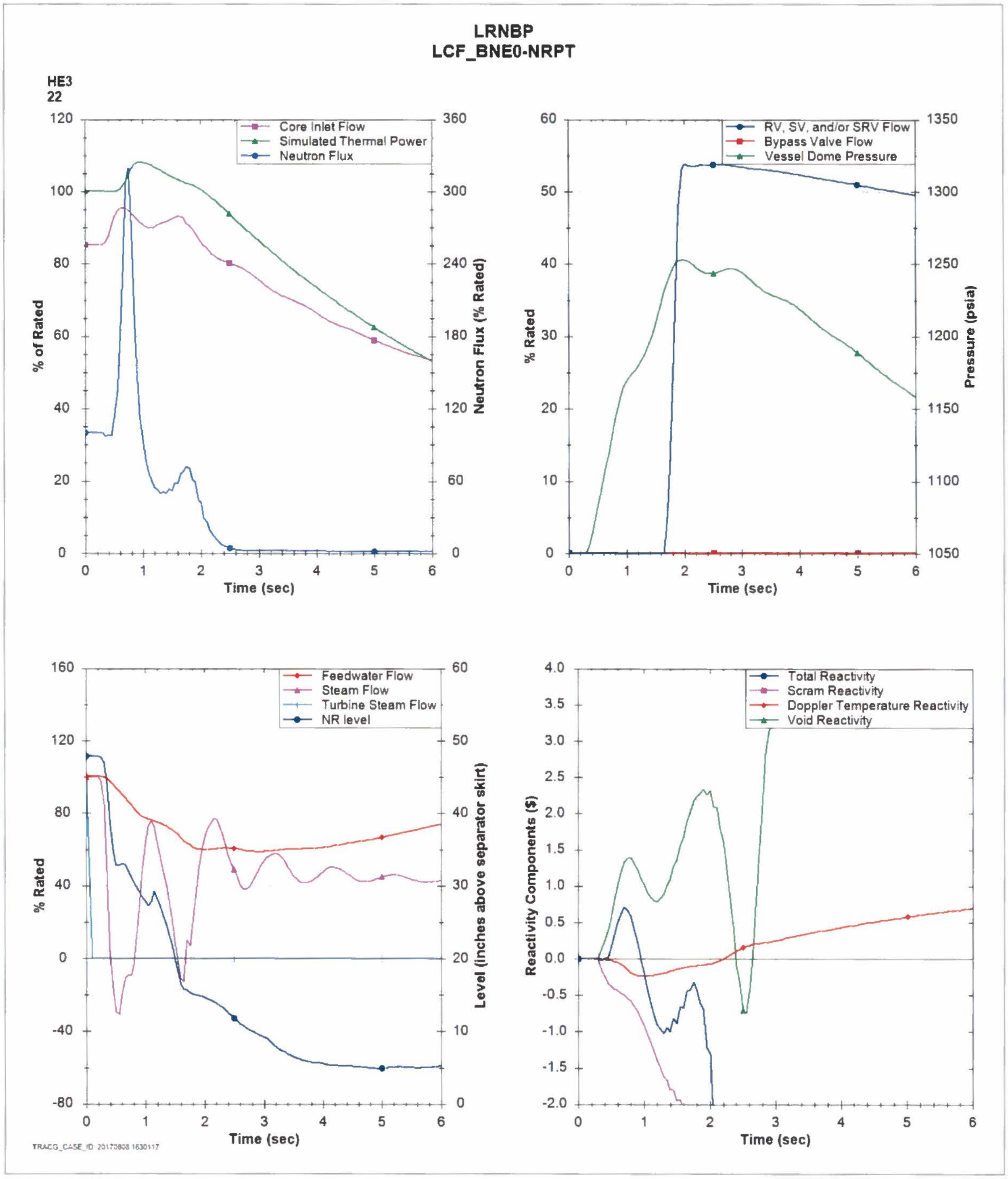

Figure 21 Plant Response to Load Rejection w/o Bypass
(EOC MELLLA+ with RPTOOS (UB))

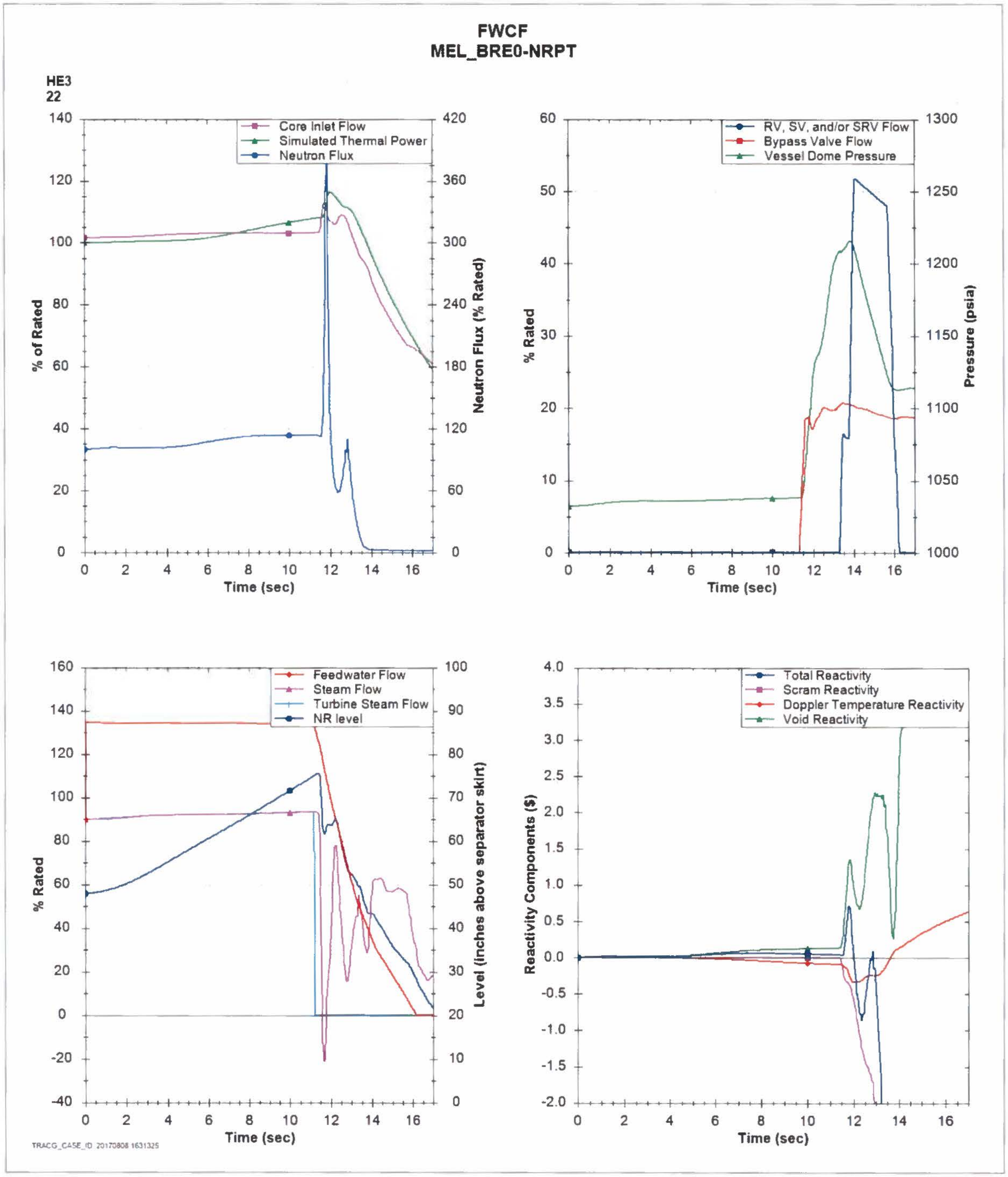

Figure 22 Plant Response to FW Controller Failure
(EOC MELLLA and FWTR with RPTOOS (UB))

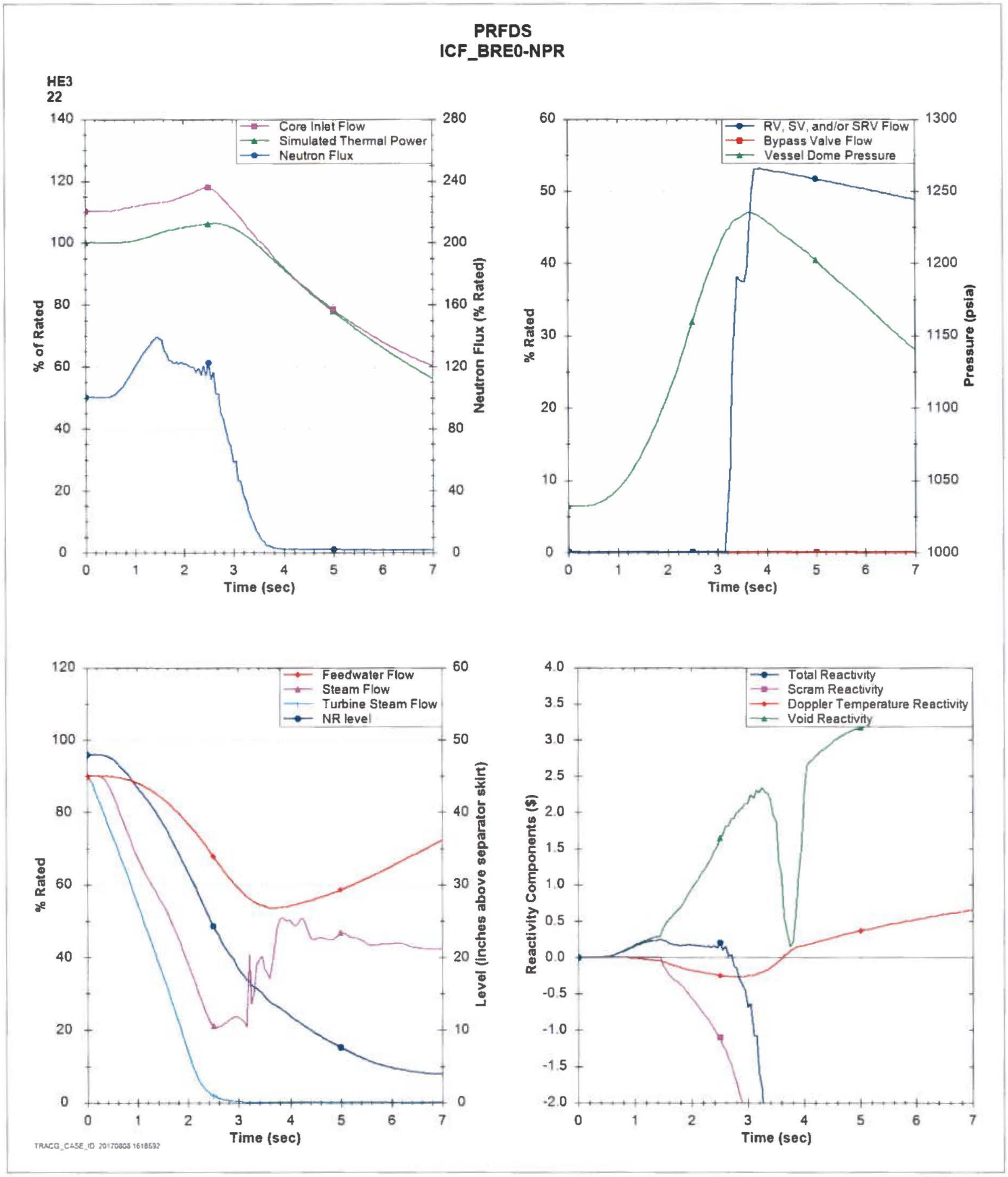

Figure 23 Plant Response to Pressure Regulator Failure Downscale (EOC ICF and FWTR with PROOS and/or PLUOOS (UB))

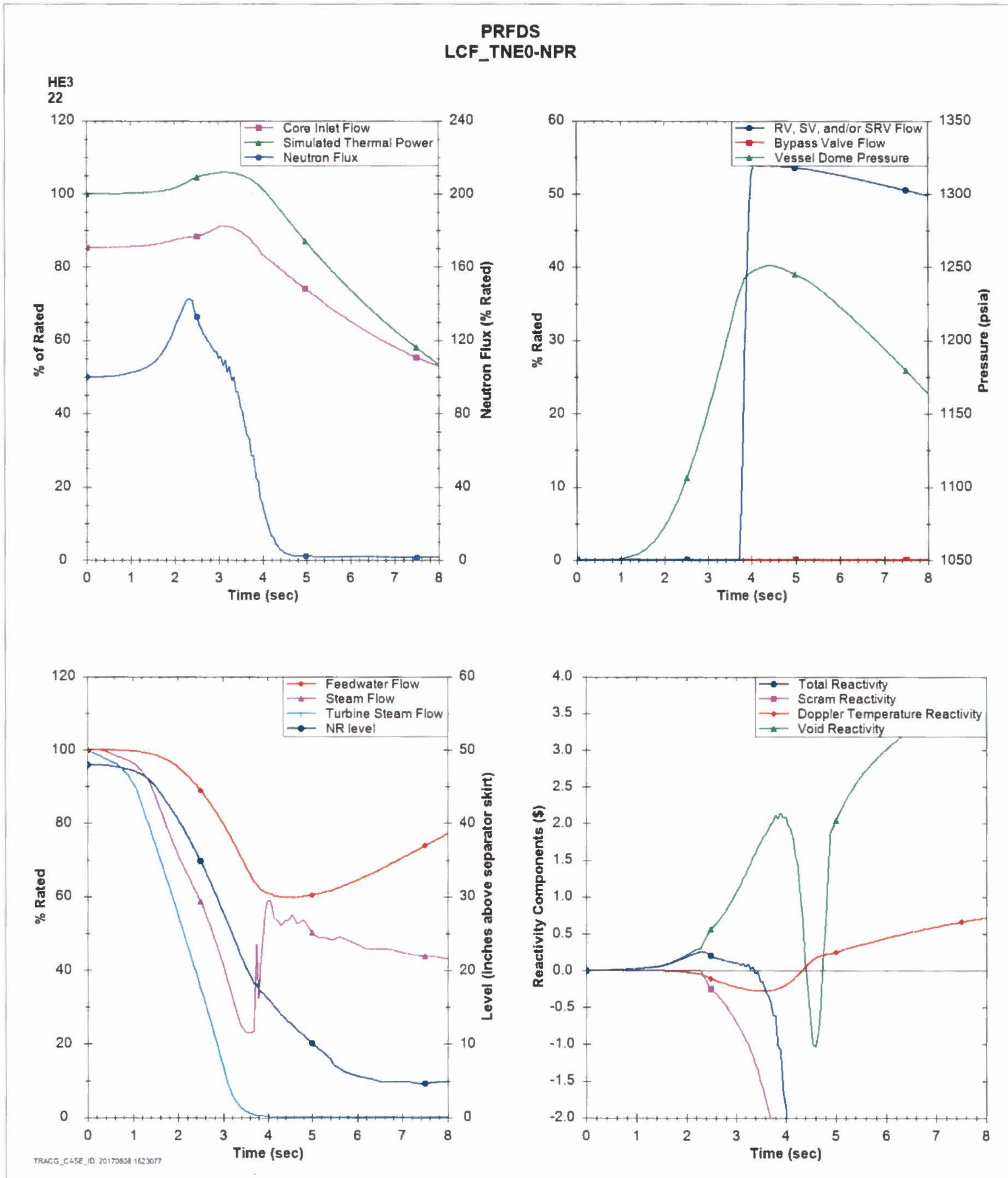

Figure 24 Plant Response to Pressure Regulator Failure Downscale (EOC MELLLA+ with PROOS and/or PLUOOS (HBB))

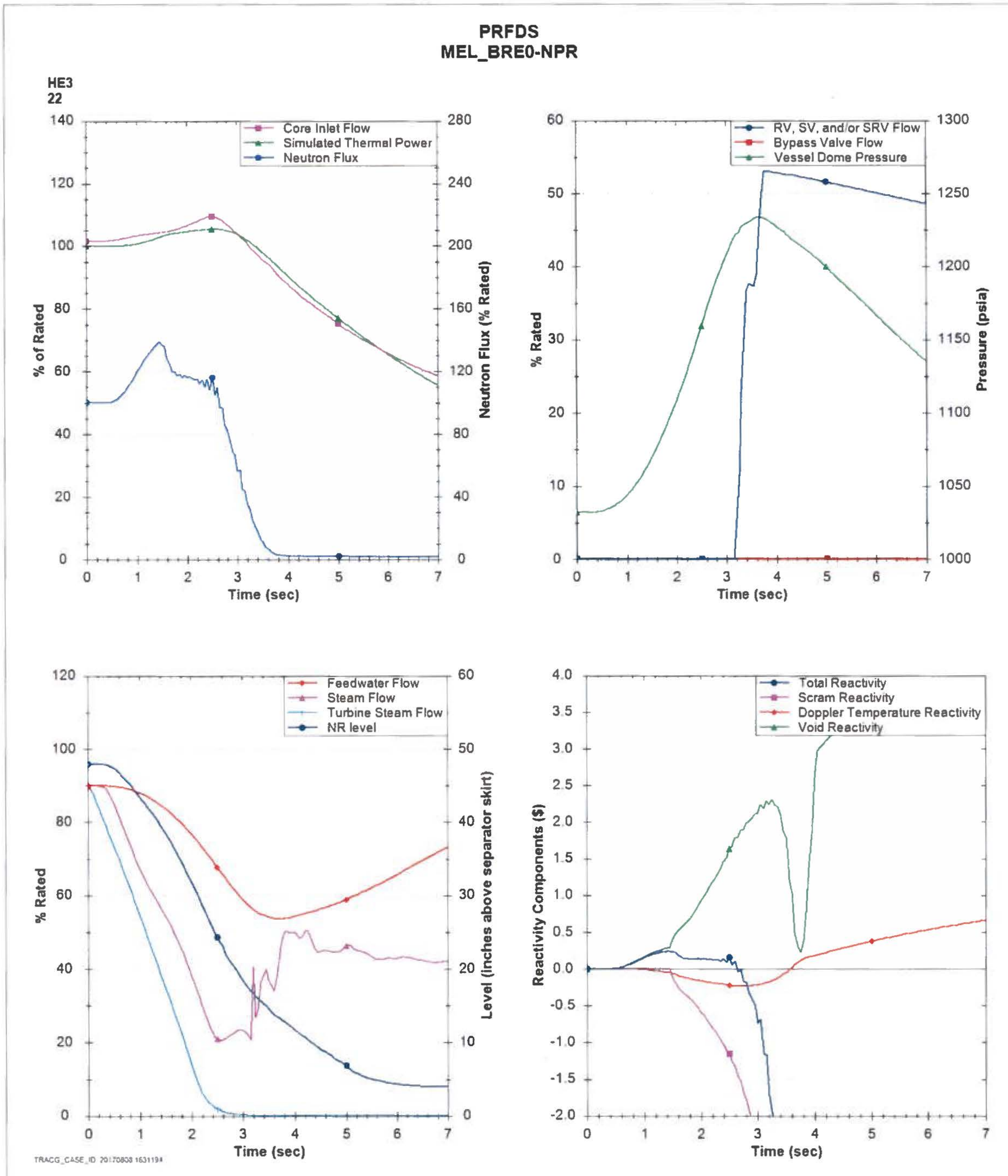

Figure 25 Plant Response to Pressure Regulator Failure Downscale (EOC MELLLA and FWTR with PROOS and/or PLUOOS (UB))

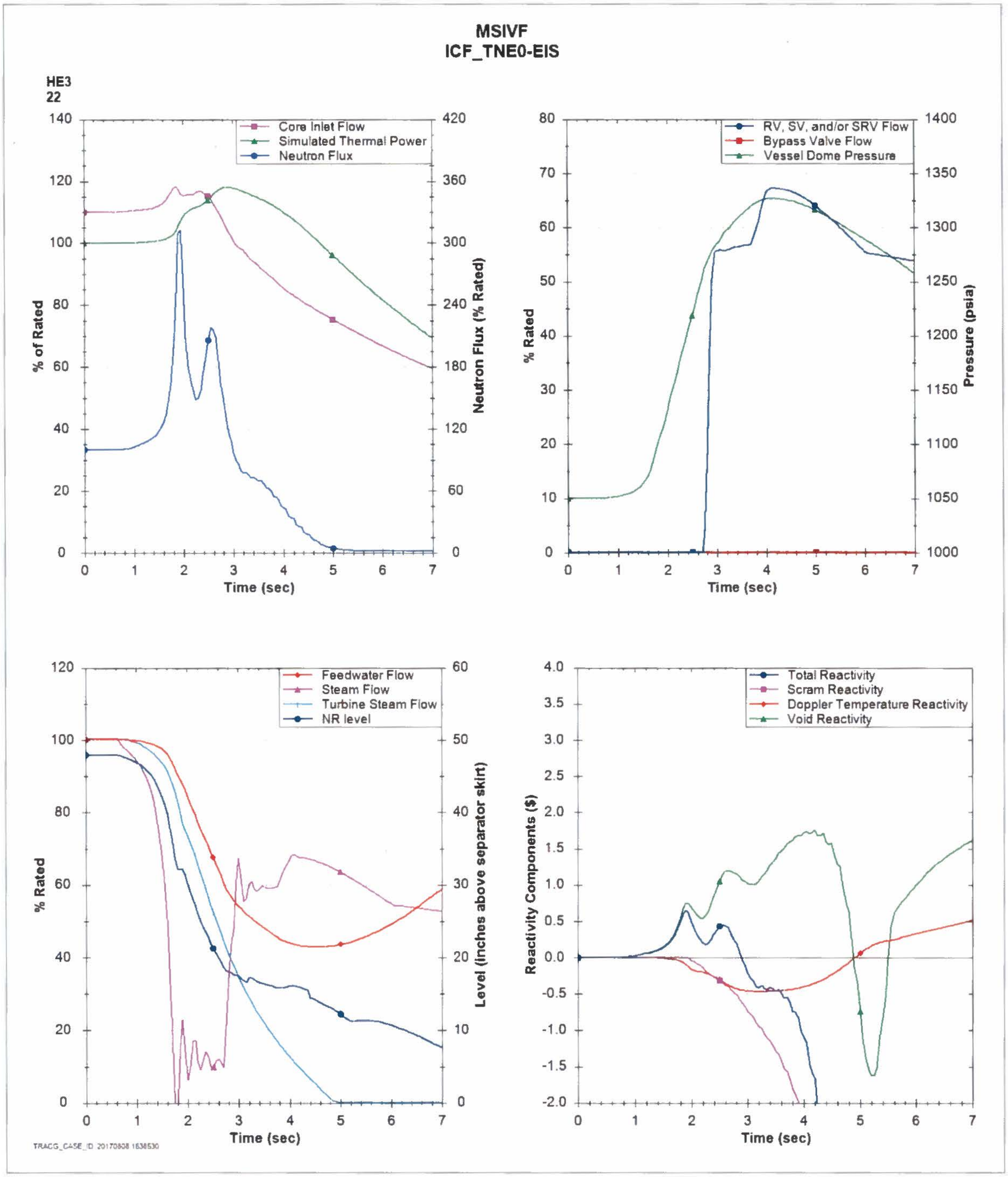

Figure 26 Plant Response to MSIV Closure (Flux Scram)
(EOC ICF (HBB))

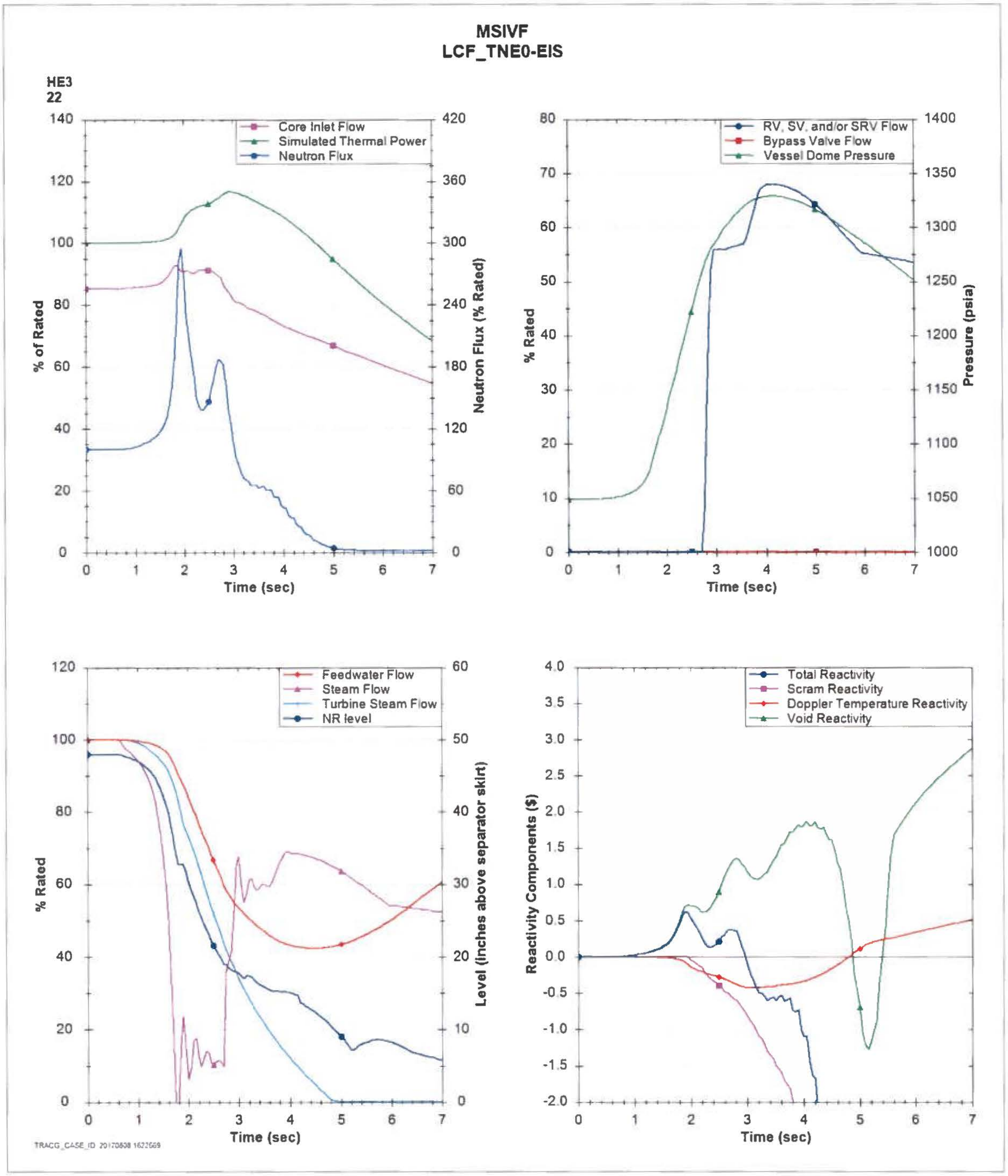

**Figure 27 Plant Response to MSIV Closure (Flux Scram)
(EOC MELLLA+ (HBB))**

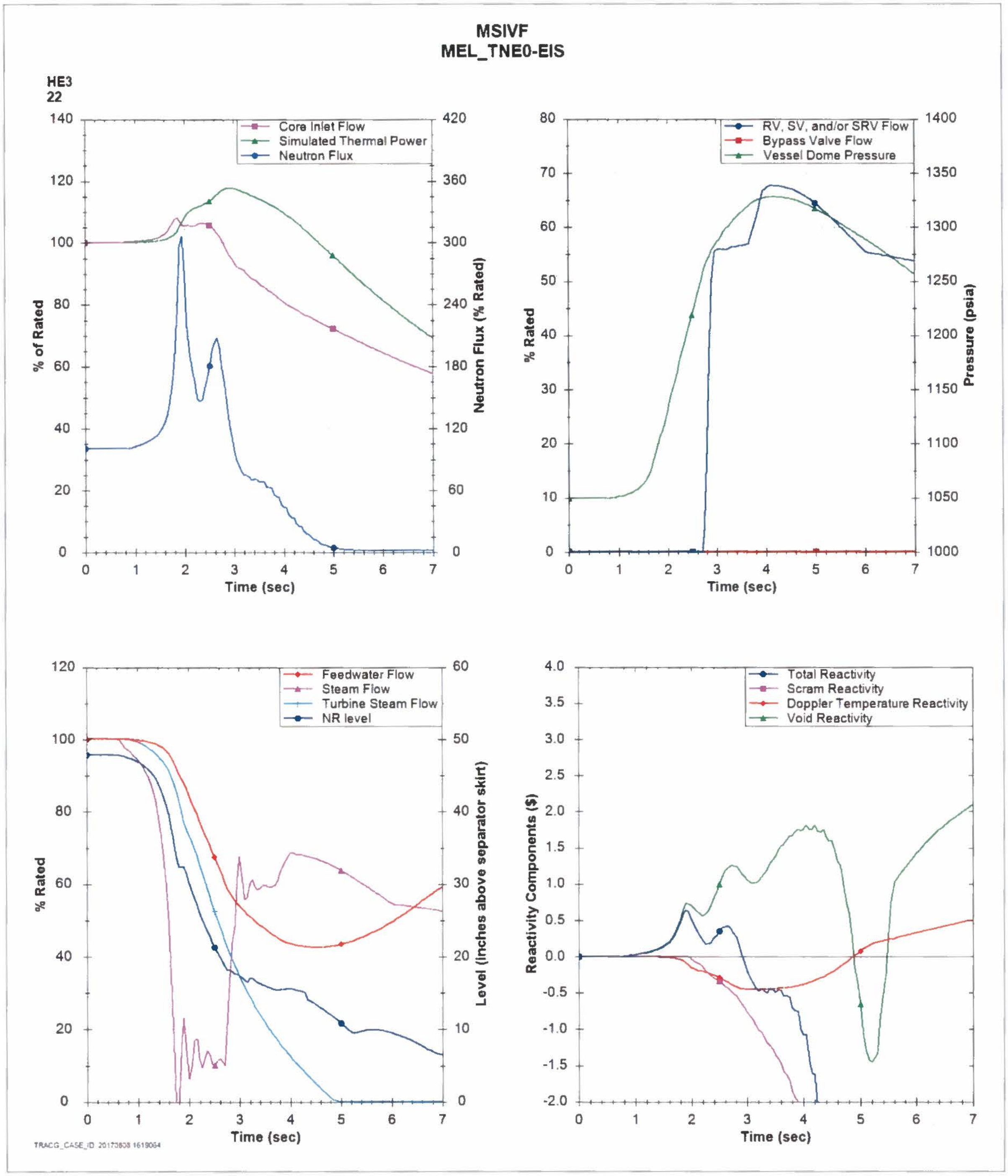

Figure 28 Plant Response to MSIV Closure (Flux Scram)
(EOC MELLLA (HBB))

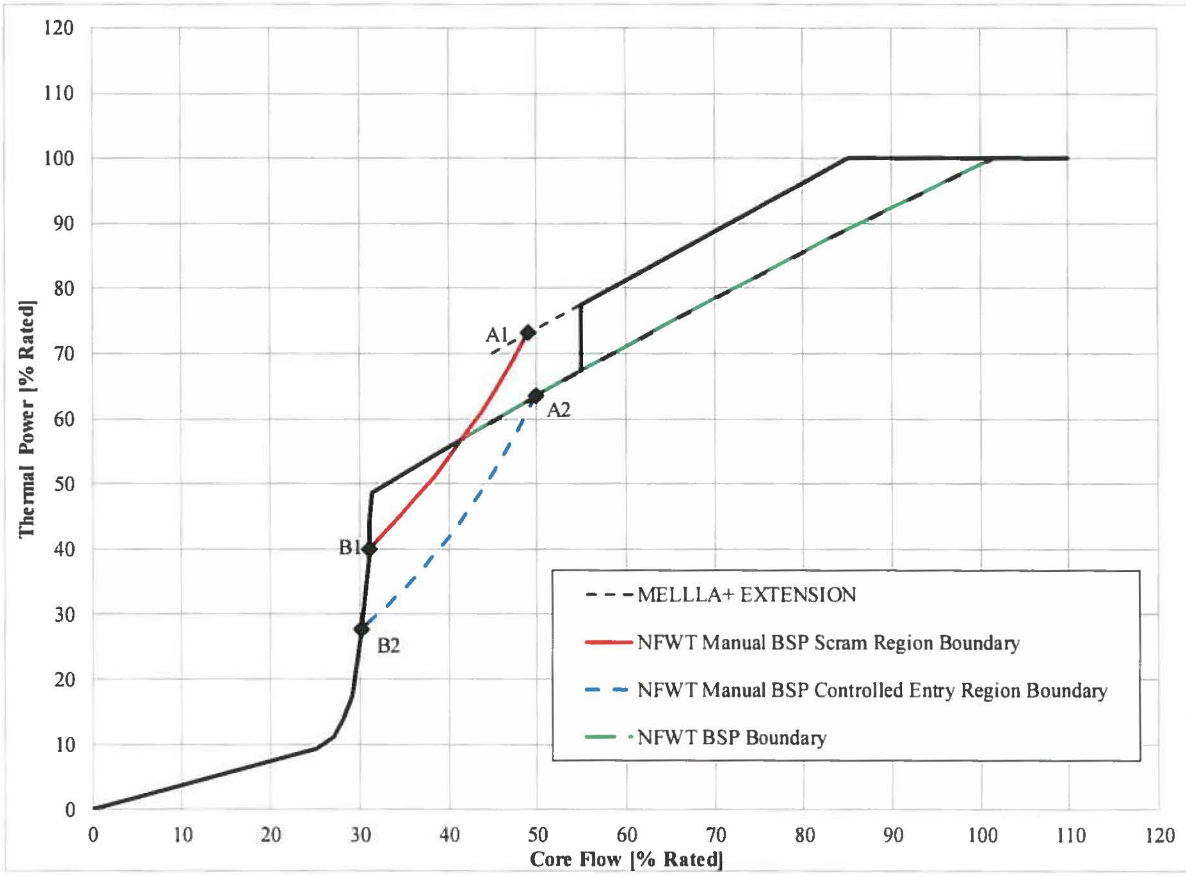

Figure 29 Manual BSP Regions and BSP Boundary for Normal Feedwater Temperature Operation

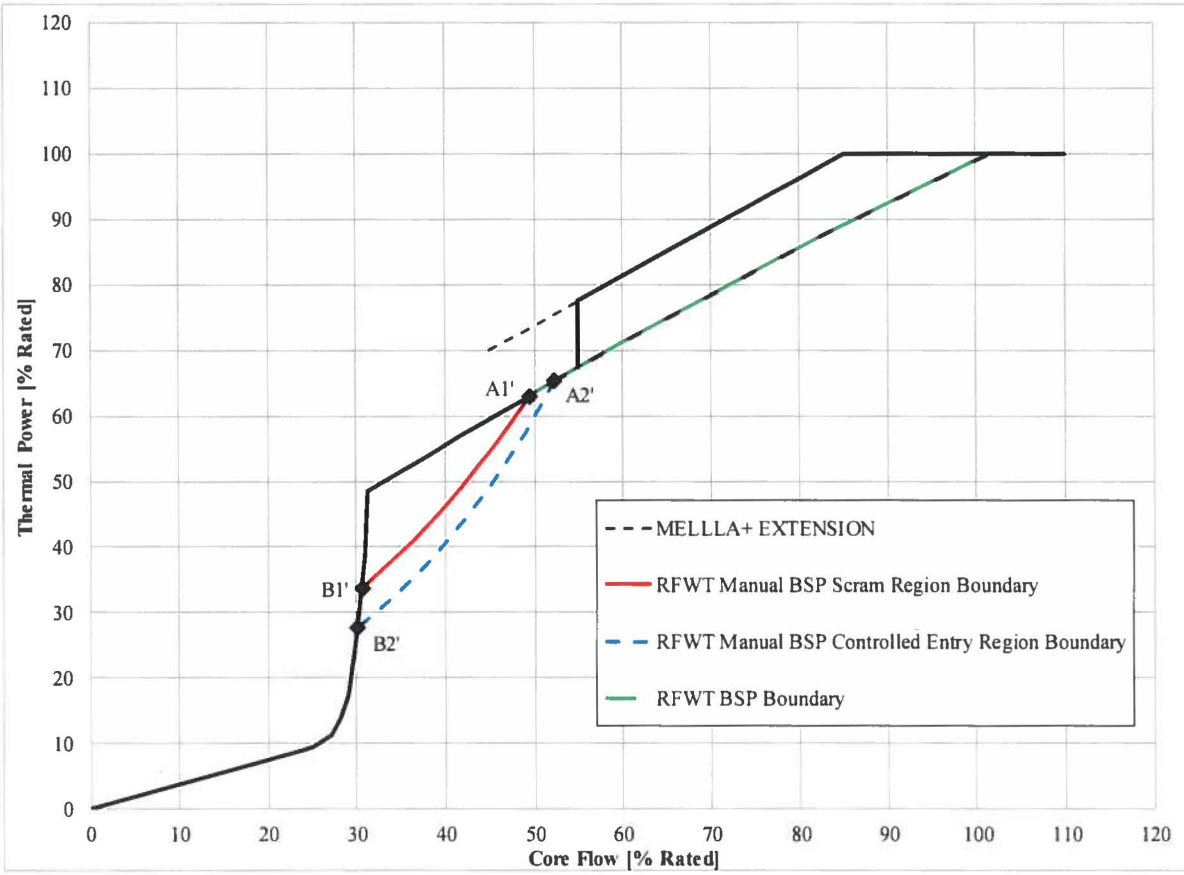

Figure 30 Manual BSP Regions and BSP Boundary for Reduced Feedwater Temperature Operation

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

Parameter	Analysis Value			
	ICF NFWT	LCF NFWT	ICF RFWT	LCF RFWT
Thermal power, MWt	4016.0	4016.0	4016.0	4016.0
Core flow, Mlb/hr	112.8	87.3	112.8	104.0
Reactor pressure (core mid-plane), psia	1067.0	1062.3	1048.4	1046.8
Inlet enthalpy, Btu/lb	524.2	515.8	512.6	509.4
Non-fuel power fraction [18]	N/A	N/A	N/A	N/A
Steam flow, Mlb/hr	16.49	16.46	14.82	14.81
Dome pressure, psig	1035.2	1034.4	1017.4	1017.4
Turbine pressure, psig	961.3	960.8	957.1	957.2

Table A-2 Pressure Relief and Safety Valve Configuration

Valve Type	Number of Valves	Lowest Setpoint (psig)
Safety/Relief Valve	11	1169.1
Spring Safety Valve	3	1297.8

[18] For TRACG methodology, the direct moderator heating is a function of moderator density.

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. The Inadvertent HPCI start-up event with a Level 8 turbine trip was analyzed with TRACG, and the OLMCPR results are summarized in Section 11 if the event sets the OLMCPR for an application condition.

Appendix D
Off-Rated Limits

Off-Rated Power Dependent Limits

The off-rated power dependent limits to be applied for Base, Base + TBSOOS, Base + RPTOOS, and Base + PROOS and/or PLUOOS are documented in Reference D-1. The Kp/MCPRp and LHGRFACp limits provided in Reference D-1 have been validated for this cycle.

The MCPRp limits provided in Reference D-1 are based on a SLMCPR of 1.15; therefore no SLMCPR adjustment is required for this cycle.

The Base Case includes 2 TBVOOS, 1 SRVOOS, 1 MSIVOOS, 1 TCV/TSVOOS, and FWHOOS/FFWTR. These Base Case EOOS conditions are included in all other application conditions.

The off-rated power dependent limits support 1 MSIVOOS at power levels ≤ 65% rated thermal power in all application conditions. The off-rated power dependent limits support 1 TCV/TSVOOS at power levels ≤ 54% rated thermal power in Base + TBSOOS. The off-rated power dependent limits support 1 TCV/TSVOOS at power levels ≤ 78% rated thermal power in all other application conditions.

<table>
<tr><td colspan="4">MCPRp Limits for:
BASE (1MSIVOOS, 1TCV and/or 1TSVOOS, 1SRVOOS, 2TBVOOS)</td></tr>
<tr><td colspan="4">Limits for Power < 26.3%</td></tr>
<tr><td colspan="2">Flow > 60.0%</td><td colspan="2">Flow ≤ 60.0%</td></tr>
<tr><td>Power (%)</td><td>Limit
MCPRp</td><td>Power (%)</td><td>Limit
MCPRp</td></tr>
<tr><td>22.6</td><td>2.99</td><td>22.6</td><td>2.67</td></tr>
<tr><td>26.3</td><td>2.83</td><td>26.3</td><td>2.60</td></tr>
<tr><td colspan="4">Limits for Power ≥ 26.3%</td></tr>
<tr><td colspan="2">Power (%)</td><td colspan="2">Limit
Kp</td></tr>
<tr><td colspan="2">26.3</td><td colspan="2">1.392</td></tr>
<tr><td colspan="2">40.0</td><td colspan="2">1.288</td></tr>
<tr><td colspan="2">55.0</td><td colspan="2">1.237</td></tr>
<tr><td colspan="2">65.0</td><td colspan="2">1.130</td></tr>
<tr><td colspan="2">85.0</td><td colspan="2">1.067</td></tr>
<tr><td colspan="2">100.0</td><td colspan="2">1.000</td></tr>
</table>

MCPRp Limits for: BASE + TBSOOS			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit** *MCPRp*	**Power (%)**	**Limit** *MCPRp*
22.6	4.15	22.6	3.64
26.3	3.78	26.3	3.25
Limits for Power ≥ 26.3%			
Power (%)		**Limit** *Kp*	
26.3		1.399	
40.0		1.323	
55.0		1.237	
65.0		1.155	
85.0		1.079	
100.0		1.000	

MCPRp Limits for: BASE + RPTOOS			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit** *MCPRp*	**Power (%)**	**Limit** *MCPRp*
22.6	2.99	22.6	2.67
26.3	2.83	26.3	2.60
Limits for Power ≥ 26.3%			
Power (%)		**Limit** *Kp*	
26.3		1.392	
40.0		1.288	
55.0		1.237	
65.0		1.130	
85.0		1.067	
100.0		1.000	

MCPRp Limits for: BASE + PROOS and/or PLUOOS			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit** *MCPRp*	**Power (%)**	**Limit** *MCPRp*
22.6	2.99	22.6	2.67
26.3	2.83	26.3	2.60
Limits for Power ≥ 26.3%			
Power (%)		**Limit** *Kp*	
26.3		1.392	
40.0		1.288	
55.0		1.237	
65.0		1.210	
85.0		1.147	
100.0		1.000	

LHGRFACp Limits for: BASE (1MSIVOOS, 1TCV and/or 1TSVOOS, 1SRVOOS, 2TBVOOS)			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit**	**Power (%)**	**Limit**
22.6	0.508	22.6	0.508
26.3	0.522	26.3	0.522
Limits for Power ≥ 26.3%			
Power (%)		**Limit**	
26.3		0.620	
40.0		0.696	
55.0		0.751	
65.0		0.817	
85.0		0.930	
100.0		1.000	

LHGRFACp Limits for: BASE + TBSOOS			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit**	**Power (%)**	**Limit**
22.6	0.397	22.6	0.397
26.3	0.417	26.3	0.442
Limits for Power ≥ 26.3%			
Power (%)		**Limit**	
26.3		0.620	
40.0		0.655	
55.0		0.714	
65.0		0.817	
85.0		0.930	
100.0		1.000	

LHGRFACp Limits for: BASE + RPTOOS			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit**	**Power (%)**	**Limit**
22.6	0.508	22.6	0.508
26.3	0.522	26.3	0.522
Limits for Power ≥ 26.3%			
Power (%)		**Limit**	
26.3		0.620	
40.0		0.696	
55.0		0.751	
65.0		0.817	
85.0		0.930	
100.0		1.000	

LHGRFACp Limits for: **BASE + PROOS and/or PLUOOS**			
Limits for Power < 26.3%			
Flow > 60.0%		**Flow ≤ 60.0%**	
Power (%)	**Limit**	**Power (%)**	**Limit**
22.6	0.508	22.6	0.508
26.3	0.522	26.3	0.522
Limits for Power ≥ 26.3%			
Power (%)		**Limit**	
26.3		0.620	
40.0		0.696	
55.0		0.751	
65.0		0.817	
85.0		0.930	
100.0		1.000	

Off-Rated Flow Dependent Limits

The off-rated flow dependent limits to be applied for Base, Base + TBSOOS, Base + RPTOOS, and Base + PROOS and/or PLUOOS are documented in Reference D-1. The MCPRf and LHGRFACf limits provided in Reference D-1 have been validated for this cycle. The flow dependent limits basis is a single pump runout with no mechanical scoop tube setpoint. Peach Bottom has ASDs installed and no M/G set. Flow dependent limits are provided for operation up to a maximum of 110% rated core flow.

The MCPRf limits provided in Reference D-1 are based on a SLMCPR of 1.12; therefore, the MCPRf limits have been scaled for the cycle-specific SLMCPR in Section 11.

The off-rated flow dependent limits support 1 MSIVOOS at power levels ≤ 65% rated thermal power in all application conditions. The off-rated flow dependent limits support 1 TCV/TSVOOS at power levels ≤ 54% rated thermal power in Base + TBSOOS. The off-rated flow dependent limits support 1 TCV/TSVOOS at power levels ≤ 78% rated thermal power in all other application conditions.

MCPRf Limits for: **BASE (1MSIVOOS, 1TCV and/or 1TSVOOS, 1SRVOOS, 2TBVOOS)**	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit** *MCPRf*
30.0	1.57
86.0	1.25
110.0	1.25

MCPRf Limits for: BASE + TBSOOS	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit** *MCPRf*
30.0	1.57
86.0	1.25
110.0	1.25

MCPRf Limits for: BASE + RPTOOS	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit** *MCPRf*
30.0	1.57
86.0	1.25
110.0	1.25

MCPRf Limits for: BASE + PROOS and/or PLUOOS	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit** *MCPRf*
30.0	1.57
86.0	1.25
110.0	1.25

LHGRFACf Limits for: BASE (1MSIVOOS, 1TCV and/or 1TSVOOS, 1SRVOOS, 2TBVOOS)	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit**
30.0	0.706
70.0	0.973
80.0	1.000
110.0	1.000

LHGRFACf Limits for: BASE + TBSOOS	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit**
30.0	0.706
70.0	0.973
80.0	1.000
110.0	1.000

LHGRFACf Limits for: BASE + RPTOOS	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit**
30.0	0.706
70.0	0.973
80.0	1.000
110.0	1.000

LHGRFACf Limits for: BASE + PROOS and/or PLUOOS	
Limits for a Maximum Runout Flow of 110.0%	
Flow (%)	**Limit**
30.0	0.706
70.0	0.973
80.0	1.000
110.0	1.000

References

D-1. *Peach Bottom Atomic Power Station Units 2 and 3 TRACG Implementation for Reload Licensing Transient Analysis*, 0000-0135-9000-R2, June 2017.

Appendix E
TRACG04 AOO Supplementary Information

Reference E-1 provides the results of the evaluations supporting the application of TRACG04 for AOO analyses for Peach Bottom. Section 11 of this report presents the MCPR limits based on the TRACG04 methodology of Reference E-2.

The safety evaluation report for licensing topical report NEDE-32906P Supplement 3-A (Reference E-2) concluded that the application of TRACG04 methods to AOO and overpressure transient analyses were acceptable subject to certain limitations and conditions. Peach Bottom 3 Cycle 22 is in compliance with these limitations and conditions.

References

E-1. *Peach Bottom Atomic Power Station Units 2 and 3 TRACG Implementation for Reload Licensing Transient Analysis, 0000-0135-9000-R2, Revision 2, June 2017.*

E-2. *Migration to TRACG04/PANAC11 from TRACG02/PANAC10 for TRACG AOO and ATWS Overpressure Transients*, NEDE-32906P, Supplement 3-A, Revision 1, April 2010.

Appendix F
Interim Methods LTR (NEDC-33173P-A Revision 4) Supplemental Information

The safety evaluation for licensing topical report NEDC-33173P-A Revision 4 (Reference F-1) concluded that the application of GEH/GNF methods to expanded operating domains was acceptable subject to certain limitations and conditions. Several of these limitations and conditions request that additional, application-specific information be provided in the SRLR. The information provided below responds to these requests for the identified items.

Limitation and Condition 9.5 (SLMCPR 2)

Limitation and Condition 9.5 states:

> *"For operation at MELLLA+, including operation at the EPU power levels at the achievable core flow state-point, a 0.01 value shall be added to the cycle-specific SLMCPR value for power-to-flow ratios up to 42 MWt/Mlbm/hr, and a 0.02 value shall be added to the cycle-specific SLMCPR value for power-to-flow ratios above 42 MWt/Mlbm/hr."*

For operation at MELLLA+, a 0.02 value was added to the cycle specific SLMCPR. The SLMCPR values reported in Section 11 reflect this adder.

Limitation and Condition 9.8 (ECCS-LOCA 2)

Limitation and Condition 9.8 states:

> *"The ECCS-LOCA will be performed for all statepoints in the upper boundary of the expanded operating domain, including the minimum core flow statepoints, the transition statepoint, as defined in Reference F-2 and the 55 percent core flow statepoint. The plant-specific application will report the limiting ECCS-LOCA results as well as the rated power and flow results. The SRLR will include both the limiting statepoint ECCS-LOCA results and the rated conditions ECCS-LOCA results."*

This limitation and condition is satisfied by the Appendix K PCTs reported in Reference 1 in Section 16.4. The level of detail contained in the SRLR is consistent with the NRC evaluation of the GNF response to RAI 25 Item b in the M+LTR (Reference F-2). The SRLR reports the bounding Licensing Basis PCT for all statepoints analyzed.

Limitation and Condition 9.10/9.11 (Transient LHGR 2/3)

Limitation and Condition 9.10 states:

> *"Each EPU and MELLLA+ fuel reload will document the calculation results of the analyses demonstrating compliance to transient T-M acceptance criteria. The plant T-M response will be provided with the SRLR or COLR, or it will be reported directly to the NRC as an attachment to the SRLR or COLR."*

Limitation and Condition 9.11 states:

> *"To account for the impact of the void history bias, plant-specific EPU and MELLLA+ applications using either TRACG or ODYN will demonstrate an equivalent to 10 percent margin to the fuel centerline melt and the 1 percent cladding circumferential plastic strain acceptance criteria due to pellet-cladding mechanical interaction for all of limiting AOO transient events, including equipment out-of-service. Limiting transients in this case, refers to transients where the void reactivity coefficient plays a significant role (such as pressurization events). If the void history bias is incorporated into the transient model within the code, then the additional 10 percent margin to the fuel centerline melt and the 1 percent cladding circumferential plastic strain is no longer required."*

Appendix B documents the fact that the results for all analyzed transients demonstrate compliance with thermal-mechanical acceptance criteria.

Table F-1 summarizes the percent margin to the Thermal Overpower and Mechanical Overpower acceptance criteria.

As referenced in Appendix E, the void history bias was incorporated into the transient model within the TRACG04 code, and therefore the 10 percent margin to the fuel centerline melt and the 1 percent cladding circumferential plastic strain acceptance criteria is no longer required.

Table F-1 Margin to the Thermal Overpower and Mechanical Overpower Acceptance Criteria

Criteria	**GNF2**
Thermal Overpower	2.76%
Mechanical Overpower	0.60%

Limitation and Condition 9.17 (Steady-State 5 Percent Bypass Voiding)

Limitation and Condition 9.17 states:

> *"The instrumentation specification design bases limit the presence of bypass voiding to 5 percent (LRPM (sic) levels). Limiting the bypass voiding to less than 5 percent for long term steady operation ensures that instrumentation is operated within the specification. For EPU and MELLLA+ operation, the bypass voiding will be evaluated on a cycle-specific basis to confirm that the void fraction remains below 5 percent at all LPRM levels when operating at steady-state conditions within the MELLLA+ upper boundary. The highest calculated bypass voiding at any LPRM level will be provided with the plant-specific SRLR."*

The bypass voiding 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.

Limitation and Condition 9.18 (Stability Setpoints Adjustment)

Limitation and Condition 9.18 states:

> *"The NRC staff concludes that the presence bypass voiding at the low-flow conditions where instabilities are likely can result in calibration errors of less than 5 percent for OPRM cells and less than 2 percent for APRM signals. These calibration errors must be accounted for while determining the setpoints for any detect and suppress long term methodology. The calibration values for the different long-term solutions are specified in the associated sections of this SE, discussing the stability methodology."*

This limitation and condition is not applicable to DSS-CD because the significant conservatisms in the current licensing methodology and associated MCPR margins are more than sufficient to compensate for the overall uncertainty in the OPRM instrumentation.

Limitation and Condition 9.19 (Void-Quality Correlation 1)

Limitation and Condition 9.19 states:

> *"For applications involving PANCEA(sic)/ODYN/ISCOR/TASC for operation at EPU and MELLLA+, an additional 0.01 will be added to the OLMCPR, until such time that GE expands the experimental database supporting the Findlay-Dix void-quality correlation to demonstrate the accuracy and performance of the void-quality correlation based on experimental data representative of the current fuel designs and operating conditions during steady-state, transient, and accident conditions."*

The OLMCPR limitation requiring an additional 0.01 adder on the OLMCPR does not apply to EPU or MELLLA+ licensing calculations when TRACG04 methods are used (Reference F-3). Therefore, the OLMCPR adder is not applied to Peach Bottom Unit 3 Cycle 22.

References

F-1. *Applicability of GE Methods to Expanded Operating Domains,* NEDC-33173P-A, Revision 4, November 2012.

F-2. *General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus,* NEDC-33006P-A, Revision 3, June 2009.

F-3. *Migration to TRACG04 / PANAC11 from TRACG02 / PANAC10 for TRACG AOO and ATWS Overpressure Transients*, NEDE-32906P, Supplement 3-A, Revision 1, April 2010.

Appendix G
MELLLA+ LTR (NEDC-33006P-A Revision 3) Supplemental Information

The safety evaluation for licensing topical report NEDC-33006P-A Revision 3 (Reference G-1) approved the operation of GE BWRs in the MELLLA+ expanded operating domain, subject to certain limitations and conditions. Several of these limitations and conditions request that additional, application-specific information be provided in the SRLR. The information provided below responds to these requests for the identified items.

Limitation and Condition 12.6 (SLMCPR Statepoints and CF Uncertainty)

Limitation and Condition 12.6 states:

> *"Until such time when the SLMCPR methodology (References G-3 and G-4) for off-rated SLMCPR calculation is approved by the staff for MELLLA+ operation, the SLMCPR will be calculated at the rated statepoint (120 percent P/100 percent CF), the plant-specific minimum CF statepoint (e.g., 120 percent P/80 percent CF), and at the 100 percent OLTP at 55 percent CF statepoint. The currently approved off-rated CF uncertainty will be used for the minimum CF and 55 percent CF statepoints. The uncertainty must be consistent with the CF uncertainty currently applied to the SLO operation or as NRC-approved for MELLLA+ operation. The calculated values will be documented in the SRLR."*

As requested, the SLMCPR calculated results at specified off-rated power/flow conditions are reported in Table G-1 below, including the low CF statepoint.

Table G-1 Two-Loop SLMCPR Results for MELLLA+ Conditions

Power (% Rated)	Flow (% Rated)	SLMCPR
100.0	110.0	1.07
100.0	100.0	1.07
100.0	85.2	1.11
77.5	55.0	1.12

Limitation and Condition 12.10.b (ECCS-LOCA Off-Rated Multiplier)

Limitation and Condition 12.10.b states:

> *"LOCA analysis is not performed on cycle-specific basis; therefore, the thermal limits applied in the M+SAR LOCA analysis for the 55 percent CF MELLLA+ statepoint and/or the transition statepoint must be either bounding or consistent with cycle-specific off-rated limits. The COLR and the SRLR will contain confirmation that the off-rated limits assumed in the ECCS-LOCA analyses bound the cycle-specific off-rated limits calculated for the MELLLA+ operation. Every future cycle reload shall confirm that the cycle-specific off-rated thermal limits applied at the 55 percent CF and/or the transition statepoints are consistent with those assumed in the plant-specific ECCS-LOCA analyses."*

The off-rated limits assumed in the ECCS-LOCA analyses are confirmed to be consistent with the cycle-specific off-rated LHGR multipliers calculated for the MELLLA+ operation. The off-rated LHGR multipliers provide adequate protection for the MELLLA+ operation.

Limitation and Condition 12.18.d (ATWS TRACG Analysis)

Limitation and Condition 12.18.d states:

> *"In general, the plant-specific application will ensure that operation in the MELLLA+ domain is consistent with the assumptions used in the ATWS analysis, including equipment out of service (e.g., FWHOOS, SLO, SRVs, SLC pumps, and RHR pumps, etc.). If assumptions are not satisfied, operation in MELLLA+ is not allowed. The SRLR will specify the prohibited flexibility options for plant-specific MELLLA+ operation, where applicable. For key input parameters, systems and engineering safety features that are important to simulating the ATWS analysis and are specified in the Technical Specification (TS) (e.g., SLCS parameters, ATWS RPT, etc.), the calculation assumptions must be consistent with the allowed TS values and the allowed plant configuration. If the analyses deviate from the allowed TS configuration for long term equipment out of service (i.e., beyond the TS LCO), the plant-specific application will specify and justify the deviation. In addition, the licensee must ensure that all operability requirements are met (e.g., NPSH) by equipment assumed operable in the calculations."*

This ATWS TRACG Analysis limitation and condition requires that the SRLR specify the prohibited flexibility options for plant-specific MELLLA+ operation, where applicable, as expressed by EOOS options in Section 8.

References

G-1. *General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus*, NEDC-33006P-A, Revision 3, June 2009.

G-2. *GE Hitachi Boiling Water Reactor, Detect and Suppress Solution – Confirmation Density*, NEDC-33075P, Revision 8, November 2013.

G-3. *Methodology and Uncertainties for Safety Limit MCPR Evaluations*, NEDC-32601P-A, August 1999.

G-4. *Power Distribution Uncertainties for Safety Limit MCPR Evaluations*, NEDC-32694P-A, August 1999.

G-5. *DSS-CD TRACG Application*, NEDE-33147P-A, Revision 4, August 2013.

Appendix H
Application to Current Licensed Thermal Power (CLTP)

The reload licensing analysis for this plant and cycle is based on TPO conditions at 4016 MWt rated core power (Reference H-1) and is applicable to CLTP conditions at 3951 MWt rated core power (Reference H-2).

Off-rated limits have been developed based on the plant transient trends versus percent of rated power and flow and these relationships have been validated for Peach Bottom TPO. Therefore, the off-rated limits provided in Appendix D are applicable for operation at both CLTP and TPO conditions. Note, however, that the Appendix D power dependent off-rated limits have been provided at TPO values of Pbypass and Pmin of 26.3% rated power and 22.6% rated power, respectively. The power dependent limit values at Pbypass and Pmin have been validated as applicable for operation at both CLTP and TPO conditions. At CLTP conditions, the power level values for Pbypass and Pmin should be adjusted to those appropriate for CLTP.

The BSP Scram Region and Controlled Entry Region for both NFWT and RFWT are conservative for CLTP in terms of absolute power. The Scram Region and Controller Entry Region power level based coordinates may be rescaled from the TPO power level to the CLTP power level. The ABSP setpoints are conservative for CLTP in terms of absolute power. The ABSP constant power line setpoint ($P_{BSP\text{-}TRIP}$) and the slope (m_{TRIP}) may also be rescaled from the TPO power level to the CLTP power level.

References

H-1. *Safety Analysis Report for Peach Bottom Atomic Power Station Units 2 and 3 Thermal Power Optimization,* NEDC-33873P, Revision 0, February 2017.

H-2. *Safety Analysis Report for Peach Bottom Atomic Power Station Units 2 & 3 Maximum Extended Load Line Limit Analysis Plus,* NEDC-33720P, Revision 0, September 2014.

Appendix I

Peach Bottom Unit 3 Cycle 22 Contingency TCV/TSV Delay Analysis

The pressurization transient results provided in Section 9 and Section 11 were performed with a 0 ms TSV delay time following a high water level (L8) turbine trip and a 0 ms TCV delay time following a high water level (L8) turbine trip.

A contingency analysis for Peach Bottom 3 Cycle 22 was performed with a 0 ms TSV delay time following a high water level (L8) turbine trip and a 45 ms TCV delay time following a high water level (L8) turbine trip. The contingency analysis evaluated the impact of this change on the FWCF and HPCIL8 events. The results show that the change could impact the Peach Bottom 3 Cycle 22 reload analysis limits. The following pressurization transient OLMCPR may be implemented for Peach Bottom 3 Cycle 22 instead of those provided in Section 11 if the TCV delay time is at least 45 ms longer than the TSV delay time.

Limiting Pressurization Events OLMCPR Summary Table:

Appl. Cond.	Exposure Range	Option A	Option B
		GNF2	**GNF2**
1	**Base (1MSIVOOS, 1TCV and/or 1TSVOOS, 1SRVOOS, 2TBVOOS)**		
	BOC to MOC	1.46	1.38
	MOC to EOC	1.49	1.41
2	**Base + TBSOOS**		
	BOC to MOC	1.51	1.42
	MOC to EOC	1.55	1.46
3	**Base + RPTOOS**		
	BOC to MOC	1.58	1.41
	MOC to EOC	1.61	1.44
4	**Base + PROOS and/or PLUOOS**		
	BOC to MOC	1.46	1.38
	MOC to EOC	1.49	1.41

Appendix J
End of Cycle Power Coastdown Restrictions

End-of-cycle power coastdown operation down to 40% reactor power is supported by the GESTAR basis document identified at the beginning of this report. Coastdown operation beyond the EOR condition is conservatively bounded by the reload licensing analyses at the EOR condition for a normal coastdown power profile. During coastdown, operation at a power level above that which can be achieved (at all-rods-out with all cycle extensions features utilized, e.g., ICF, FFWTR) with steady-state equilibrium xenon concentrations is not supported.

Appendix K
List of Acronyms

Acronym	Description
ΔCPR	Delta Critical Power Ratio
Δk	Delta k-effective
2RPT (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
ASD	Adjustable Speed Drive
BOC	Beginning of Cycle
BSP	Backup Stability Protection
BWROG	Boiling Water Reactor Owners Group
CCFL	Countercurrent Flow Limitation
CFR	Code of Federal Regulation
COLR	Core Operating Limits Report
CPR	Critical Power Ratio
DIRPT	Delta MCPR over Initial MCPR for a two-Recirculation Pump Trip
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)
EOOS	Equipment Out of Service
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
FW	Feedwater
FWCF	Feedwater Controller Failure
FWHOOS	Feedwater Heaters Out of Service
FWTR	Feedwater Temperature Reduction
GESTAR	General Electric Standard Application for Reactor Fuel
GETAB	General Electric Thermal Analysis Basis
GS3	GEH Simplified Stability Solution
GSF	Generic Shape Function
HAL	Haling Burn
HBB	Hard Bottom Burn

Acronym	Description
HBOM	Hot Bundle Oscillation Magnitude
HCOM	Hot Channel Oscillation Magnitude
HFCL	High Flow Control Line
HPCI	High Pressure Coolant Injection
ICA	Interim Corrective Action
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
LFWH	Loss of Feedwater Heating
LHGR	Linear Heat Generation Rate
LHGRFACf	Off-rated flow dependent LHGR multiplier
LHGRFACp	Off-rated power dependent LHGR multiplier
LOCA	Loss of Coolant Accident
LOSC	Loss of Stator Cooling
LPRM	Local Power Range Monitor
LRNBP	Load Rejection without Bypass
LRWHBP	Load Rejection with Half 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
MEOD	Maximum Extended Operating Domain
MOC	Middle of Cycle
MRB	Maximal Region Boundaries
MSF	Modified Shape Function
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/MT	Megawatt days per Metric Ton
MWd/ST	Megawatt days per Standard Ton
MWt	Megawatt Thermal
N/A	Not Applicable
NBP	No Bypass

Acronym	Description
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
P_{dome}	Peak Dome Pressure
P_{sl}	Peak Steam Line Pressure
P_v	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
SRI	Select Rod Insert
SRLR	Supplemental Reload Licensing Report
S/RV (SRV)	Safety/Relief Valve
SRVOOS	Safety/Relief Valve(s) Out of Service
SS	Steady State
SSV	Spring Safety Valve
STP	Simulated Thermal Power
STU	Short Tons (or Standard Tons) of Uranium
TBSOOS	Turbine Bypass System Out of Service
TBV	Turbine Bypass Valve
TBVO	Turbine Bypass Valves Open

Acronym	Description
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
TOPPS	Tracking Over-Power Protection System
TRF	Trip Reference Function
TSIP	Technical Specifications Improvement Program
TSV	Turbine Stop Valve
TSVOOS	Turbine Stop Valve Out of Service
TT	Turbine Trip
TTNBP	Turbine Trip without Bypass
TTWHBP	Turbine Trip with Half Bypass
UB	Under Burn