NEDO-24133
Class I
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SUPPLEMENTAL RELOAD LICENSING SUBMITTAL
FOR
MONTICELLO NUCLEAR GENERATING PLANT
RELOAD 6

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

1. PLANT-UNIQUE ITEMS (1.0)*

None.

2. RELOAD FUEL BUNDLES (1.0, 2.0, 3.3.1 AND 4.0)

	Fuel Type	Number	Number Drilled
Irradiated	8DB262	220	None
Irradiated	8DB250	24	None
Irradiated	8DB219L	128	None
New	8DRB265	52	52
New	8DRB282	60	60
	Total	484	

3. REFERENCE CORE LOADING PATTERN (3.3.1)

Nominal previous cycle core exposure: 8.89 Gwd/t. Nominal core average exposure at end of cycle ~14.4 GWd/t including coastdown. Core loading pattern: Figure 1.

4. CALCULATED CORE EFFECTIVE MULTIPLICATION AND CONTROL SYSTEM WORTH - NO VOIDS, 20°C (3.3.2.1.1 AND 3.3.2.1.2)

BOC k_{eff}	
Uncontrolled	1.112
Fully Controlled	0.9505
Strongest Control Rod Out	0.9859
R, Maximum Increase in Cold Core Reactivity with Exposure Into Cycle, Δk	0.0

*( ) refers to areas of discussion in Reference 1.

**Reference 1: "General Electric Boiling Water Reactor Generic Reload Fuel Application," NEDE-24011-P-3 and NEDO-24011-2, March 1978.

5. STANDBY LIQUID CONTROL SYSTEM SHUTDOWN CAPABILITY (3.3.2.1.3)

ppm	Shutdown Margin (Δk) (20°C, Xenon Free)
900	≥0.03

6. RELOAD UNIQUE TRANSIENT ANALYSIS INPUTS (3.3.2.1.5 AND 5.2)

	EOC 7
Void Coefficient N/A* (¢/% Rg)	-6.98/-8.7
Void Fraction (%)	37.37
Doppler Coefficient N/A (¢/°F)	-0.257/-0.244
Average Fuel Temperature (°F)	1157
Scram Worth N/A ($)	-38.29/-30.63
Scram Reactivity versus Time	Figure 2

7. RELOAD UNIQUE GETAB TRANSIENT ANALYSIS INITIAL CONDITION PARAMETERS (5.2)

	EOC 7	
Exposure	8x8	8x8R
Peaking factor (radial)	1.65	1.77
R-Factor	1.094	1.051
Bundle Power (MWt)	5.567	5.977
Bundle Flow (10^3 lb/hr)	103.3	101.0
Initial MCPR	1.32	1.32

8. SELECTED MARGIN IMPROVEMENT OPTIONS (5.2.2)

None (Improved Simmer Margin Evaluation is given in Appendix A)

*N = Nuclear Input Data
A = Used in Transient Analysis

9. CORE-WIDE TRANSIENT ANALYSIS RESULTS (5.2.1)

Transient	Exposure	Power (%)	Core Flow (%)	ϕ (% NBR)	Q/A (% NBR)	P_{SL} (psig)	P_V (psig)	ΔCPR 8x8/8x8R	Plant Response
Load Rejection without Bypass	EOC 7	100	100	313.2	114.3	1163	1197	0.24/0.24	Figure [illegible]
Turbine Trip without Bypass	EOC 7	100	100	311.6	114.9	1168	1201	0.25/0.25	Figure [illegible]
Loss of 100°F Feedwater Heater	-	100	100	119.1	118.0	1025	1070	0.16/0.17	Figure 4
Feedwater Controller Failure	--	100	100	231.9	114.8	1127	1169	0.22/0.22	Figure [illegible]

10. LOCAL ROD WITHDRAWAL ERROR (WITH LIMITING INSTRUMENT FAILURE) TRANSIENT SUMMARY (5.2.1)

Rod Block Reading**	Rod Position (Feet Withdrawn)	ΔCPR* 8x8/8x8R	LHGR 8x8/8x8R	Limiting Rod Pattern
104	3.0	0.068/0.115	13.36/13.46	
105	3.5	0.096/0.145	13.37/13.48	Figure 6
106	4.0	0.103/0.171	13.39/13.50	
107	4.0	0.103/0.171	13.39/13.50	
108	5.5	0.183/0.236	14.79/14.65	
109	6.5	0.231/0.295	15.50/15.36	

11. OPERATING MCPR LIMIT (5.2)

8x8	8x8R
1.32	1.32

*Based on initial MCPR of 1.69 8x8R, 1.46 (8x8).
**Indicates setpoint selected.

12. OVERPRESSURIZATION ANALYSIS SUMMARY (5.3)

Transient	Power (%)	Core Flow (%)	P_{sl} (psig)	P_v (psig)	Plant Response
MSIV Closure (Flux Scram)	100	100	1203	1241	Figure 7

13. STABILITY ANALYSIS RESULTS (5.4)

Decay Ratio: Figure 8

Reactor Core Stability:

Decay Ratio, x_2/x_o (Natural Circulation-100% Rod Line)	0.574

Channel Hydrodynamic Performance

	Decay Ratio (Natural Circulation-100% Rod Line)
8x8 Channel	0.088
8x8R Channel	0.065

14. LOSS-OF-COOLANT ACCIDENT RESULTS (5.5.2)

Fuel type 8DRB265

Exposure (MWd/t)	MAPLHGR (kW/ft)	PCT (°F)	Local Oxidation Fraction
200	10.4	2196	0.036
1,000	10.4	2199	0.036
5,000	10.4	2194	0.035
10,000	10.5	2198	0.035
15,000	10.5	2197	0.035
20,000	10.4	2198	0.036
25,000	10.3	2194	0.035
30,000	10.3	2196	0.036

Fuel type 8DRB282; other types reported in NEDO-24050, September 1977.

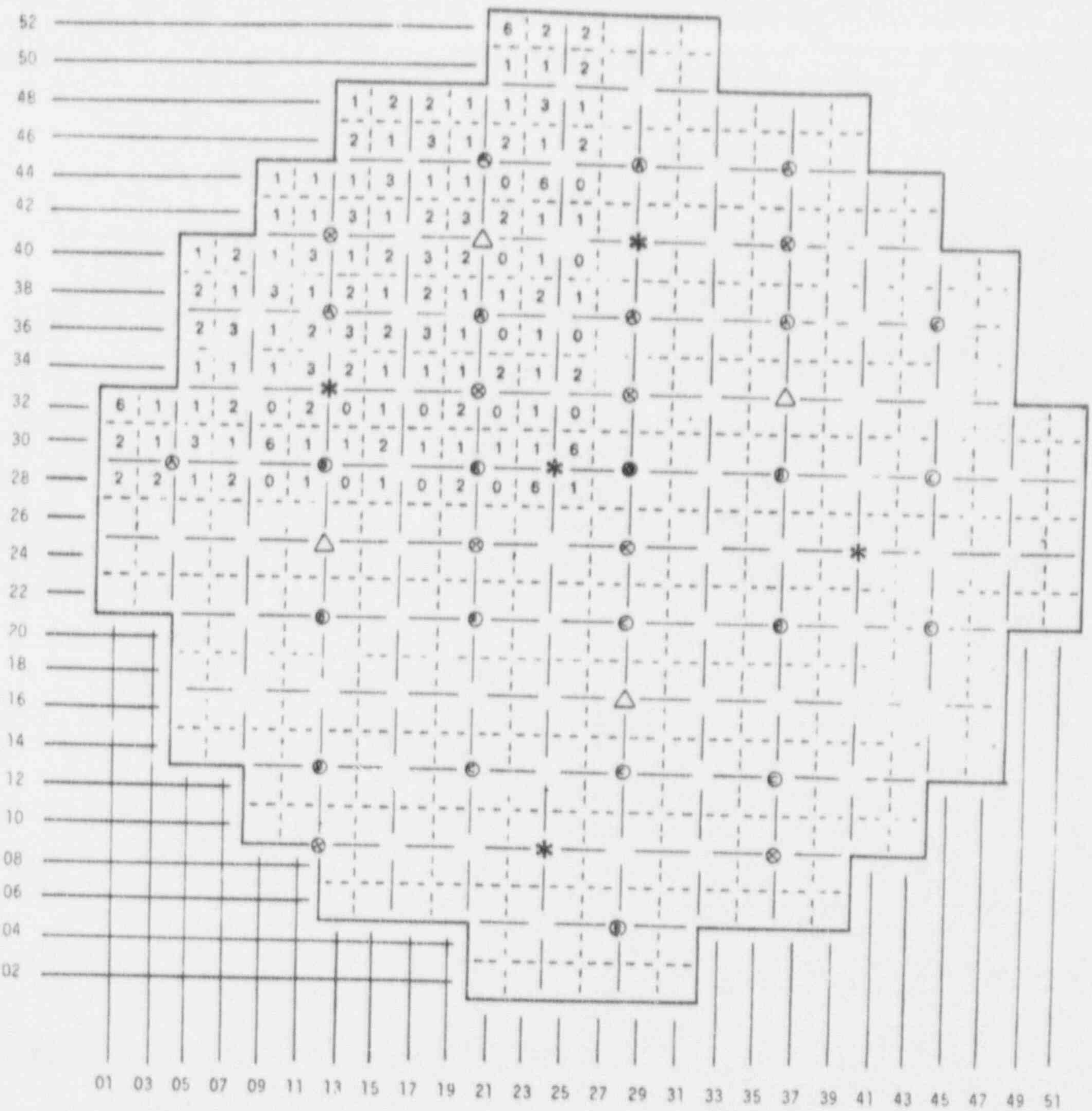
Exposure (MWd/t)	MAPLHGR (kW/ft)	PCT (°F)	Local Oxidation Fraction
200	10.3	2195	0.036
1,000	10.4	2197	0.036
5,000	10.4	2193	0.035
10,000	10.5	2198	0.035
15,000	10.5	2200	0.036
20,000	10.4	2198	0.036
25,000	10.3	2199	0.036
30,000	10.3	2195	0.036

15. LOADING ERROR RESULTS (5.5.4)

Limiting event for 8x8 fuel:	misplaced bundle
MCPR:	1.07 (from an initial CPR of 1.45)
Limiting event for 8x8R fuel:	rotated bundle
MCPR:	1.07 (from an initial CPR of 1.40)

16. CONTROL ROD DROP ANALYSIS RESULTS (5.5.1)

Doppler Reactivity Coefficient:	Figure 9
Accident Reactivity Shape Functions:	Figures 10 and 11
Scram Reactivity Functions:	Figures 12 and 13.



Ⓐ LPRM Location (Letter indicates TIP machine)

● LPRM Locatior Common location for all TIP machines)

⊗ IRM Locations

△ SRM Locations

✱ Source Locations

1 – BDB262
6 – BDB250
2 – BDB2196
3 – BDRB265
0 – BDRB282
QUARTER CORE SYMMETRIC

Figure 1. ᴹᵒnticello Design Reference Core Loading, Reload-6

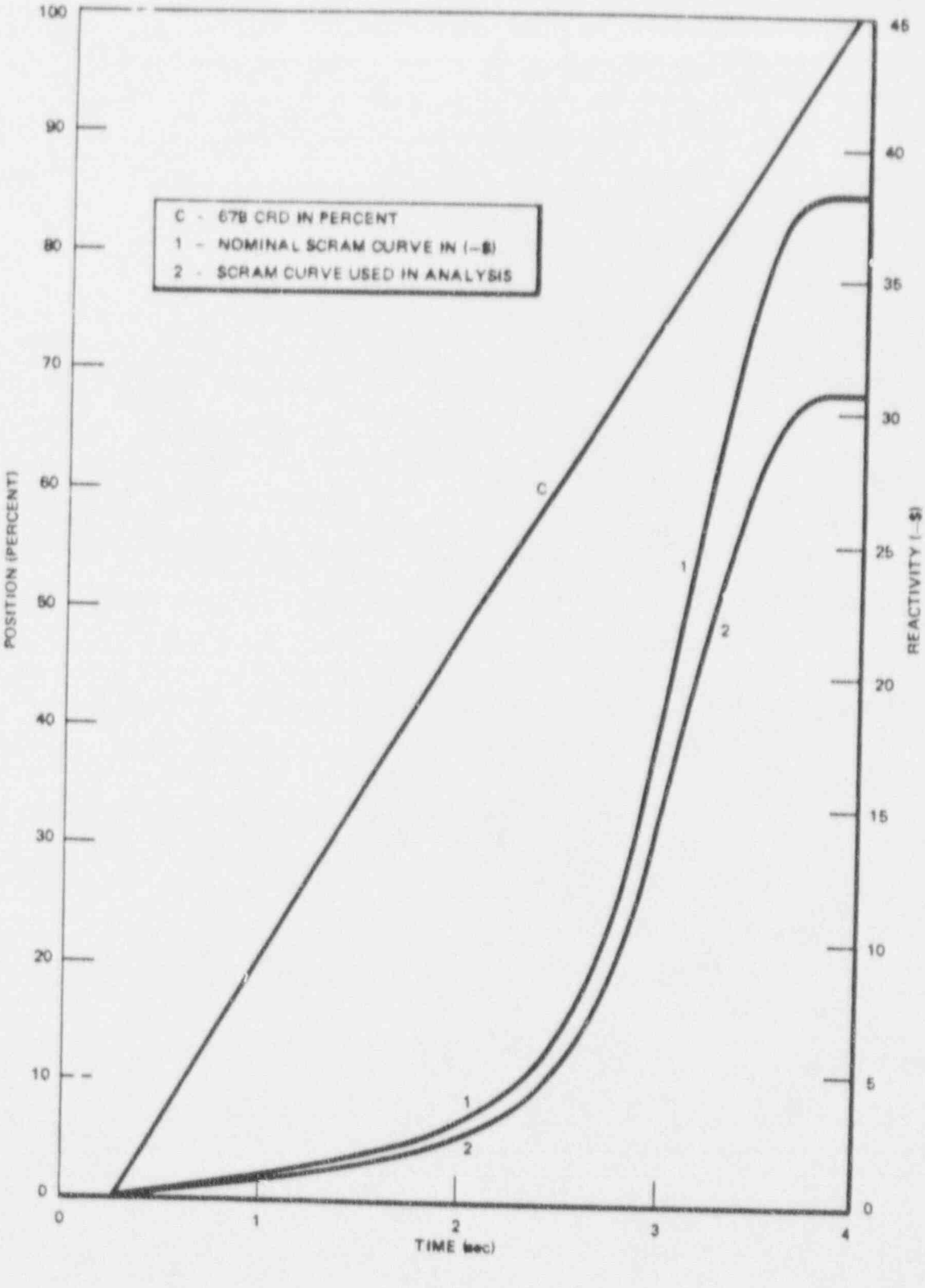


Figure 2. Scram Reactivity Curve for EOC 7

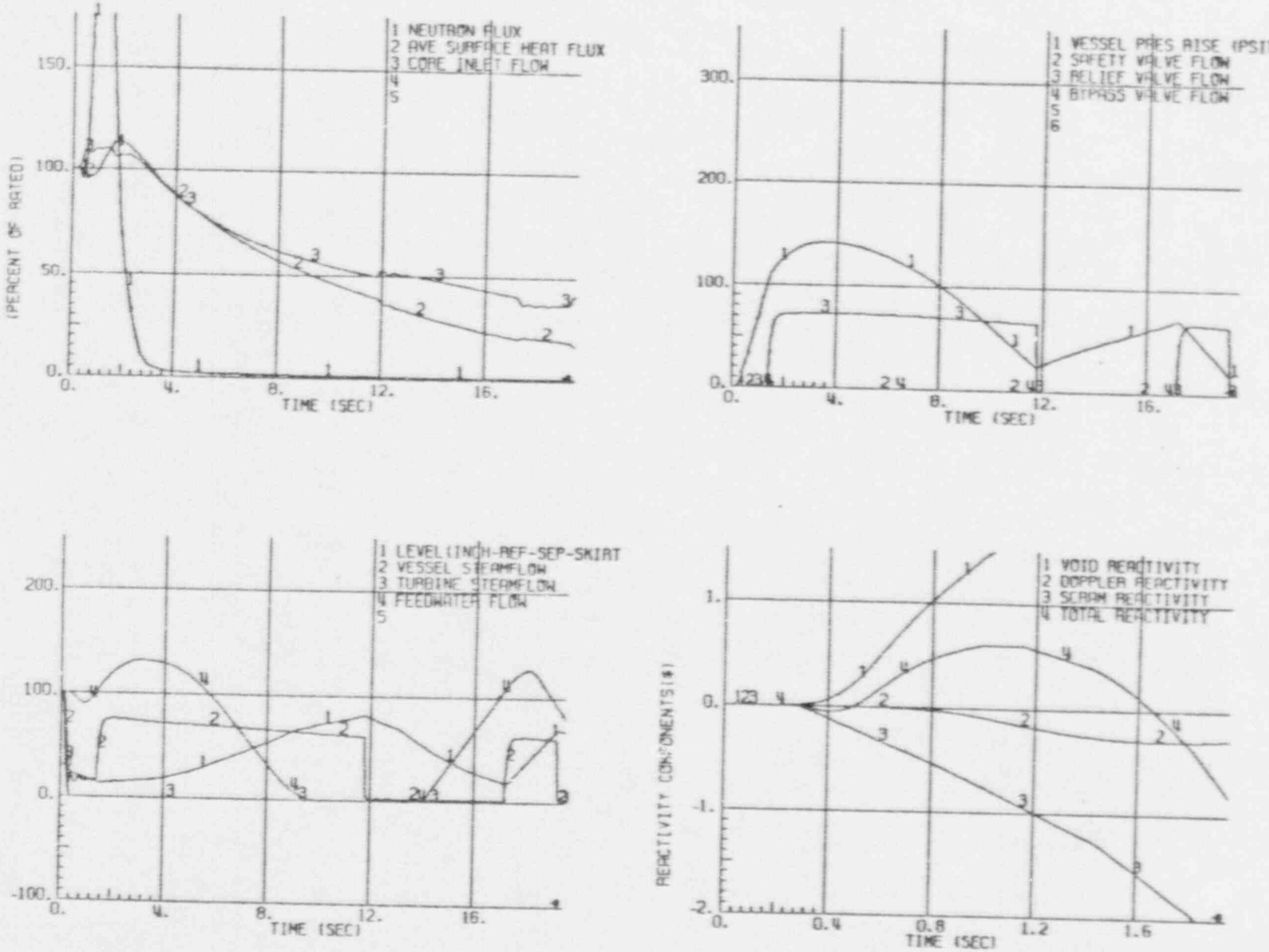


Figure 3a. Monticello EOC7 Generator Load Rejection, Without Bypass

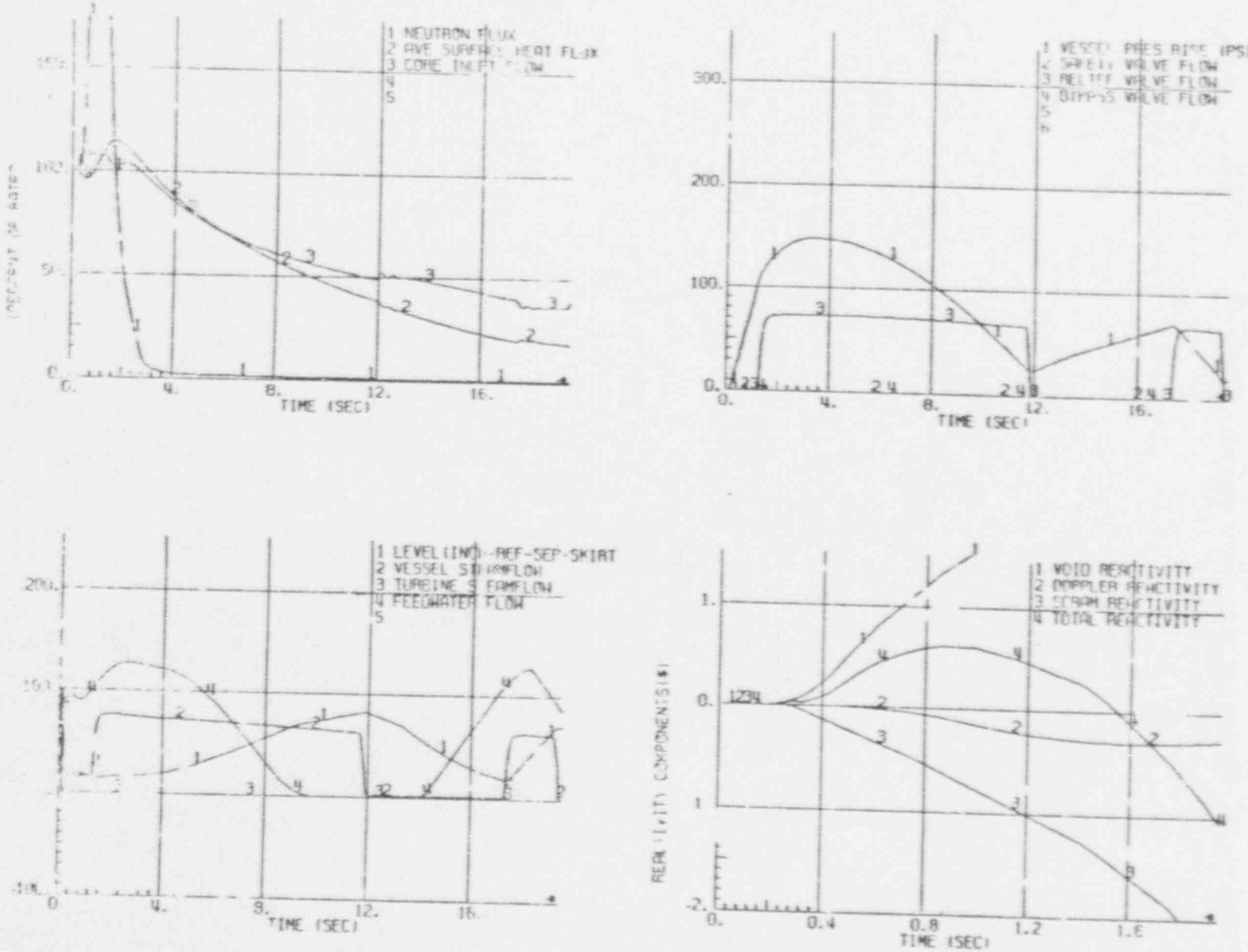


Figure 3b. Monticello EOC7, Turbine Trip Without Bypass, Trip Scram

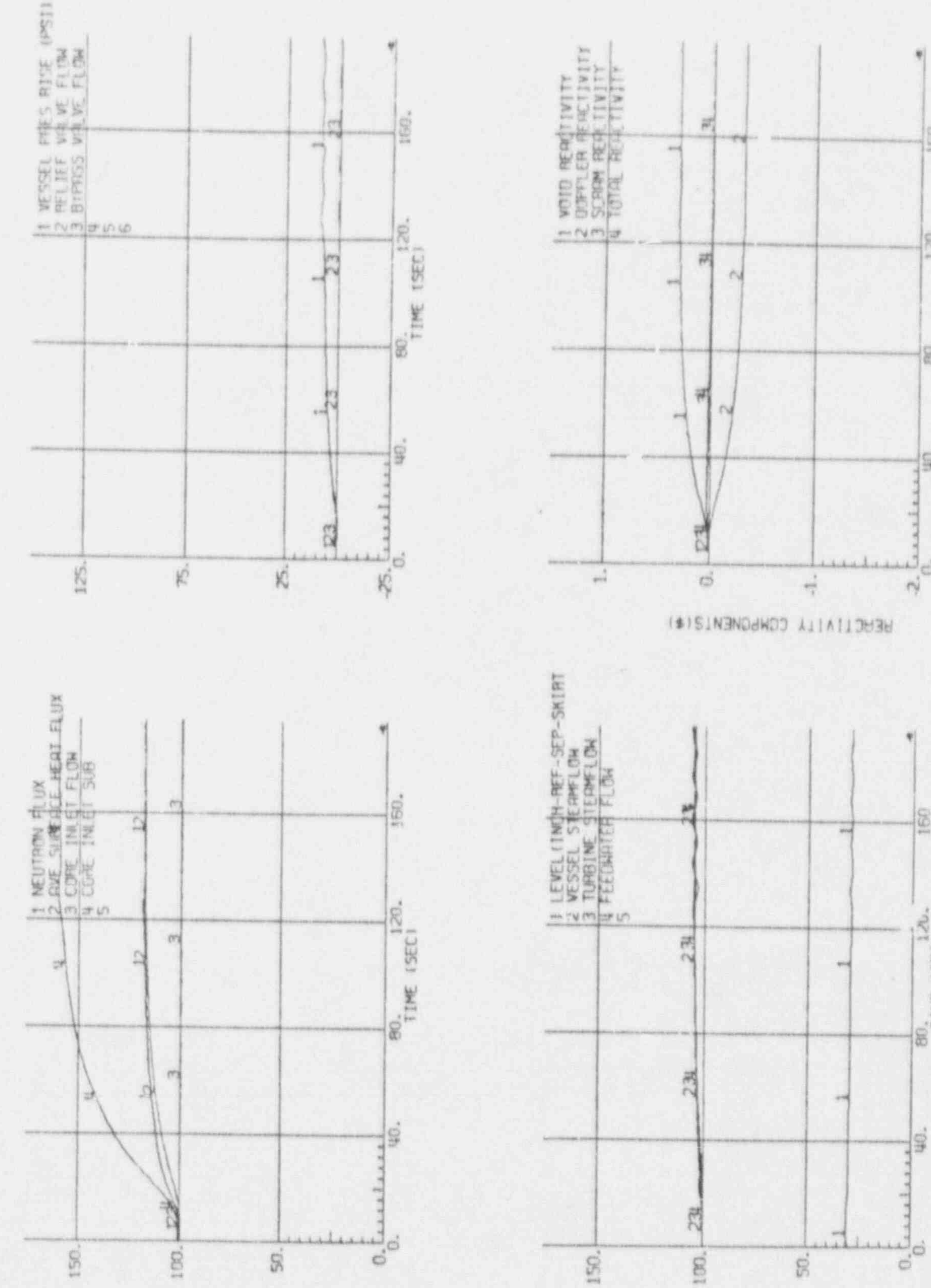


Figure 4. Monticello Loss of 100°F Feedwater Heating, Manual Flow Control

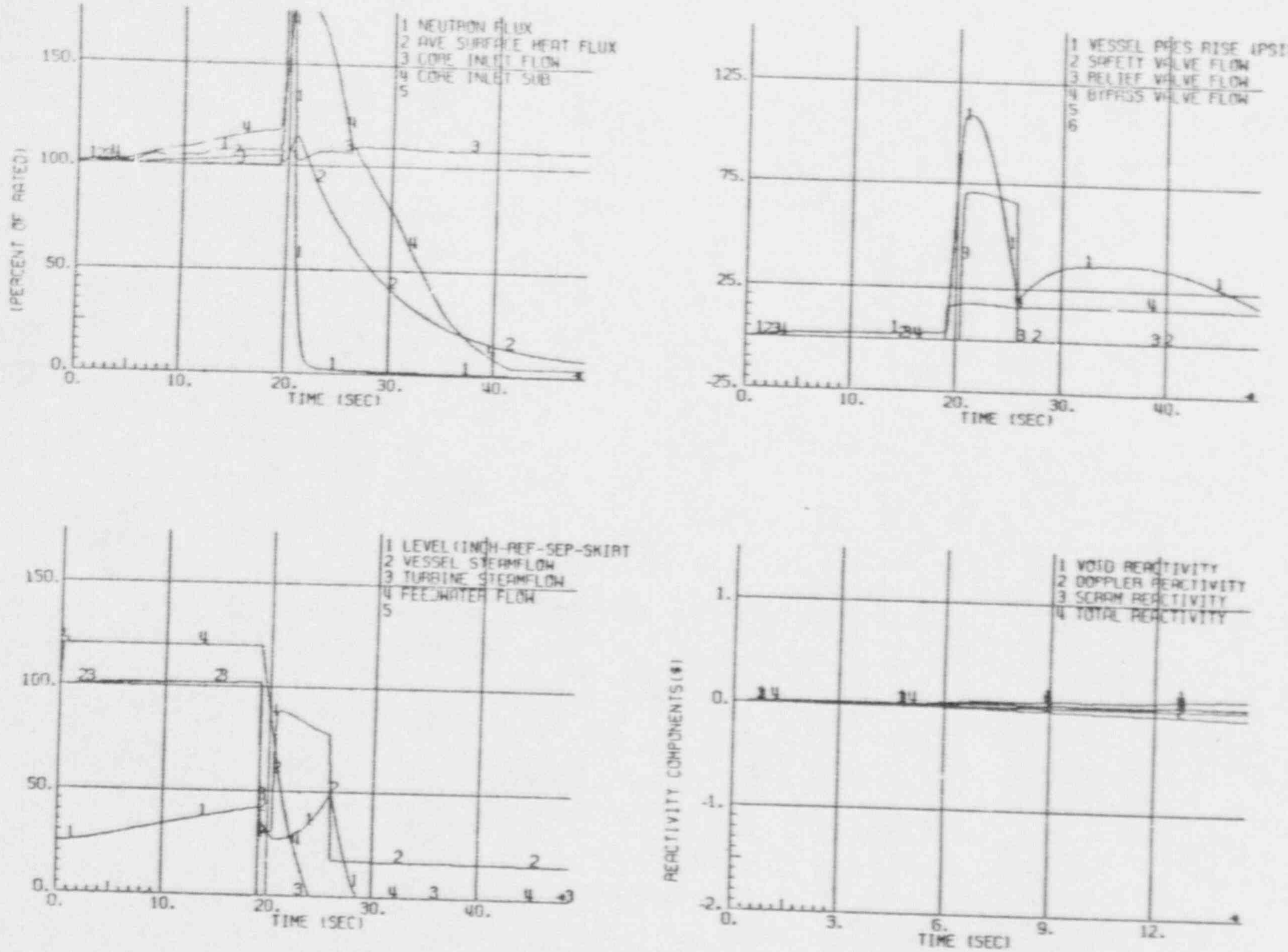


Figure 5. Monticello Feedwater Controller Failure, Maximum Demand, with High Level Turbine Trip

	01	03	05	07	09	11	13
01							36
03				32		32	
05			14		6		14
07		32		32		32	
09			6		0		6
11		32		32		32	
13	36		14		6		14

NOTES:
1. ROD PATTERN IS 1/4 CORE MIRROR SYMMETRIC, UPPER LEFT QUADRANT SHOWN ON MAP
2. NUMBER INDICATES NUMBER OF NOTCHES WITHDRAWN OUT OF 48. BLANK IS A WITHDRAWN ROD
3. ERROR ROD AT 9,9

Figure 6. Limiting Rod Pattern for RWE

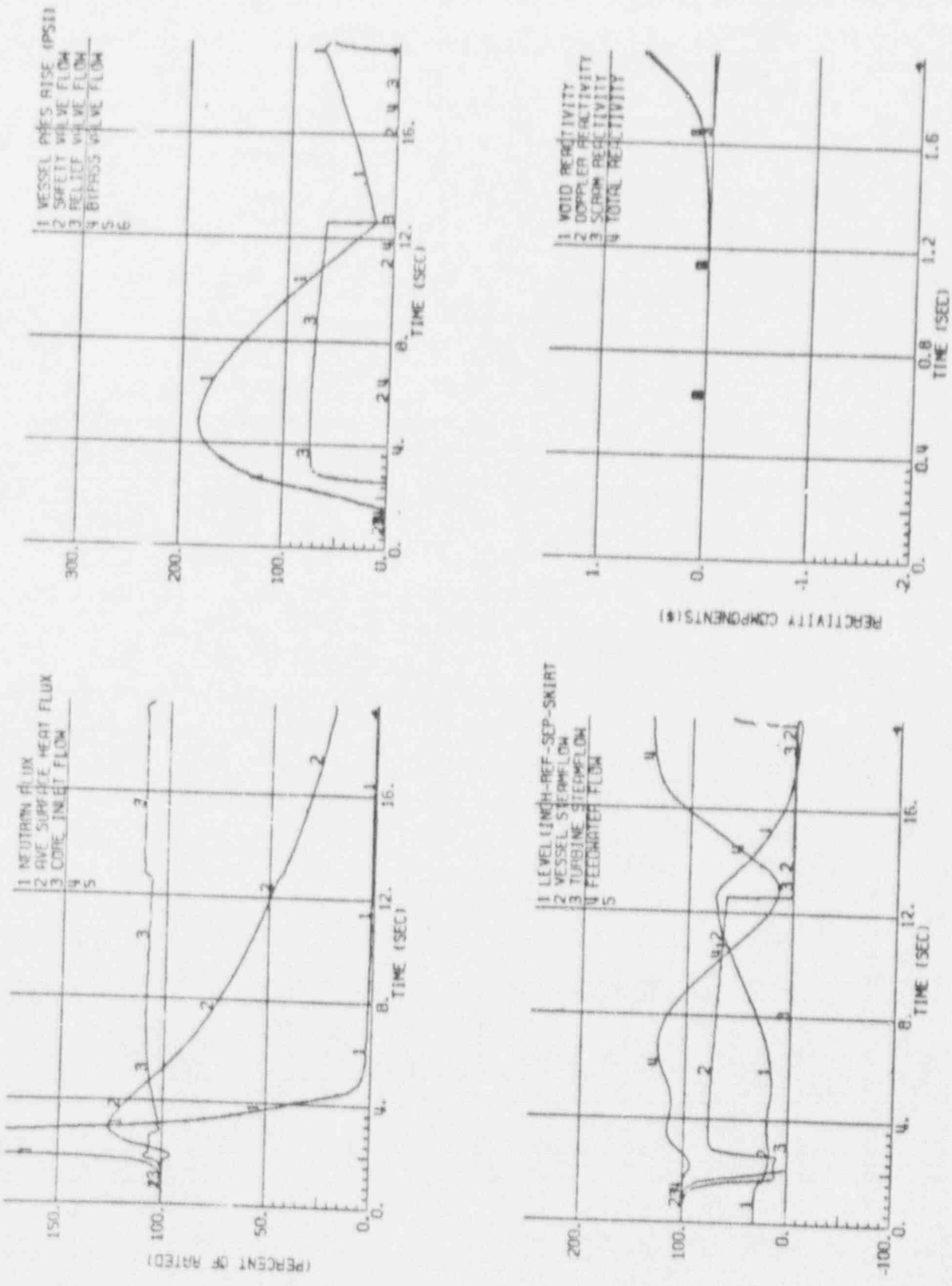


Figure 7. Monticello MSIV Closure, Flux Scram

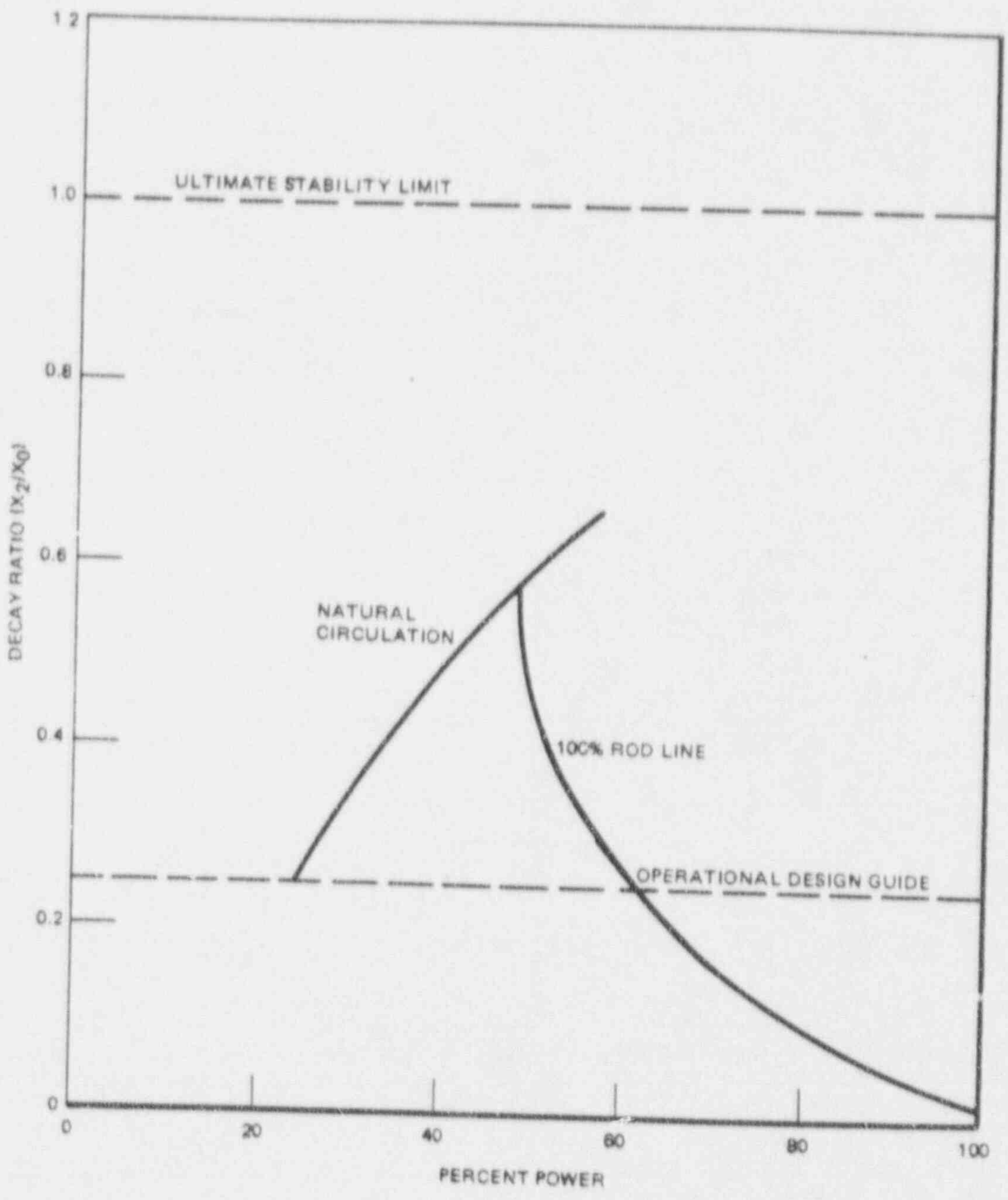


Figure 8. Decay Ratio

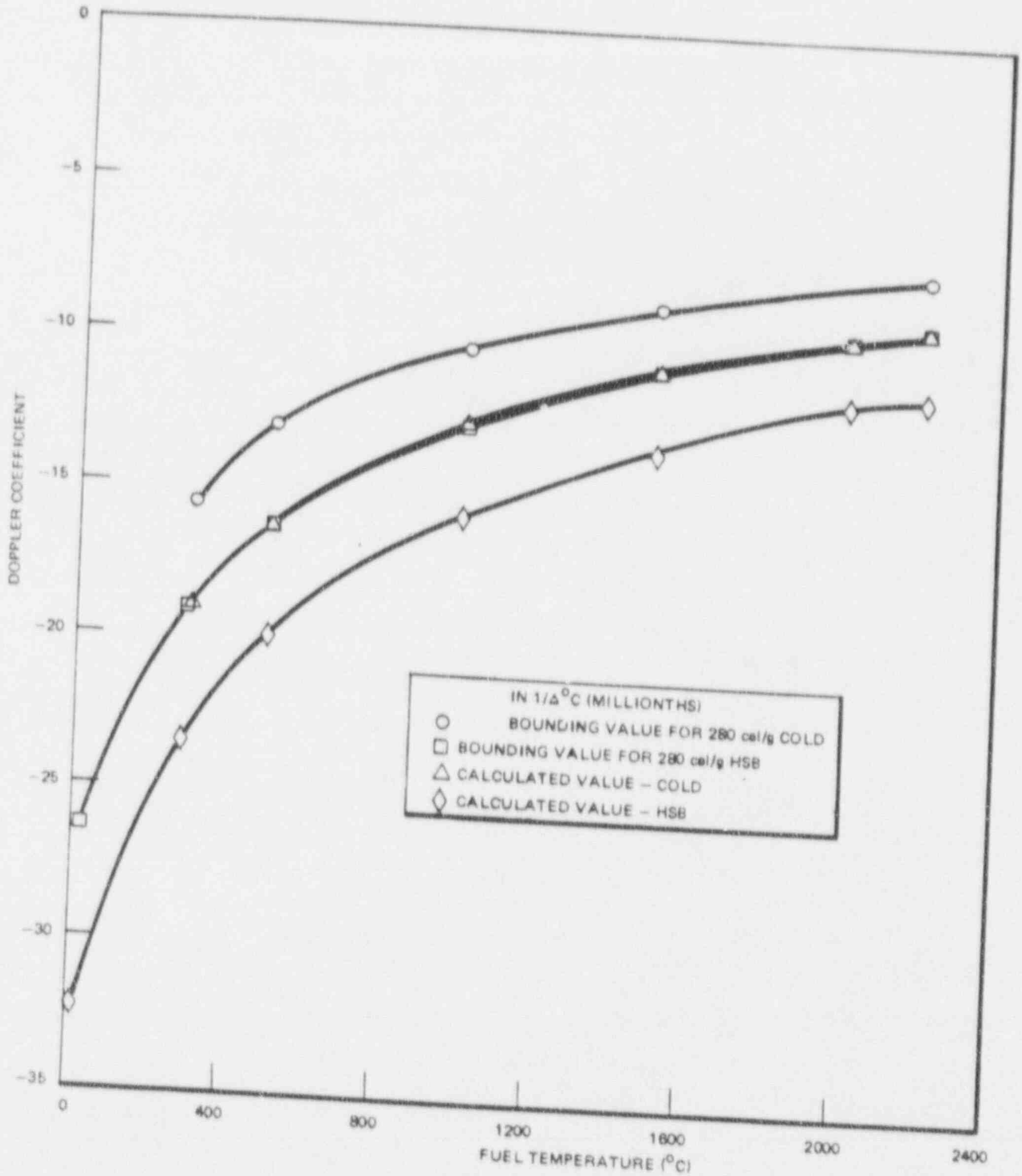


Figure 9. Fuel Doppler Coefficient

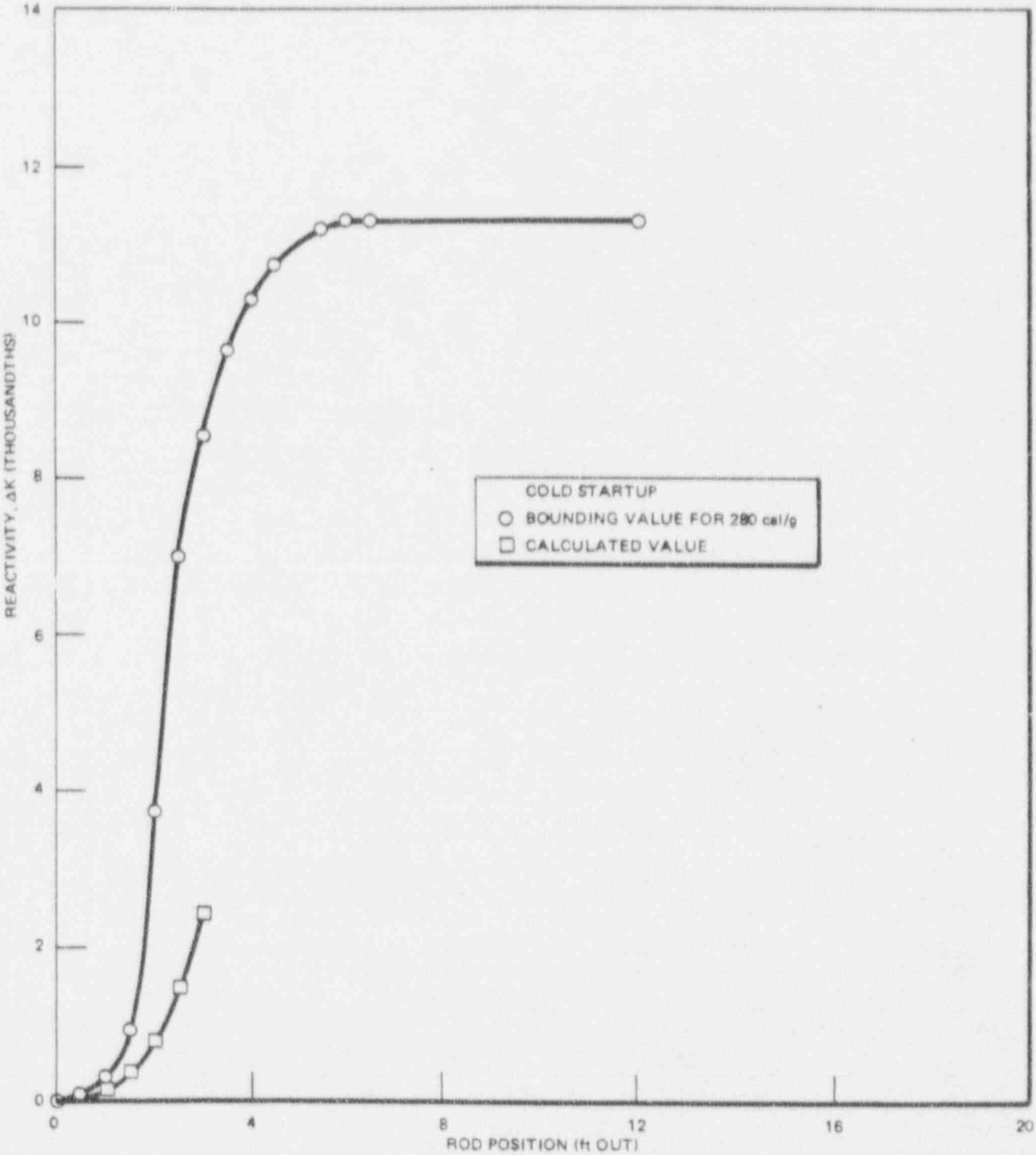


Figure 10. Accident Reactivity Shape at 20°C

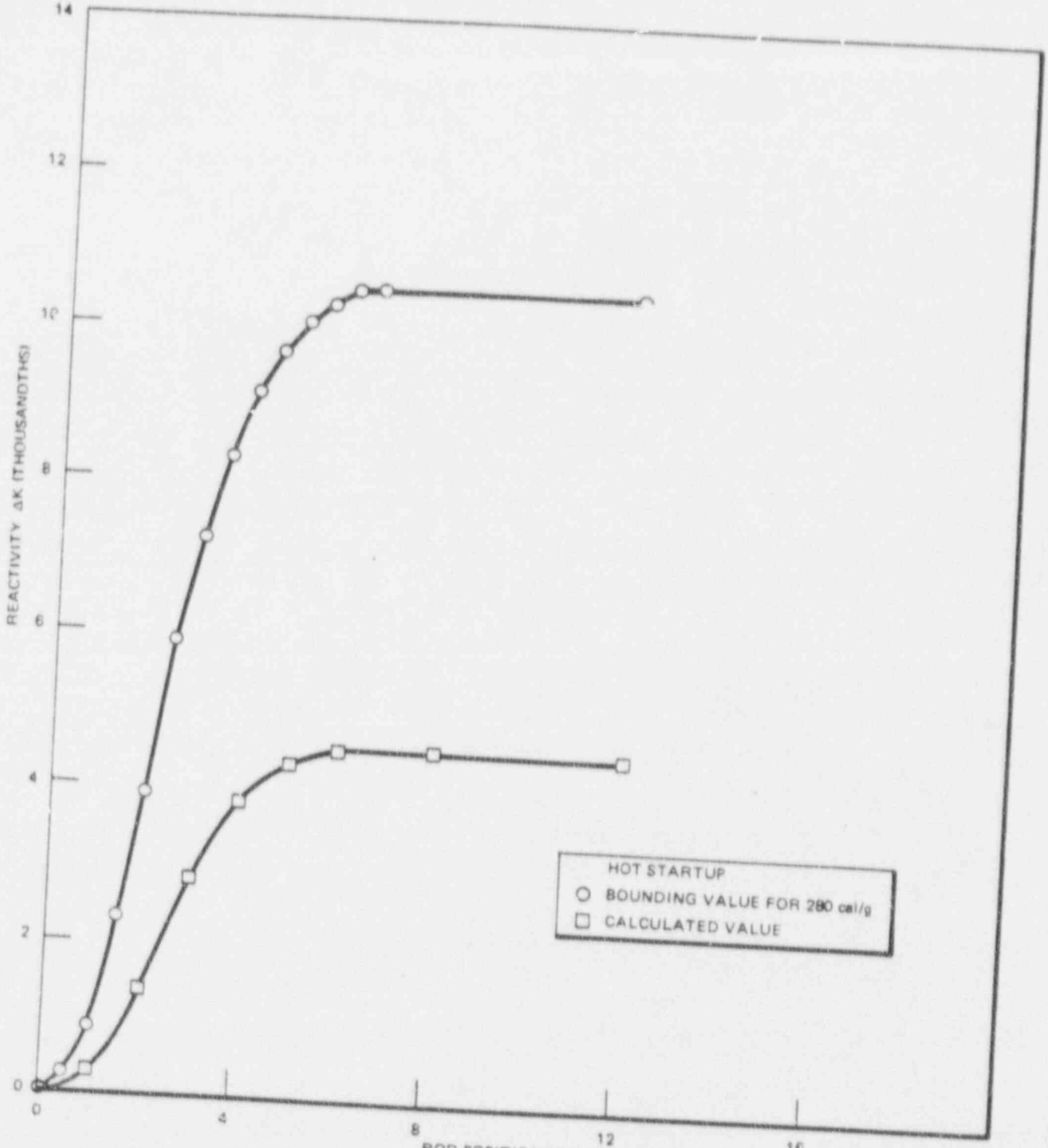


Figure 11. Accident Reactivity Shape Function at 286°C

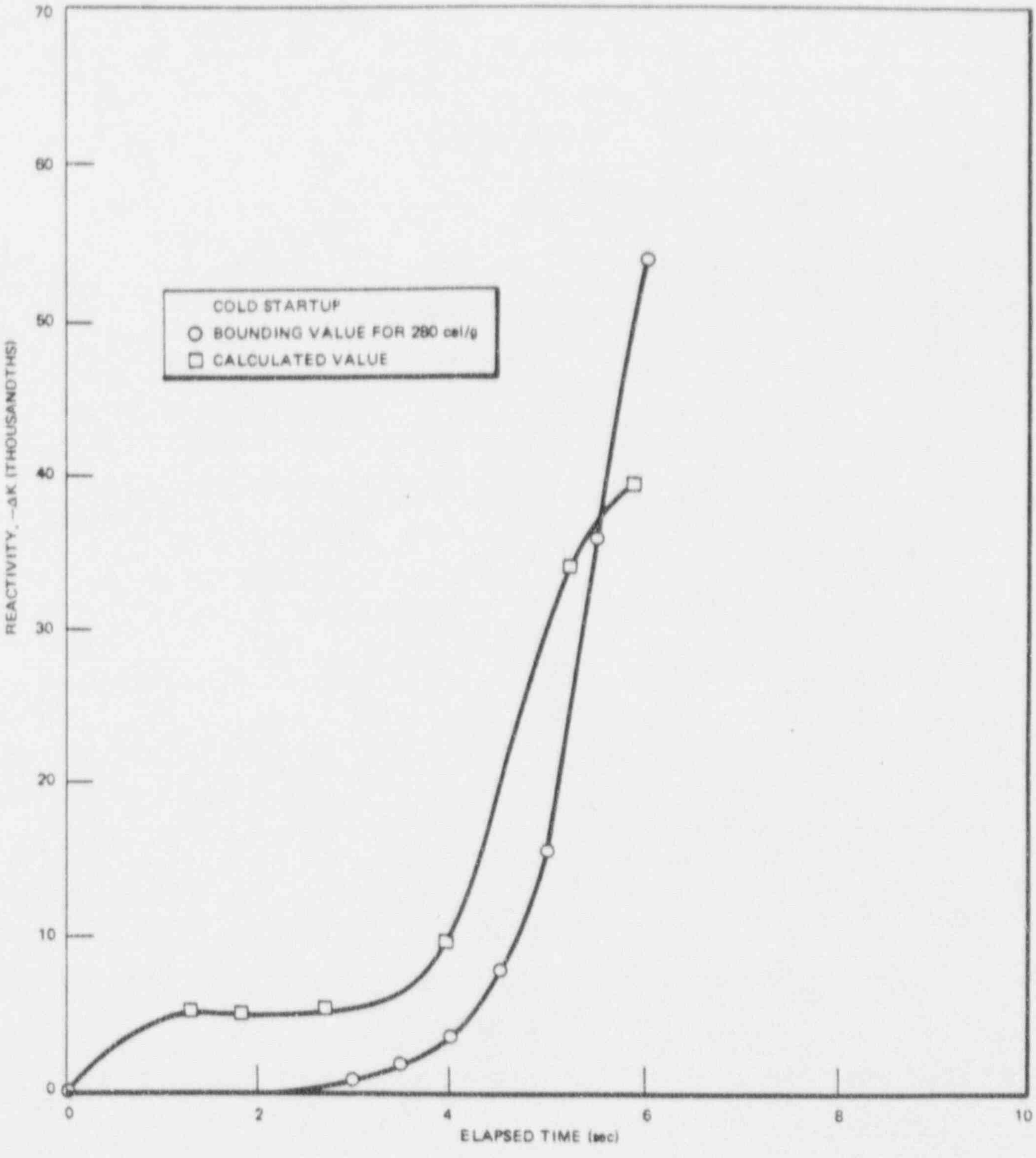


Figure 12. Scram Reactivity Function at 20°C

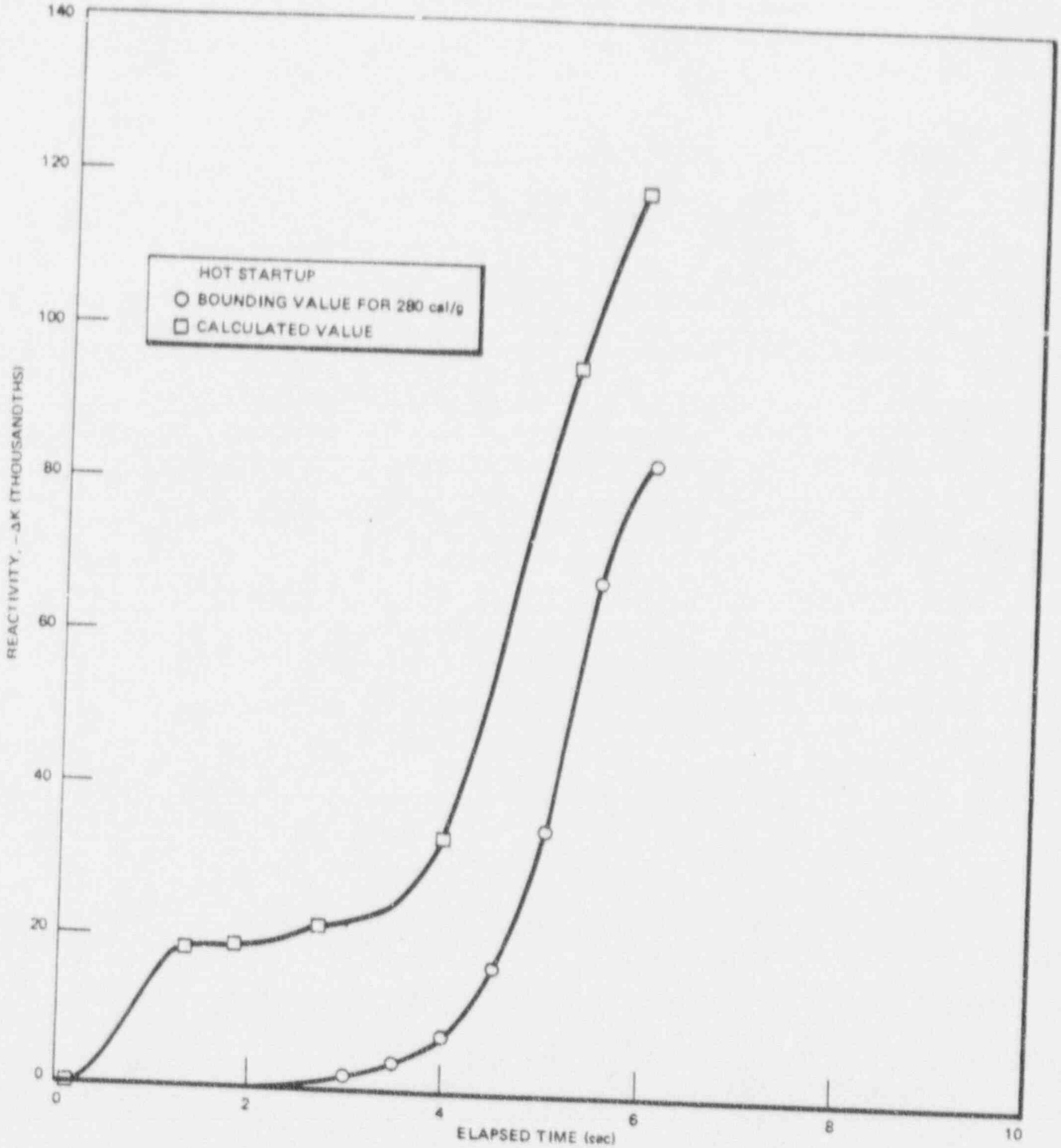


Figure 13. Scram Reactivity Function at 286°C