ENCLOSURE 1

LOSS OF SECONDARY COOLANT

BASIC ACTIONS

GENERIC SECONDARY LINE BREAK

1. VERIFY STEAMLINE ISOLATION
2. IDENTIFY FAULTED STEAM GENERATOR
3. ISOLATE AFW TO FAULTED STEAM GENERATOR
4. RESTORE LEVEL IN NON-FAULTED STEAM GENERATORS
5. TERMINATE SAFETY INJECTION
   - PTS CONCERN
   - HEATUP CONCERN
6. GO TO COLD SHUTDOWN CONDITIONS USING RHR SYSTEM

SI TERMINATION CRITERIA

	PTS	HEATUP
RCS PRESSURE	X	X
PRESSURIZER LEVEL	X	X
RCS SUBCOOLING	X	X
SECONDARY HEAT SINK *	X	X

* STEAM GENERATOR LEVEL OR AFW FLOW

BASIC ACTIONS

SONGS #1 SECONDARY LINE BREAK

1. VERIFY AFW FLOW TO STEAM GENERATOR

2. IDENTIFY (IF POSSIBLE) TYPE AND LOCATION OF BREAK
   - ISOLATE AFW TO STEAM GENERATOR WITH FEEDLINE BREAK

3. ATTEMPT TO RESTORE LEVEL IN STEAM GENERATORS

4. REGULATE AFW TO ALL STEAM GENERATORS TO MAINTAIN 100 DEGREES PER HOUR COOLDOWN

5. TERMINATE SI/REGULATE CHARGING
   - PTS CONCERN
   - HEATUP CONCERN

6. GO TO COLD SHUTDOWN CONDITIONS USING RHR SYSTEM

SI TERMINATION CRITERIA

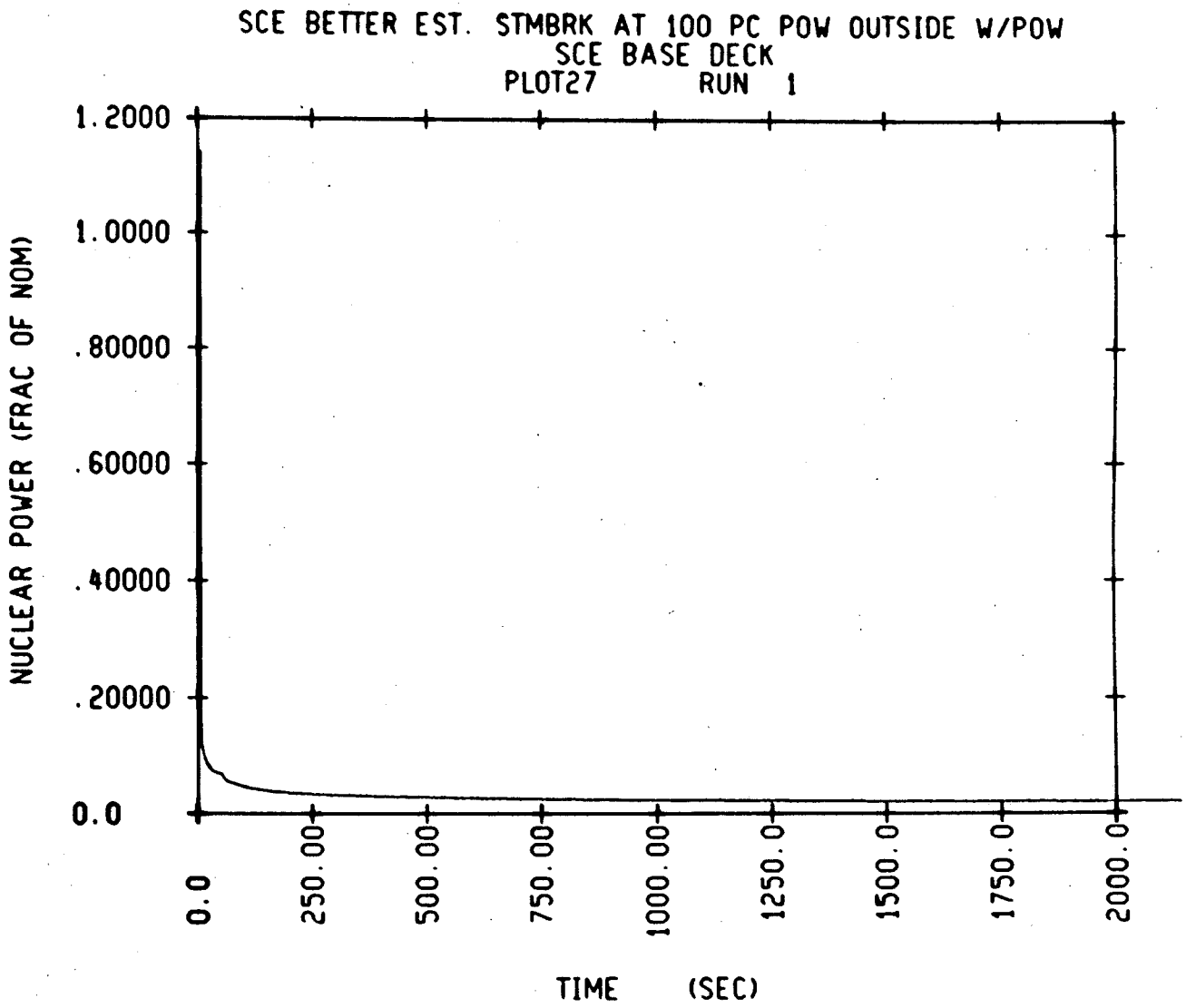
	PTS	HEATUP
RCS PRESSURE	X	X
PRESSURIZER LEVEL	X	X
RCS SUBCOOLING	X	X
SECONDARY HEAT SINK *	X	X

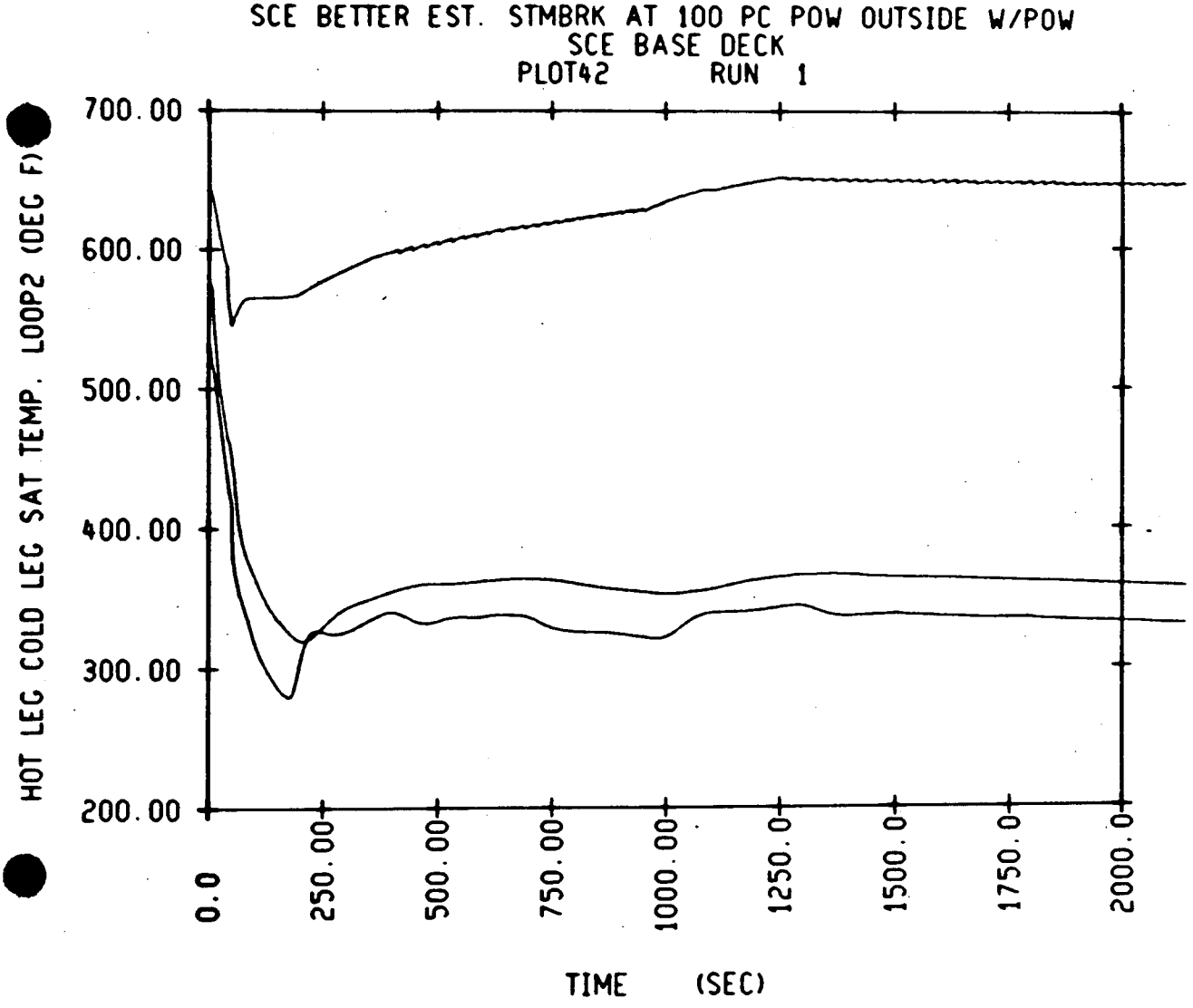
* AFW FLOW AND RCS TEMPERATURES STABLE OR DECREASING

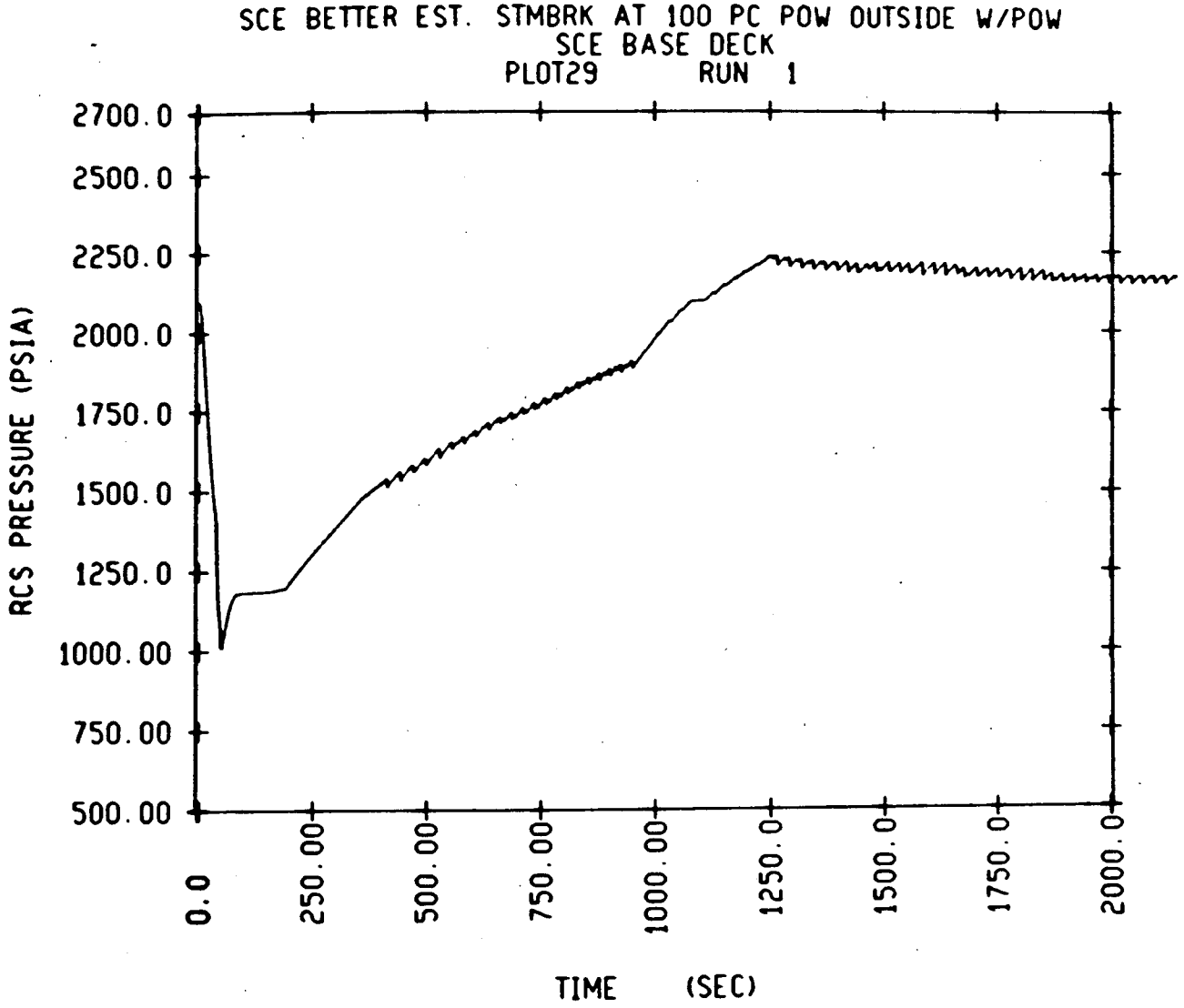
FULL POWER DE STEAMLINE BREAK

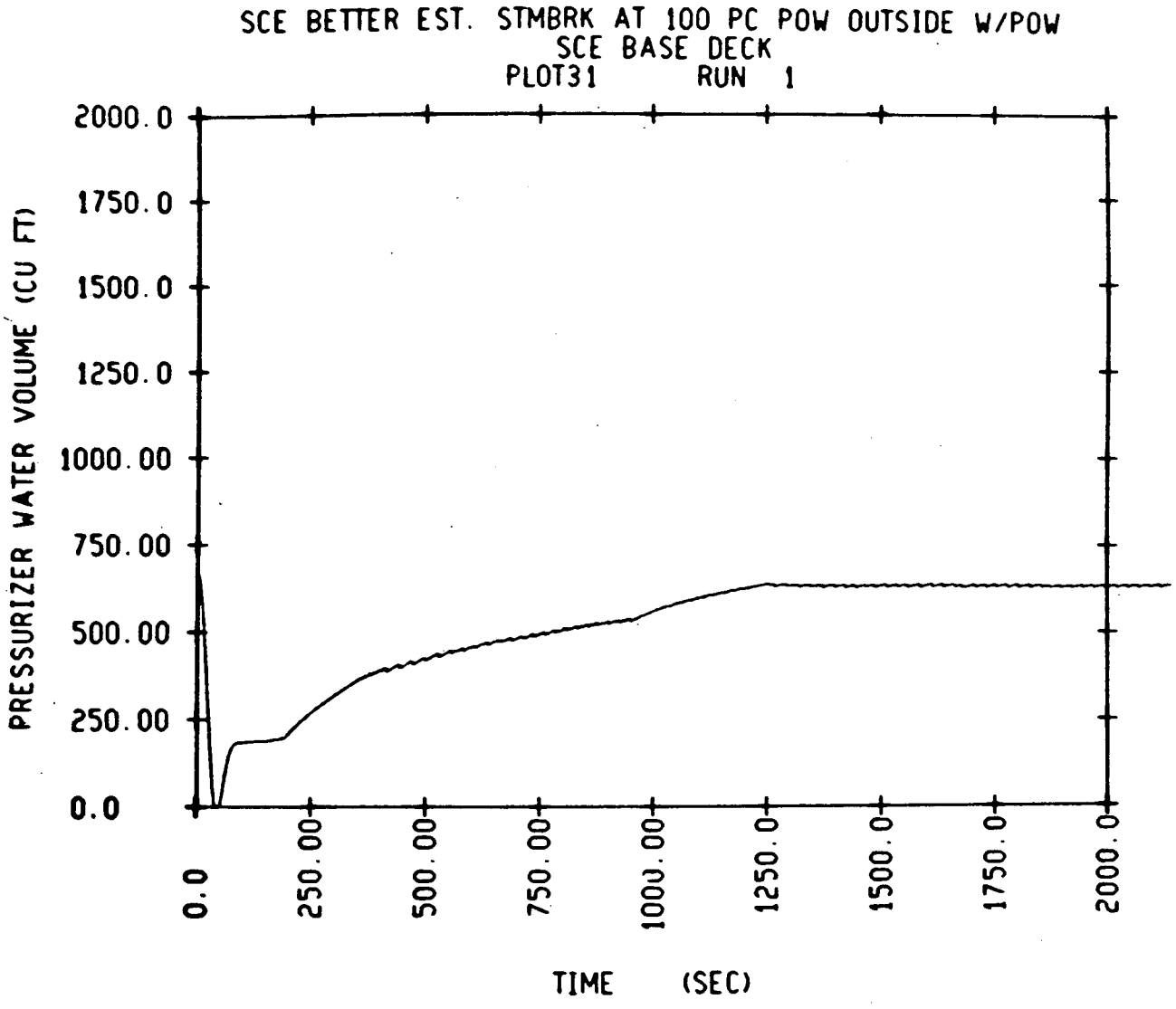
EVENT	TIME
PIPE RUPTURE	0
REACTOR TRIP (HIGH NEUTRON FLUX)	4.8
ROD MOTION	5.3
SI INITIATION (LOW PRESSURIZER PRESSURE)	20.5
RCP TRIP	22.5
MFW ISOLATION	22.5
SI SYSTEM ALIGNED AND RUNNING	42.5
STEAM GENERATOR DRYOUT	200.0
M/D AFW PUMPS STARTED (300 GPM)	322.5
MAIN FEEDLINES PURGED	650.0
OPERATOR ACTION (AFW TROTTLED TO 75 GPM)	950.0
OPERATOR ACTION (AFW TROTTLED TO 200 GPM)	1250.0

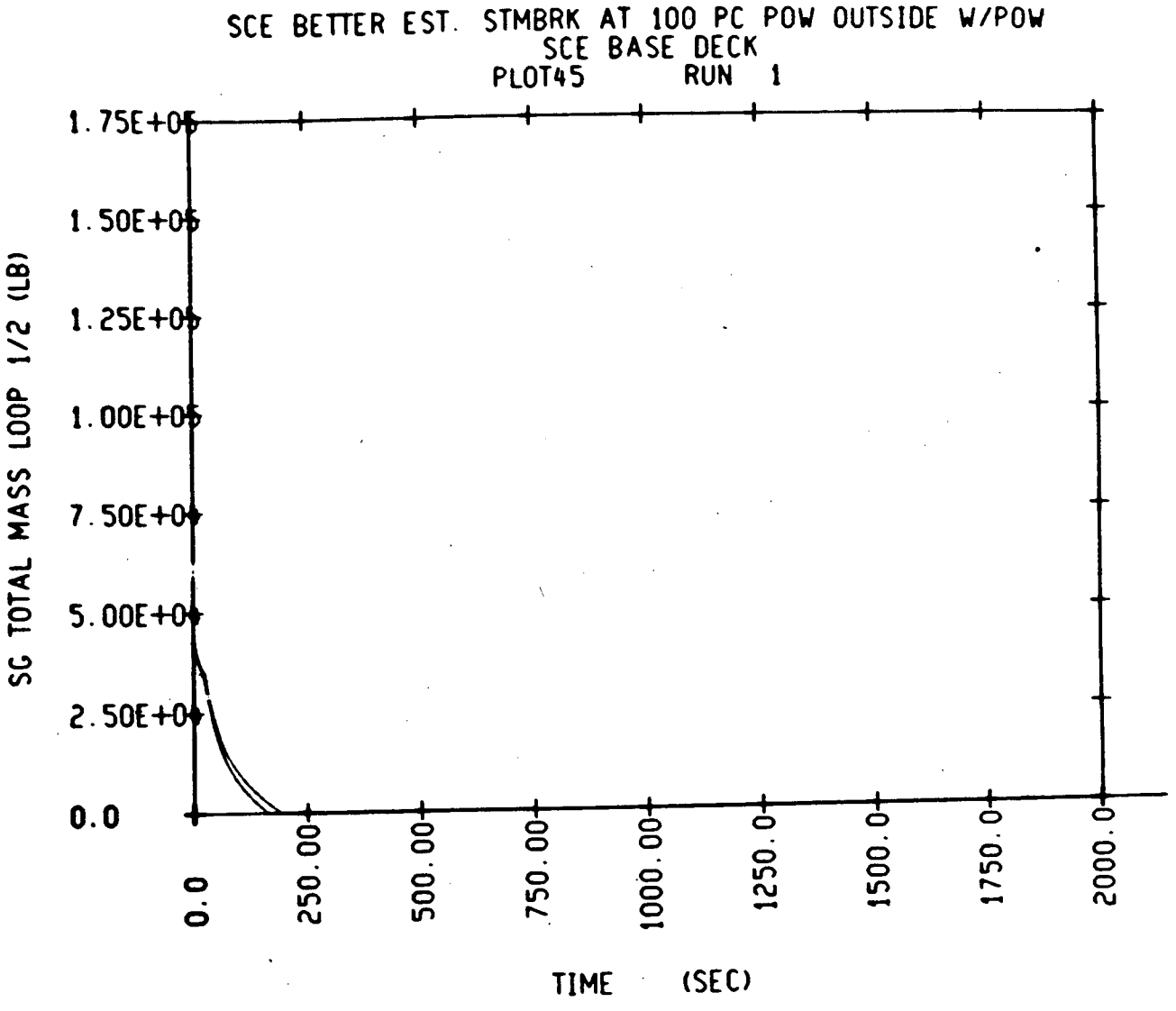
DE = 1.12 FT^2/LOOP

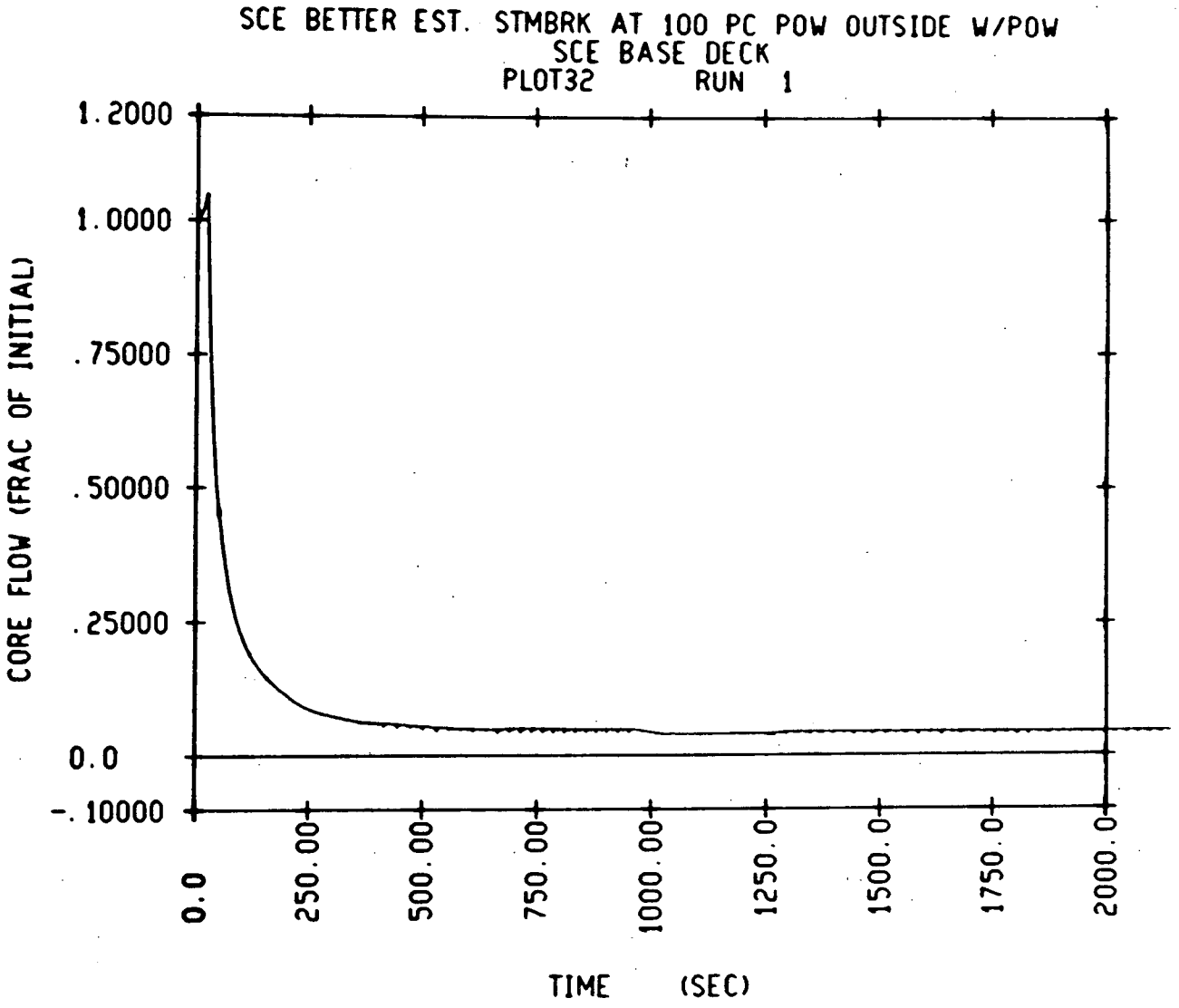

SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT27 RUN 1
NUCLEAR POWER (FRAC OF NOM)
1.2000
1.0000
.80000
.60000
.40000
.20000
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

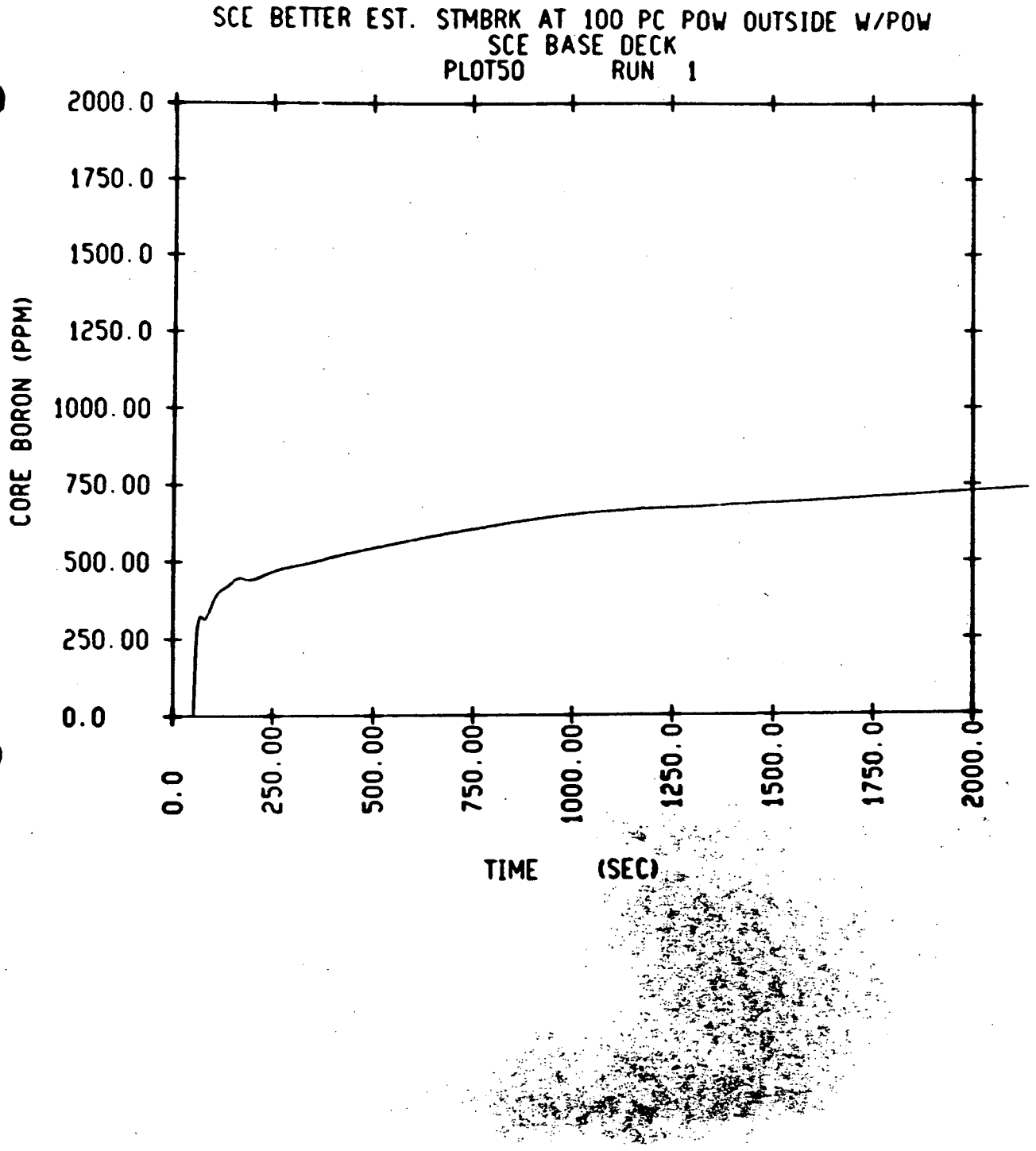

SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT42 RUN 1
HOT LEG COLD LEG SAT TEMP. LOOP2 (DEG F)
700.00
600.00
500.00
400.00
300.00
200.00
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT29 RUN 1
RCS PRESSURE (PSIA)
2700.0
2500.0
2250.0
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT31 RUN 1
PRESSURIZER WATER VOLUME (CU FT)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT45 RUN 1
SG TOTAL MASS LOOP 1/2 (LB)
1.75E+06
1.50E+06
1.25E+06
1.00E+06
7.50E+0
5.00E+0
2.50E+0
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

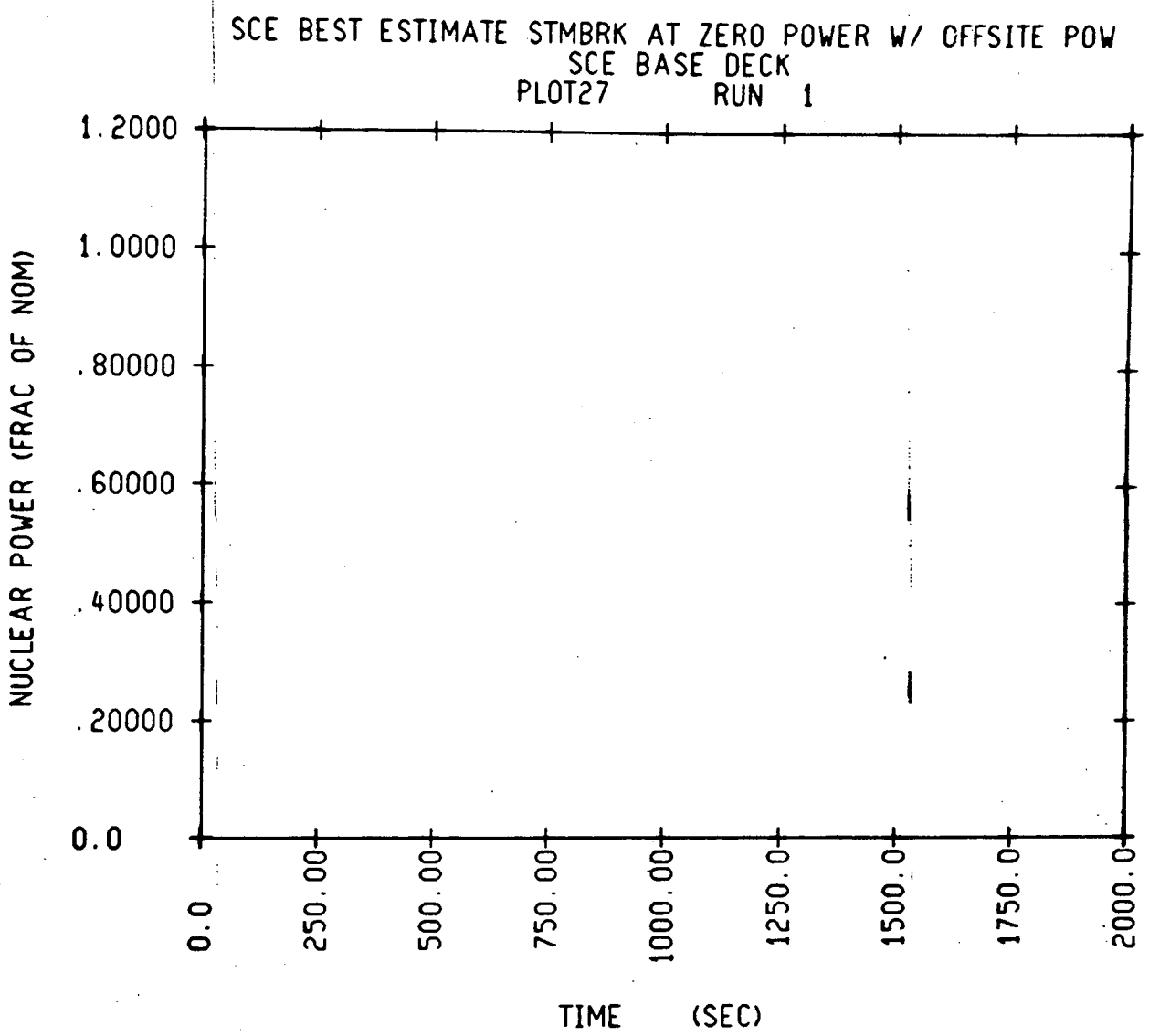

SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT32 RUN 1
1.2000
1.0000
.75000
.50000
.25000
0.0
-.10000
CORE FLOW (FRAC OF INITIAL)
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

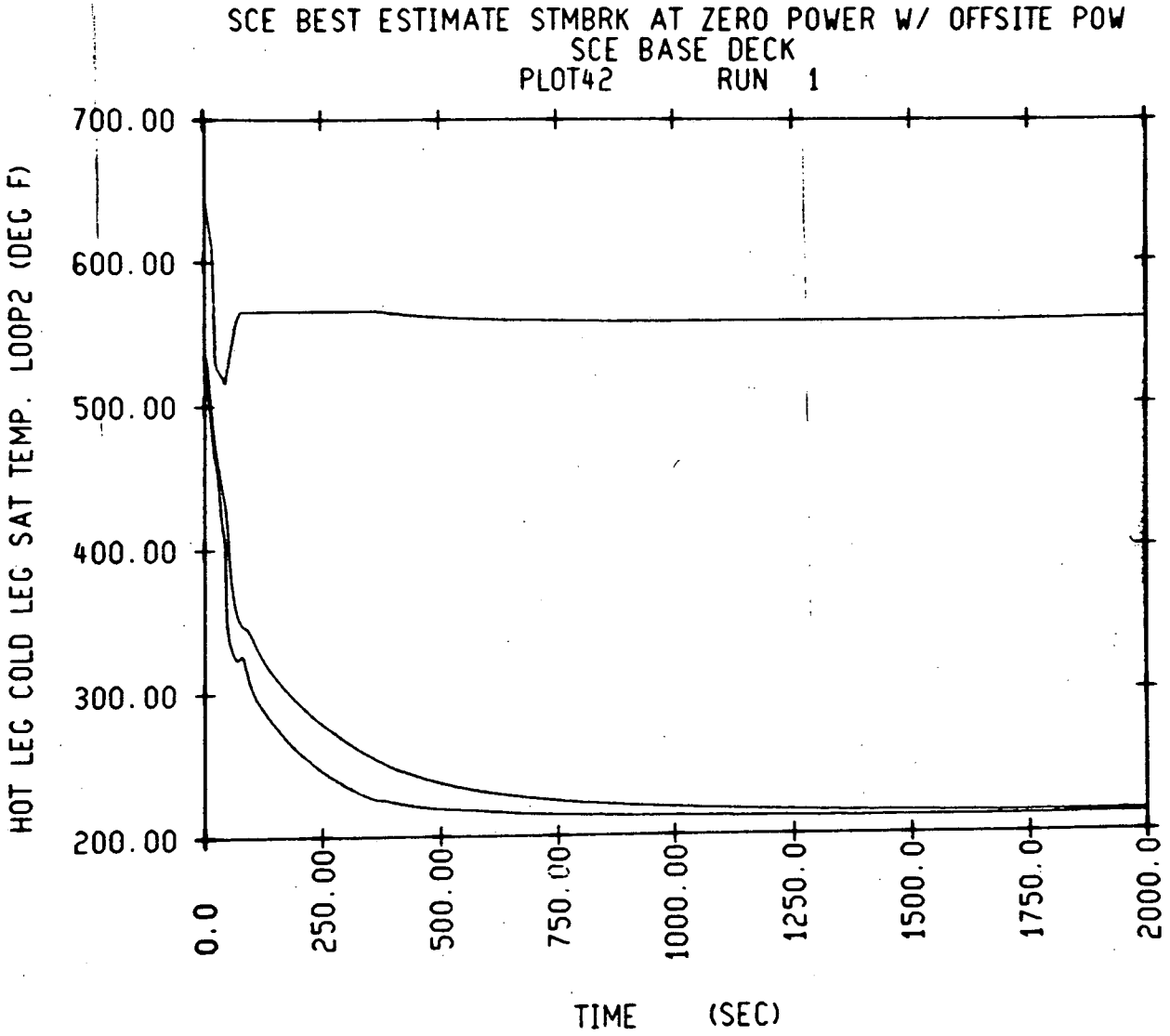

SCE BETTER EST. STMBRK AT 100 PC POW OUTSIDE W/POW
SCE BASE DECK
PLOT50 RUN 1
CORE BORON (PPM)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

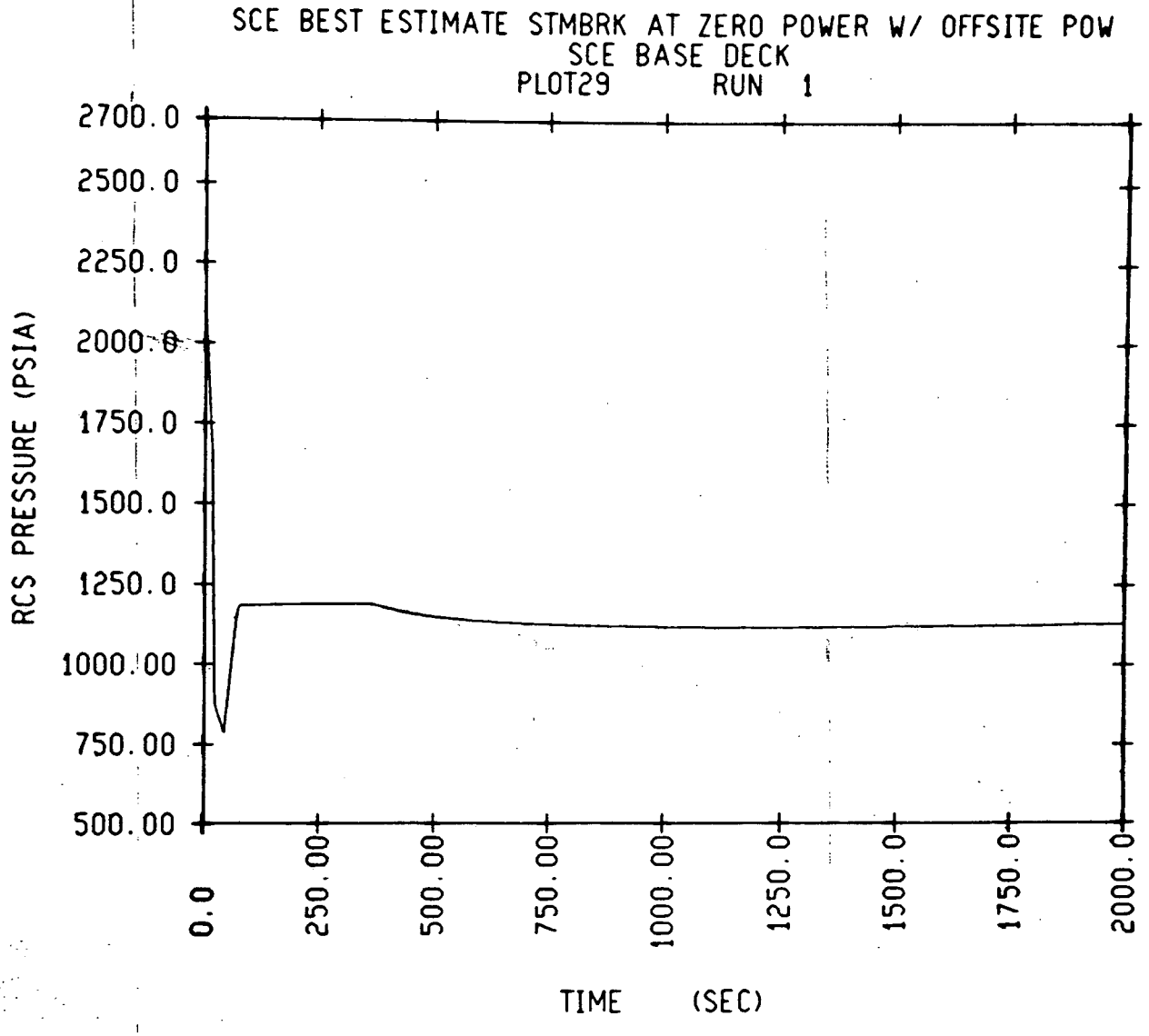
ZERO POWER DE STEAMLINE BREAK

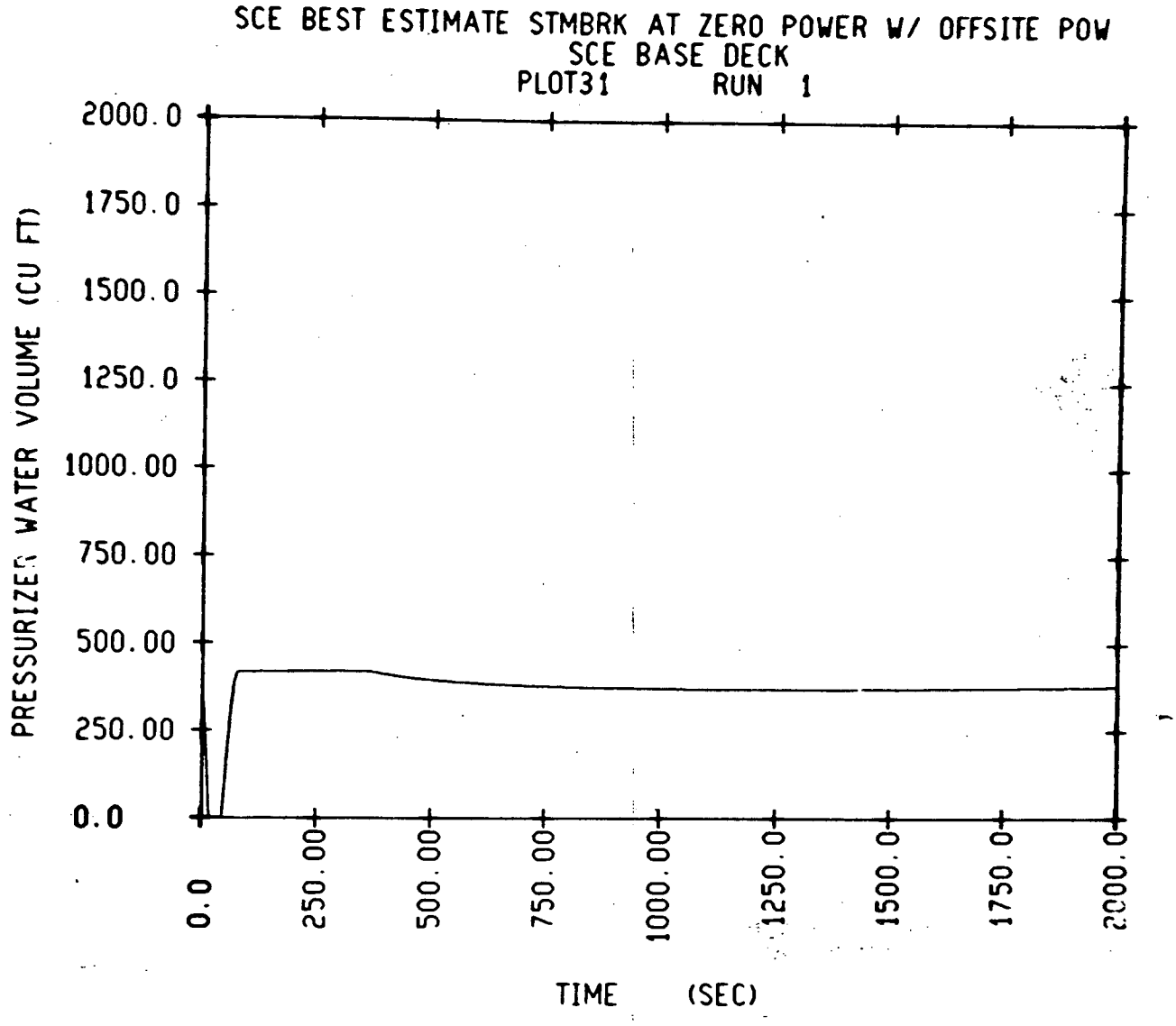
EVENT	TIME
PIPE RUPTURE	0
SI INITIATION	15.5
RCP TRIP	17.5
MFW ISOLATION	17.5
PRESSURIZER EMPTY	18.0
SI SYSTEM ALIGNED AND RUNNING	37.5
M/D AFW PUMPS STARTED (75 GPM)	317.0
SI TERMINATED	317.0
NORMAL CHARGING AND LETDOWN RESTORED	317.0
STEAM GENERATOR MINIMUM MASS	600.0

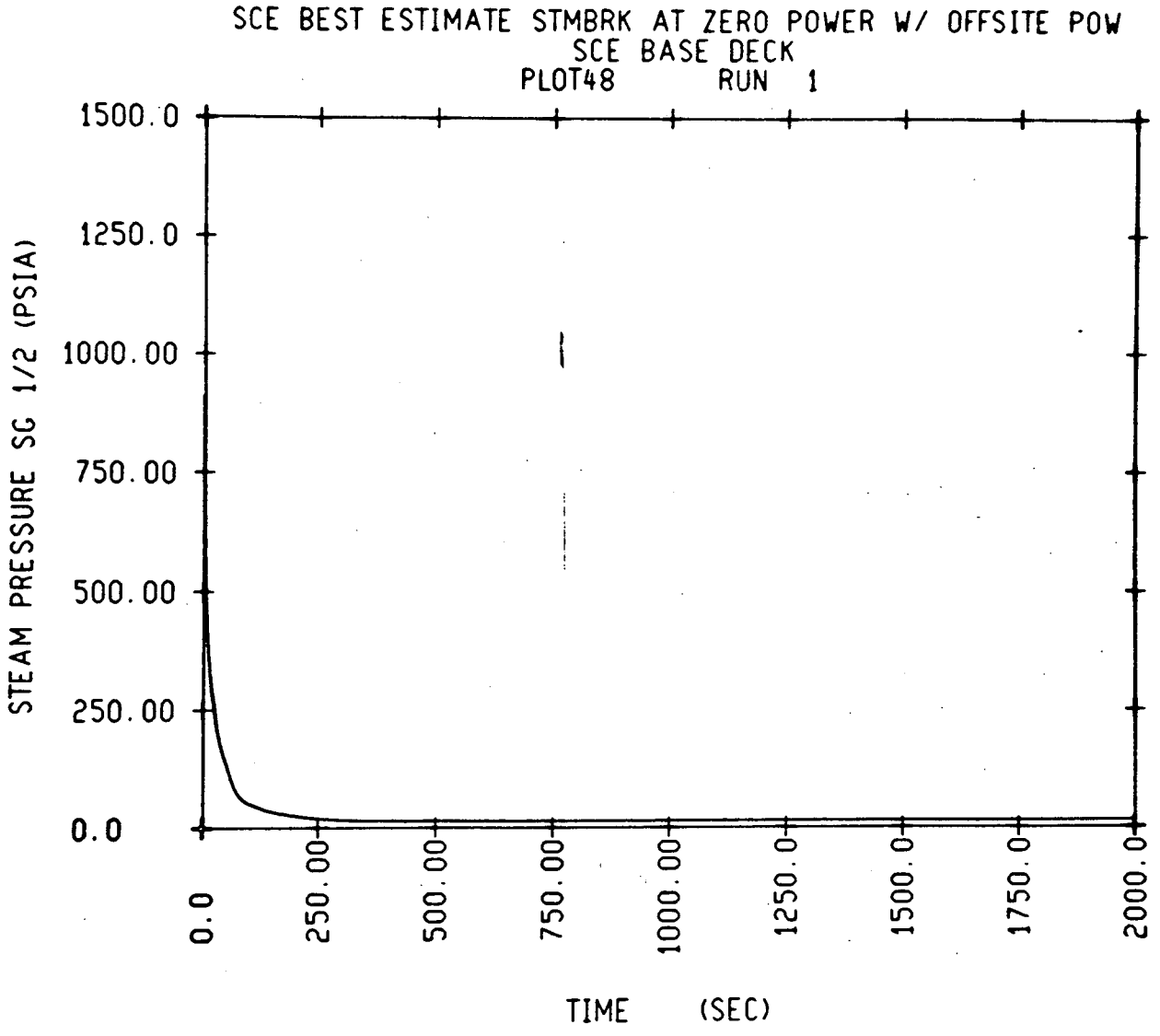
DE = 1.12^2/LOOP

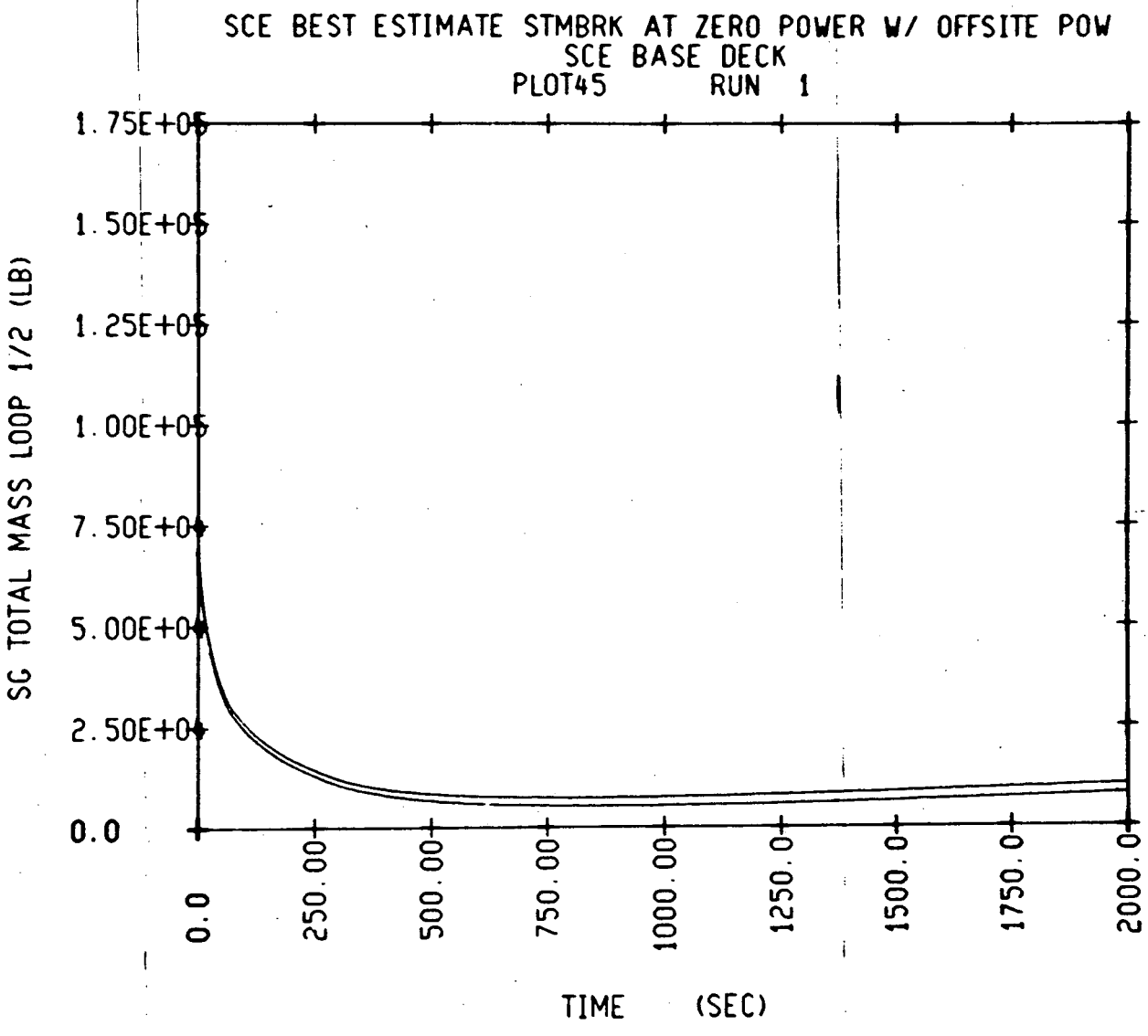

SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT27 RUN 1
NUCLEAR POWER (FRAC OF NOM)
1.2000
1.0000
.80000
.60000
.40000
.20000
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

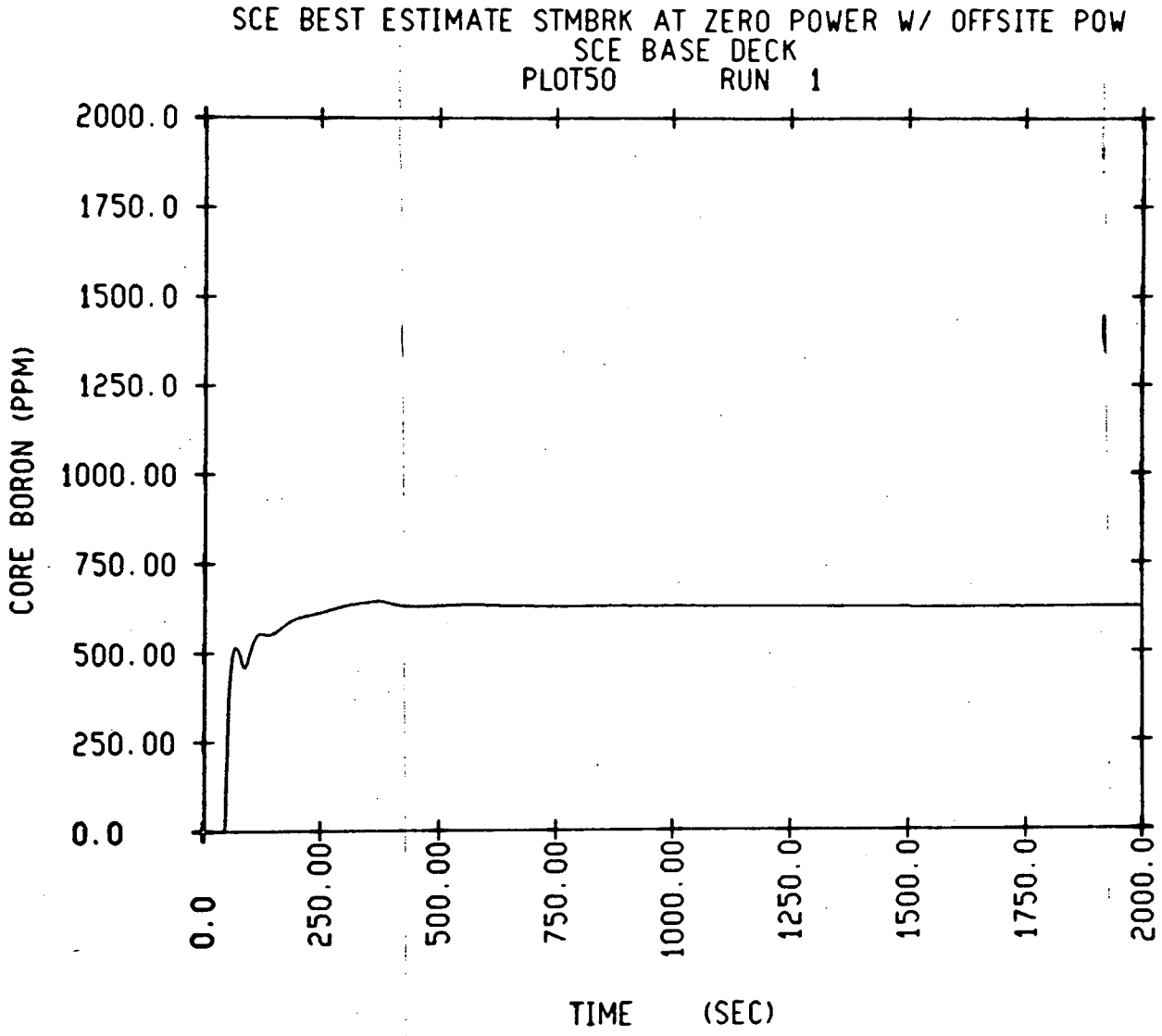

SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT42 RUN 1
HOT LEG COLD LEG SAT TEMP. LOOP2 (DEG F)
700.00
600.00
500.00
400.00
300.00
200.00
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

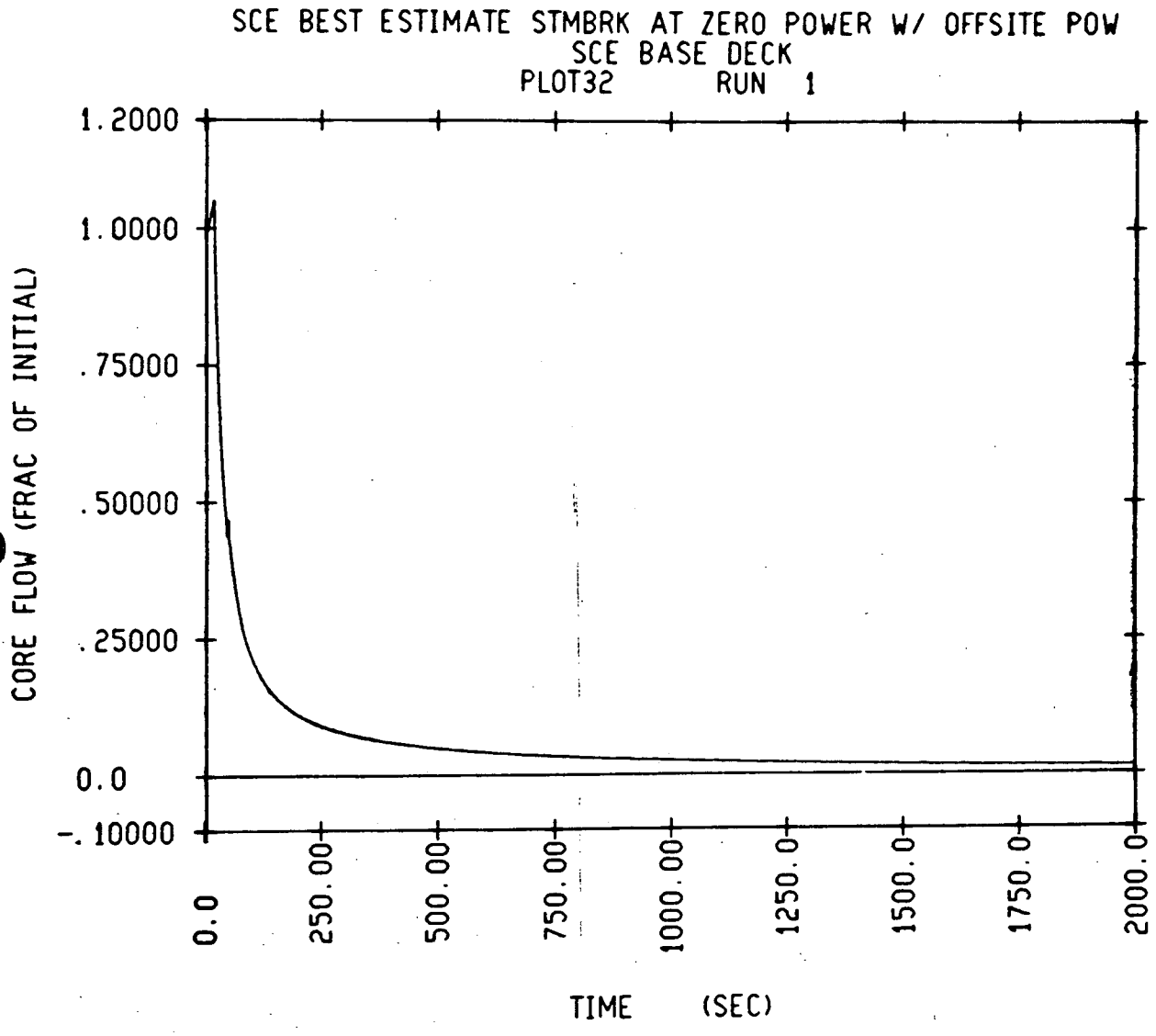

SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT29 RUN 1
RCS PRESSURE (PSIA)
2700.0
2500.0
2250.0
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT31 RUN 1
PRESSURIZER WATER VOLUME (CU FT)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT48 RUN 1
STEAM PRESSURE SG 1/2 (PSIA)
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT45 RUN 1
SG TOTAL MASS LOOP 1/2 (LB)
1.75E+05
1.50E+05
1.25E+05
1.00E+05
7.50E+04
5.00E+04
2.50E+04
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

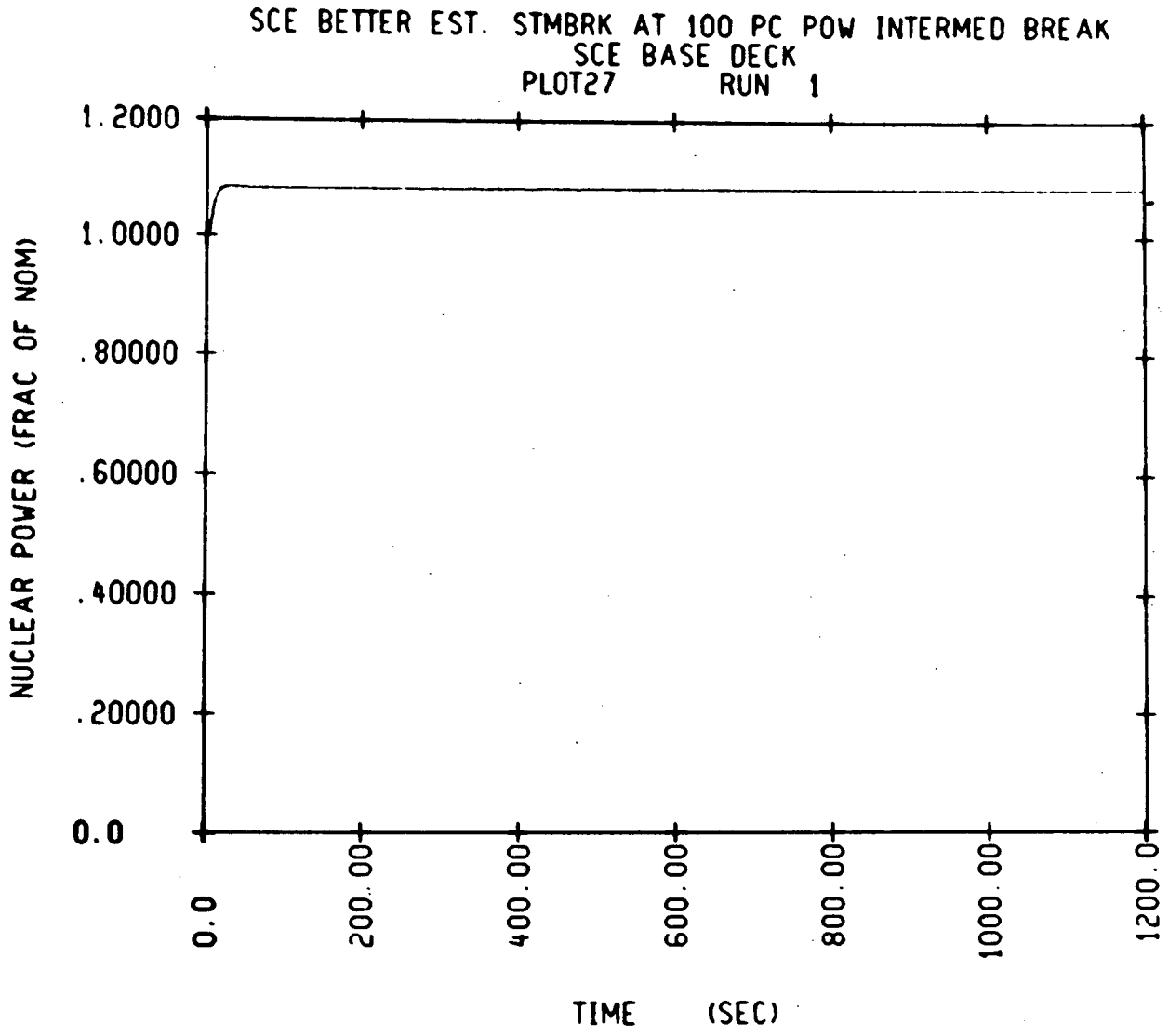

SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT50 RUN 1
CORE BORON (PPM)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

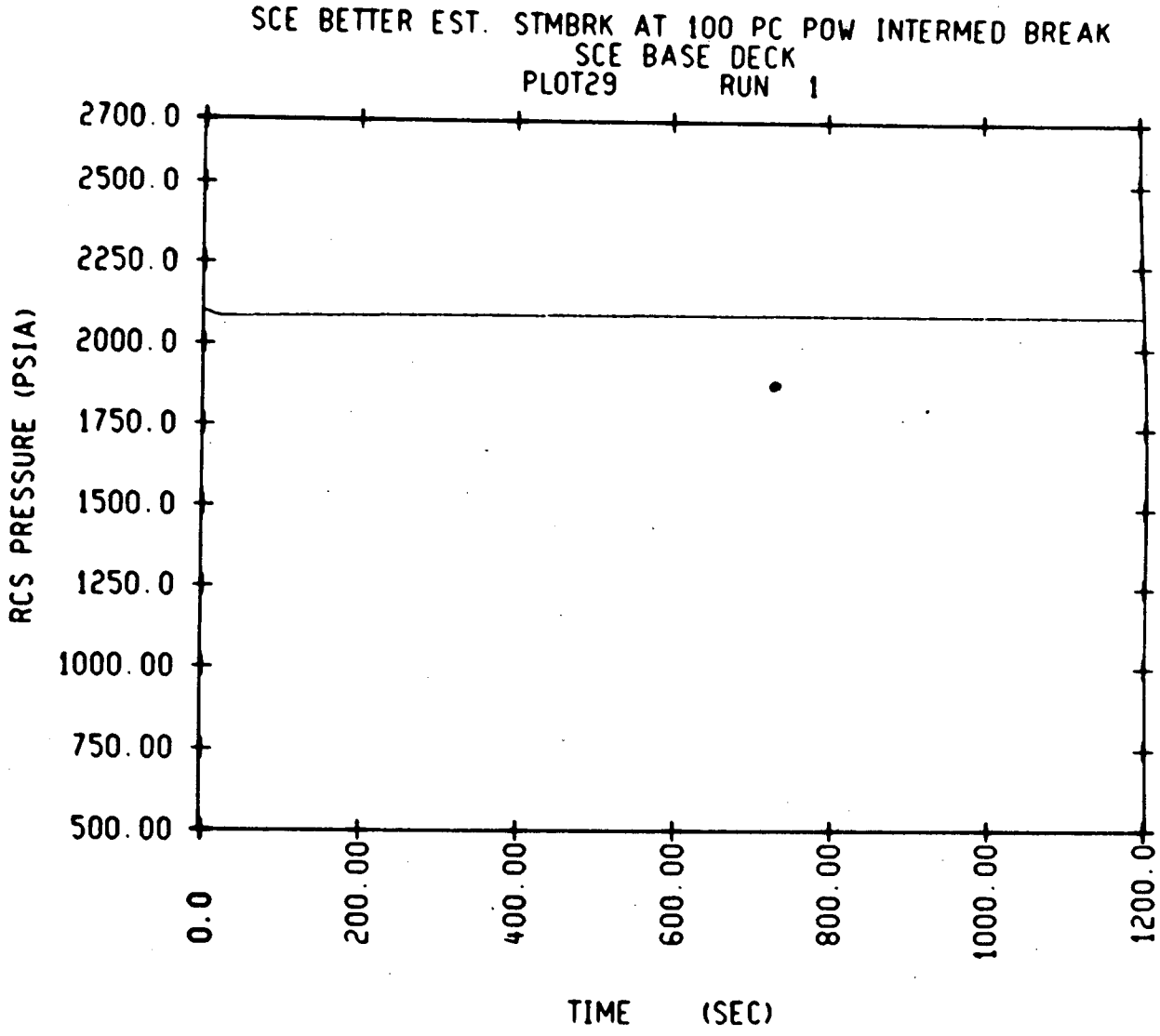

SCE BEST ESTIMATE STMBRK AT ZERO POWER W/ OFFSITE POW
SCE BASE DECK
PLOT32 RUN 1
1.2000
1.0000
.75000
.50000
.25000
0.0
-.10000
CORE FLOW (FRAC OF INITIAL)
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

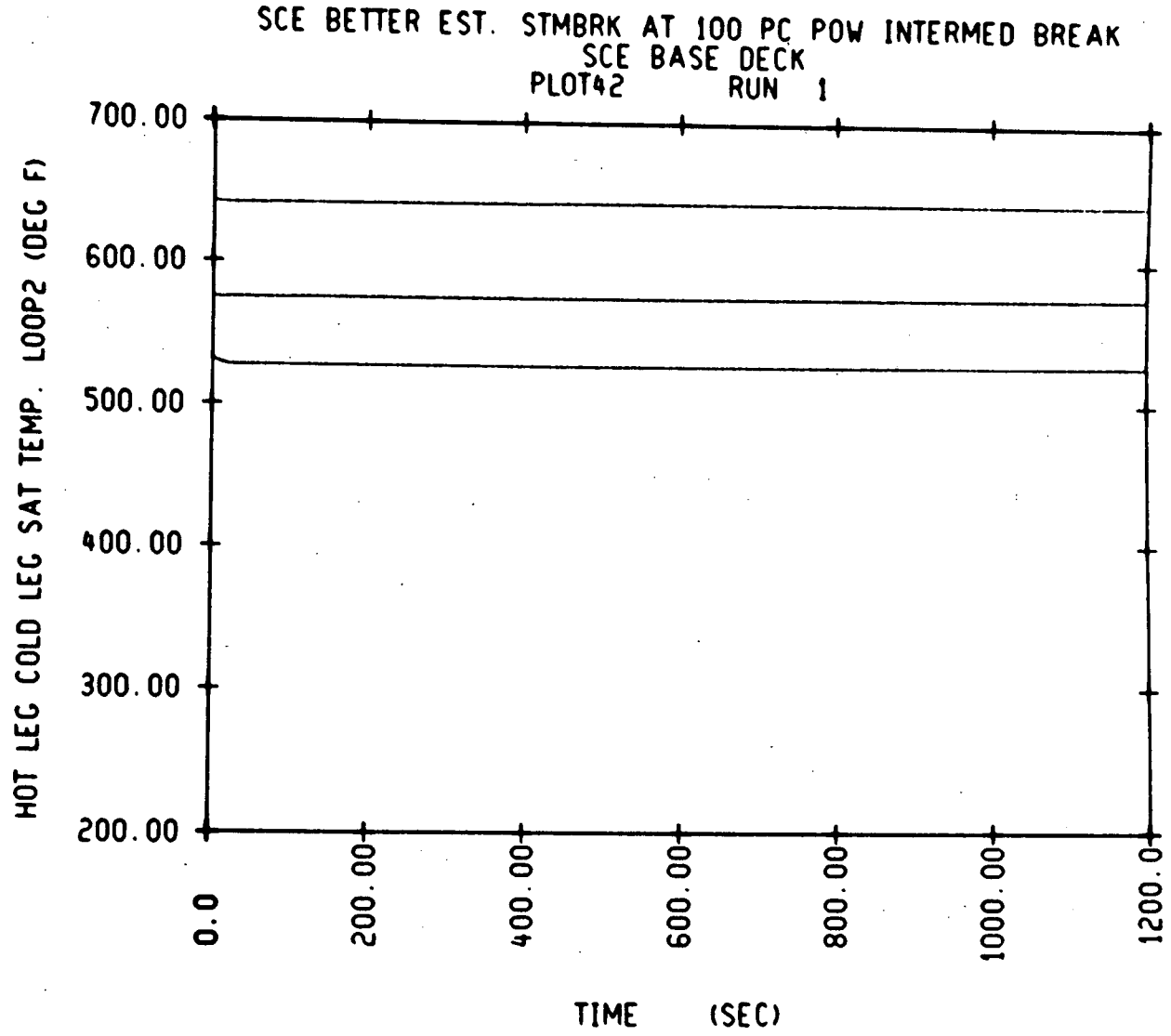
INTERMEDIATE FULL POWER STEAMLINE BREAK

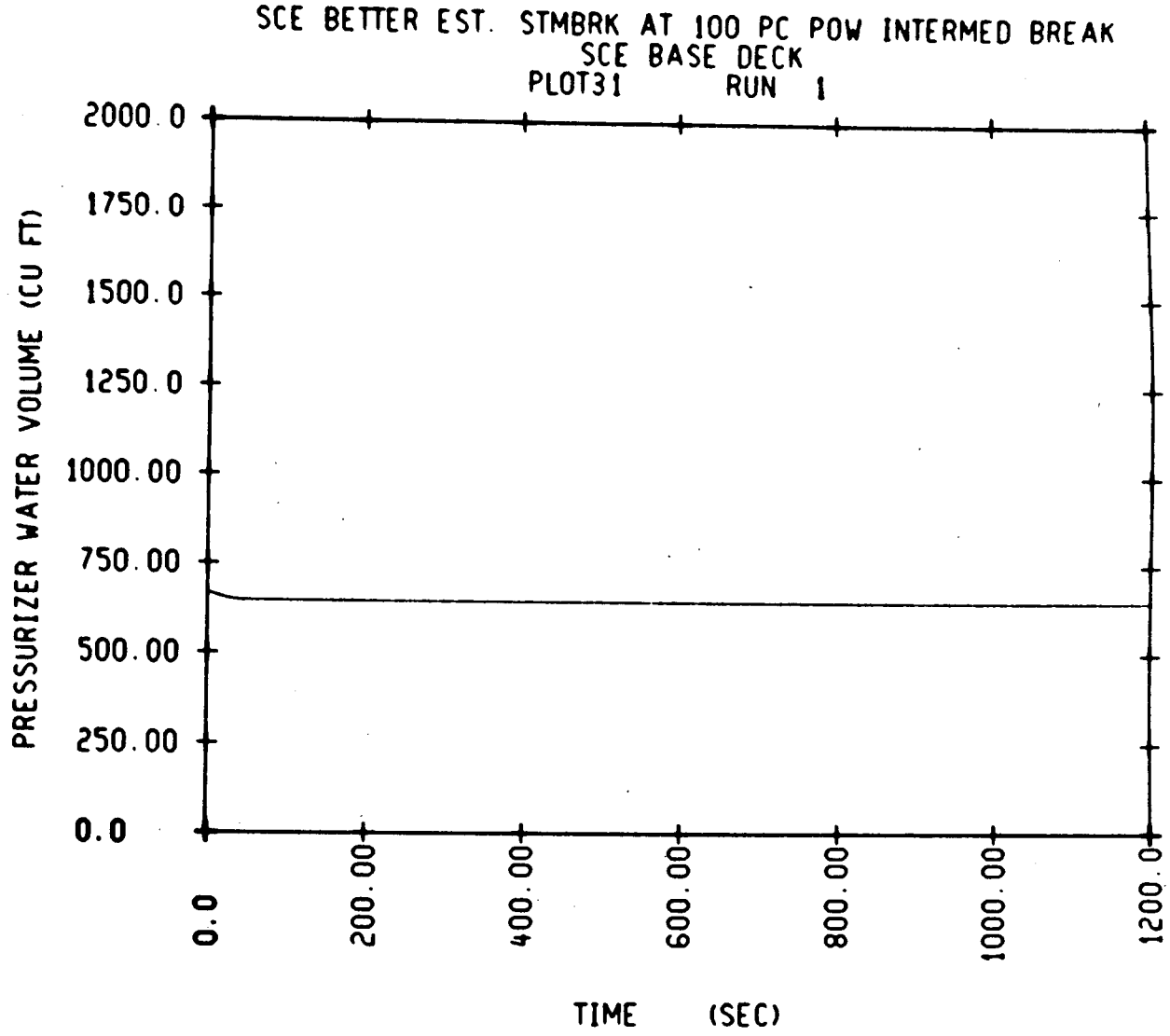
EVENT	TIME
PIPE RUPTURE	0
PLANT STABILIZED	60

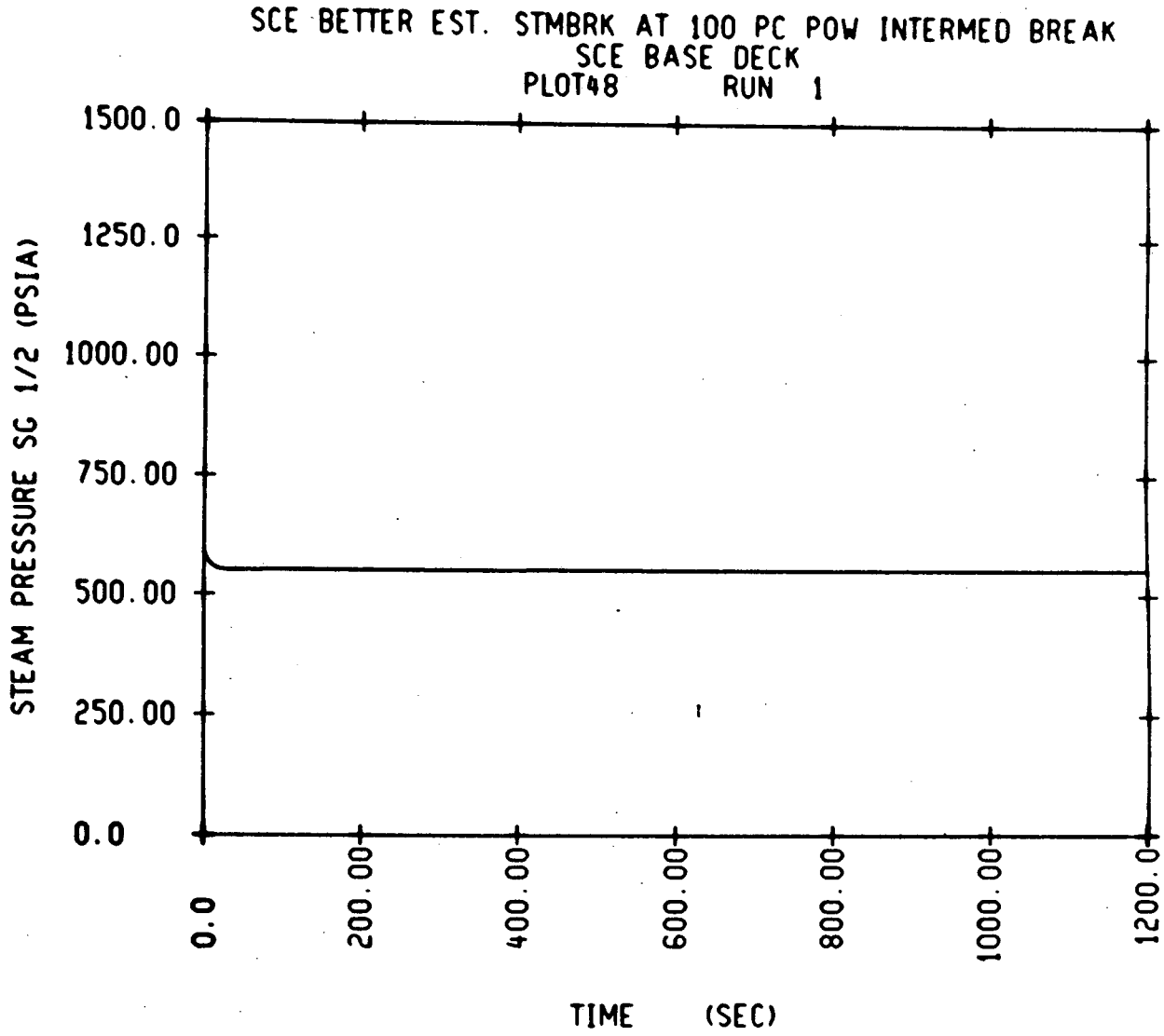
INTERMEDIATE = 0.1 FT^2/LOOP

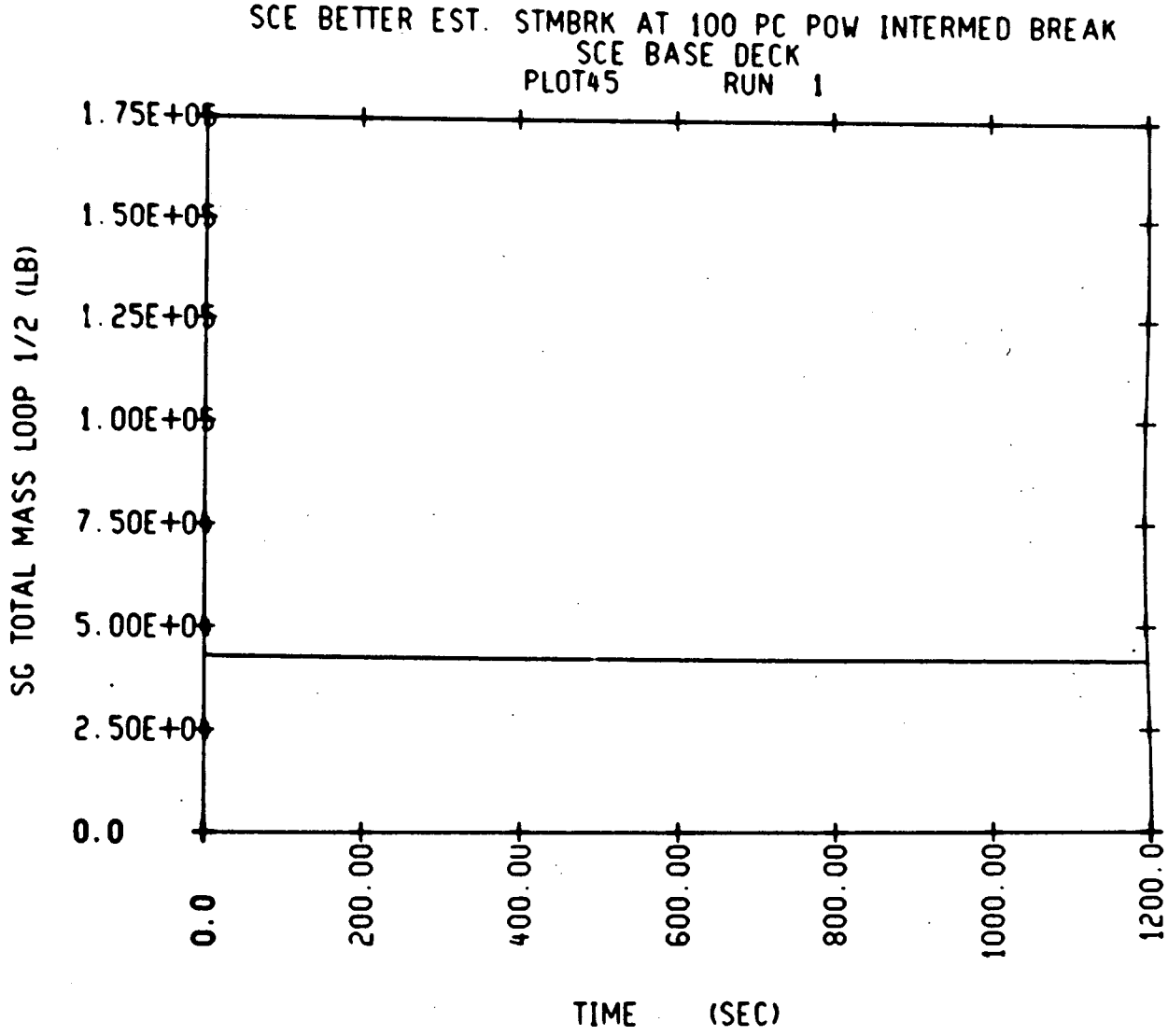

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT27 RUN 1
NUCLEAR POWER (FRAC OF NOM)
1.2000
1.0000
.80000
.60000
.40000
.20000
0.0
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

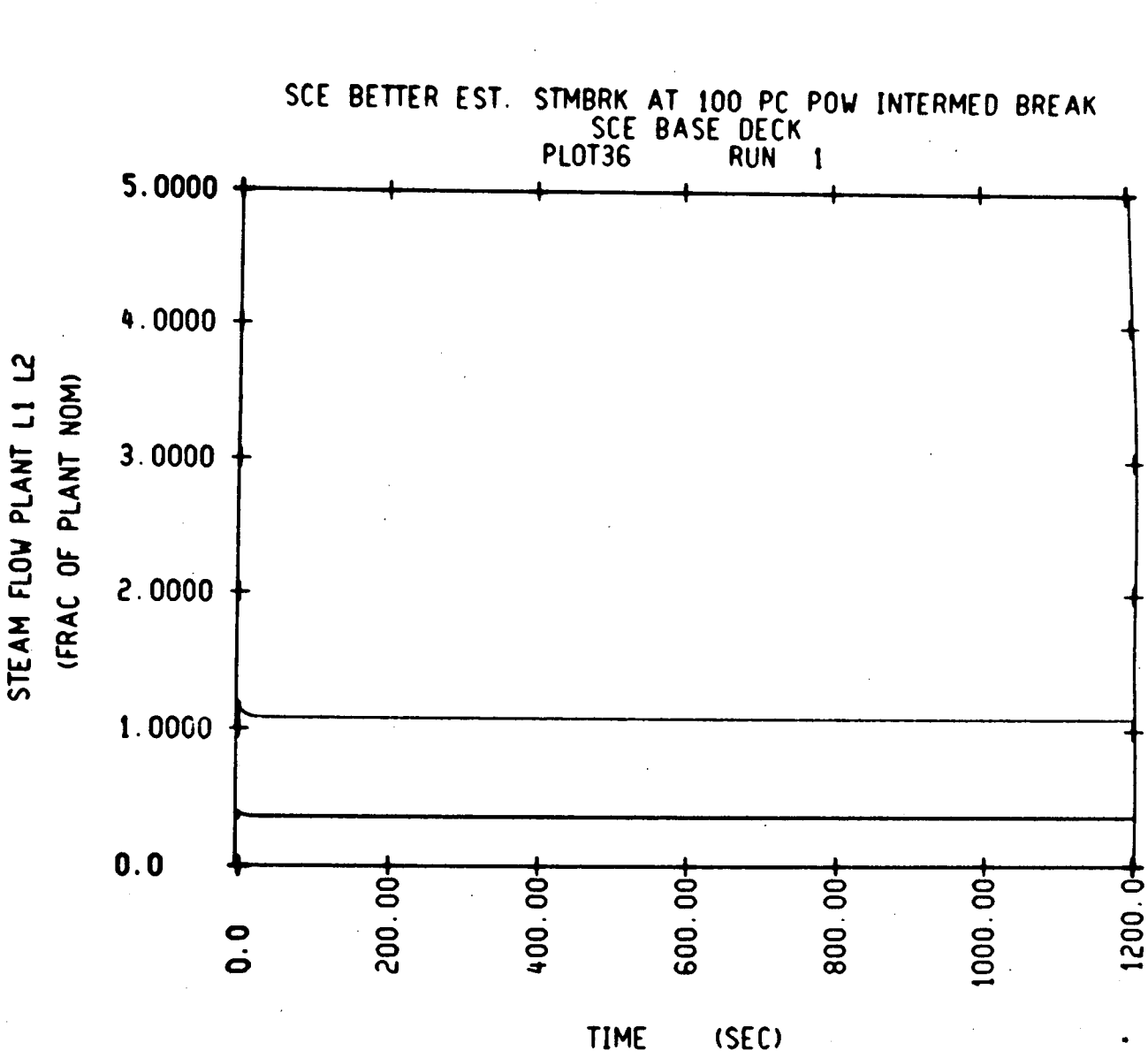

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT29 RUN 1
RCS PRESSURE (PSIA)
2700.0
2500.0
2250.0
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

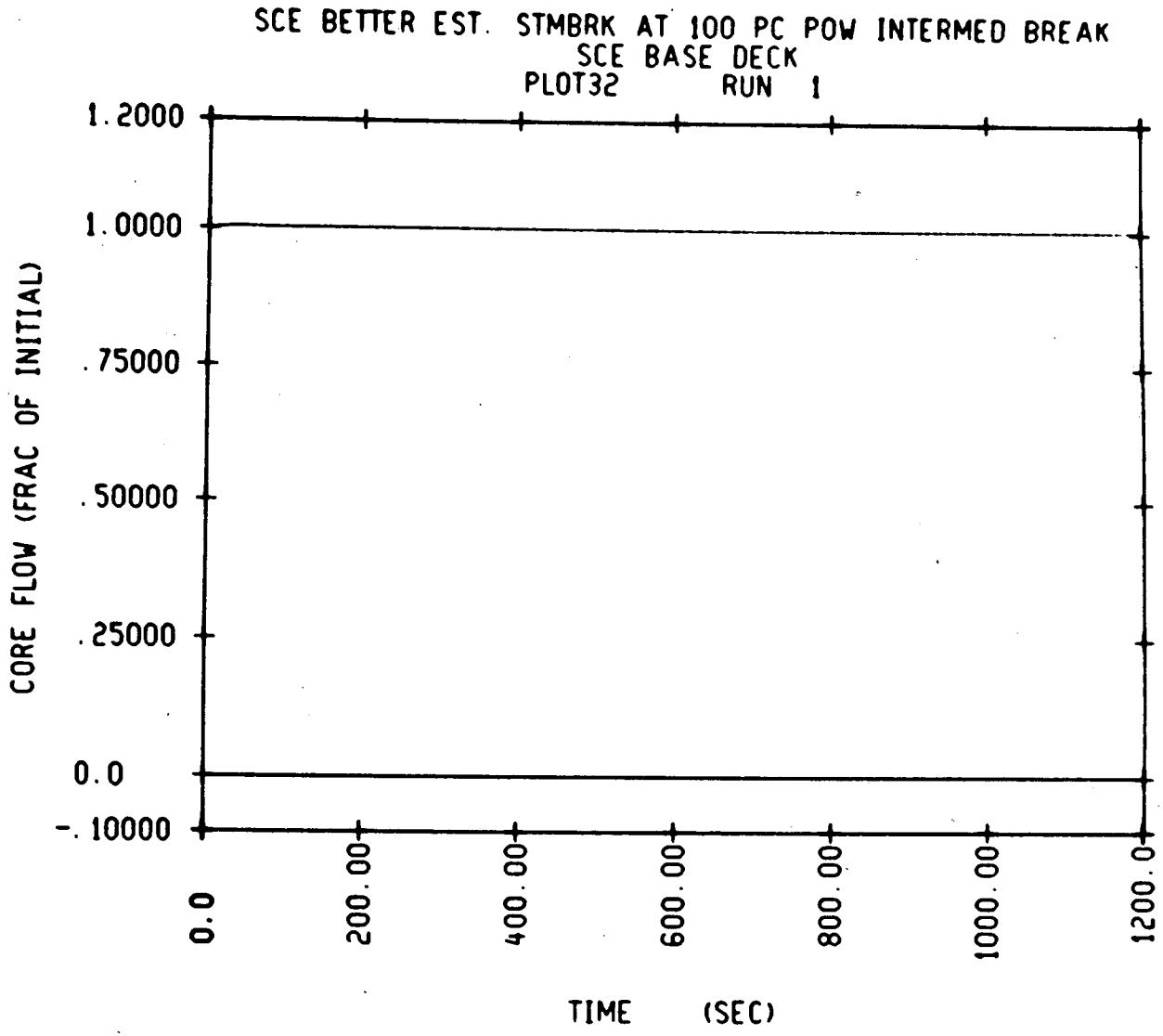

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT42 RUN 1
HOT LEG COLD LEG SAT TEMP. LOOP2 (DEG F)
700.00
600.00
500.00
400.00
300.00
200.00
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

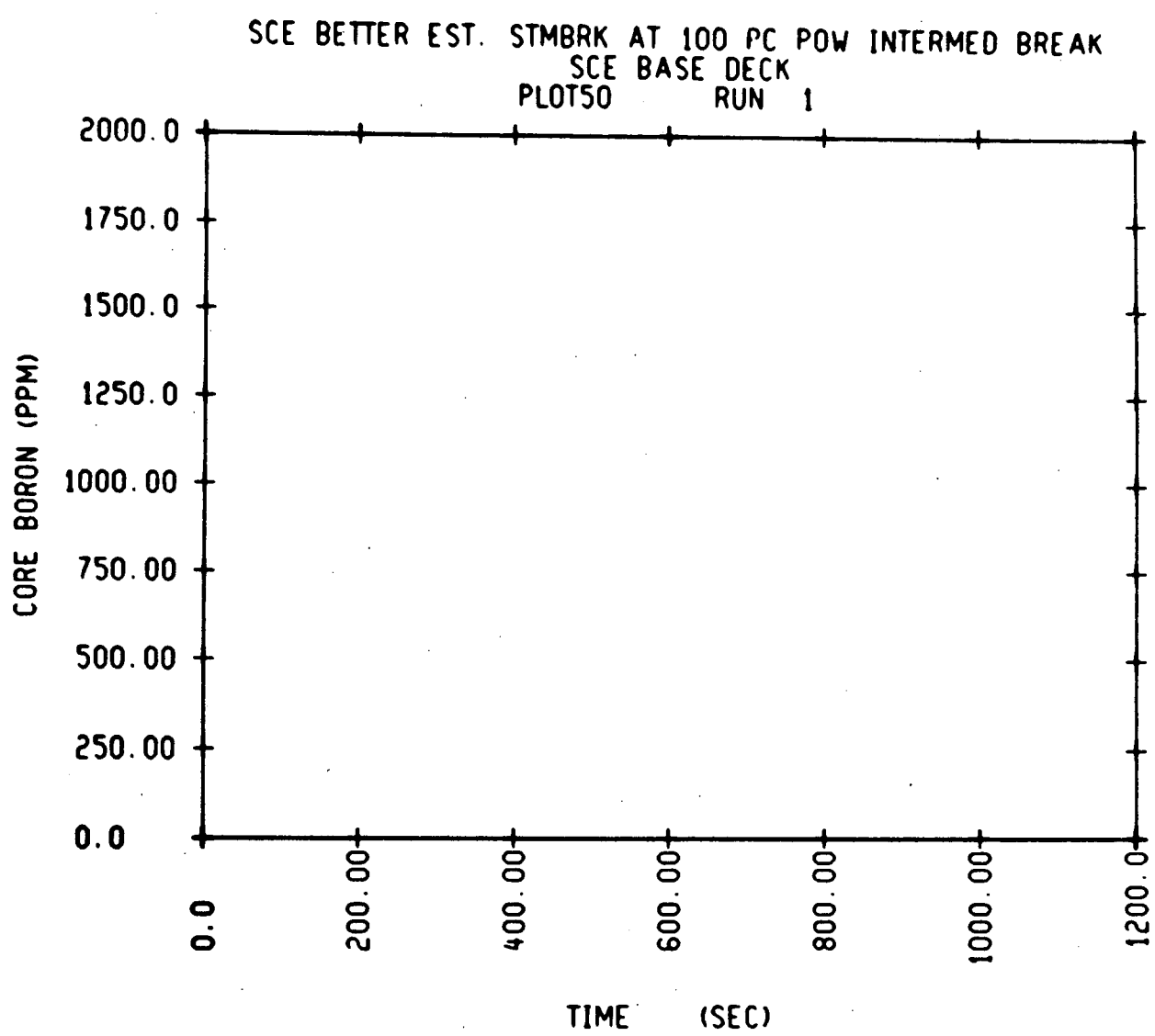

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT31 RUN 1
PRESSURIZER WATER VOLUME (CU FT)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)


SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT48 RUN 1
STEAM PRESSURE SG 1/2 (PSIA)
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

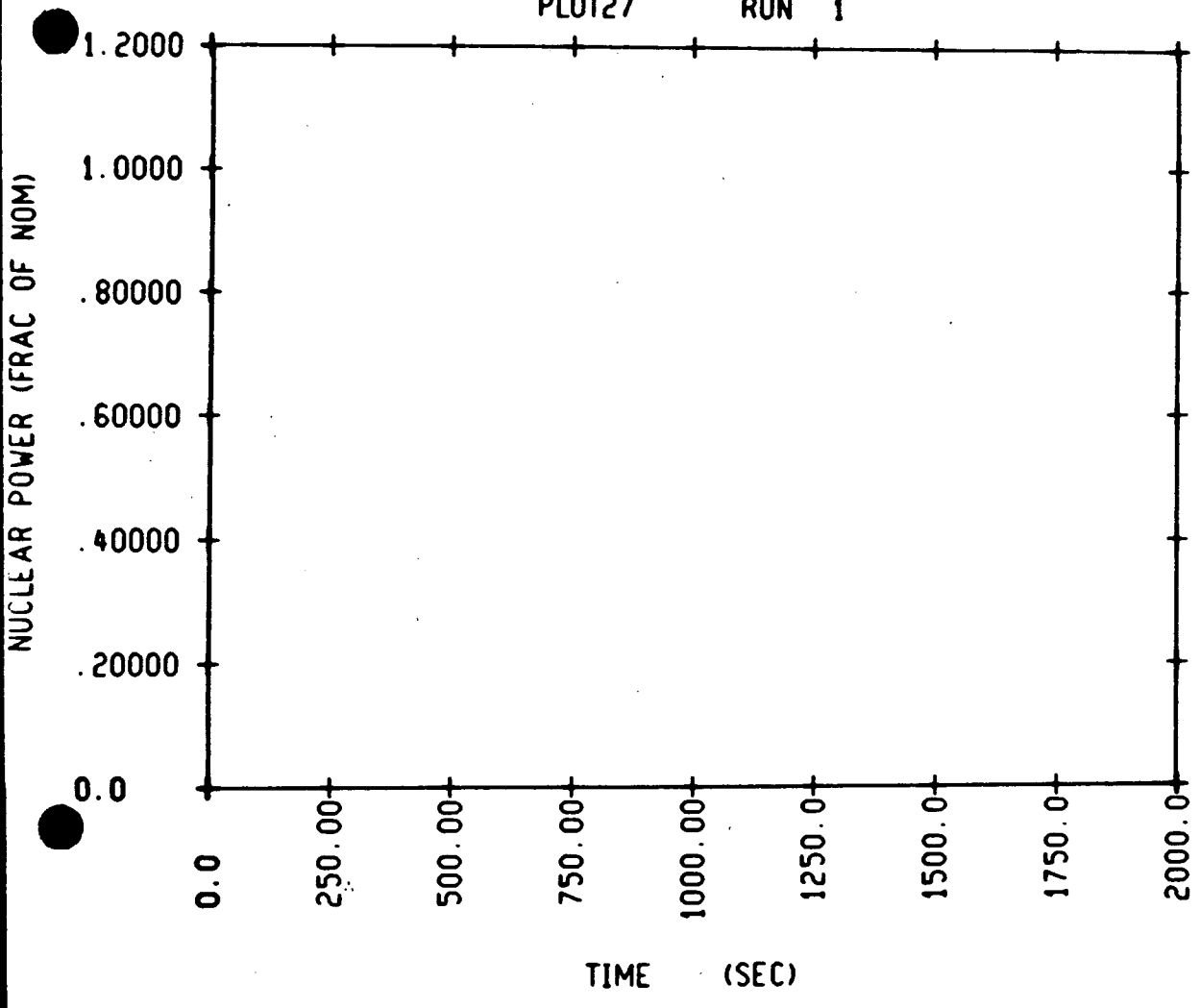

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT45 RUN 1
SG TOTAL MASS LOOP 1/2 (LB)
1.75E+05
1.50E+05
1.25E+05
1.00E+05
7.50E+04
5.00E+04
2.50E+04
0.0
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

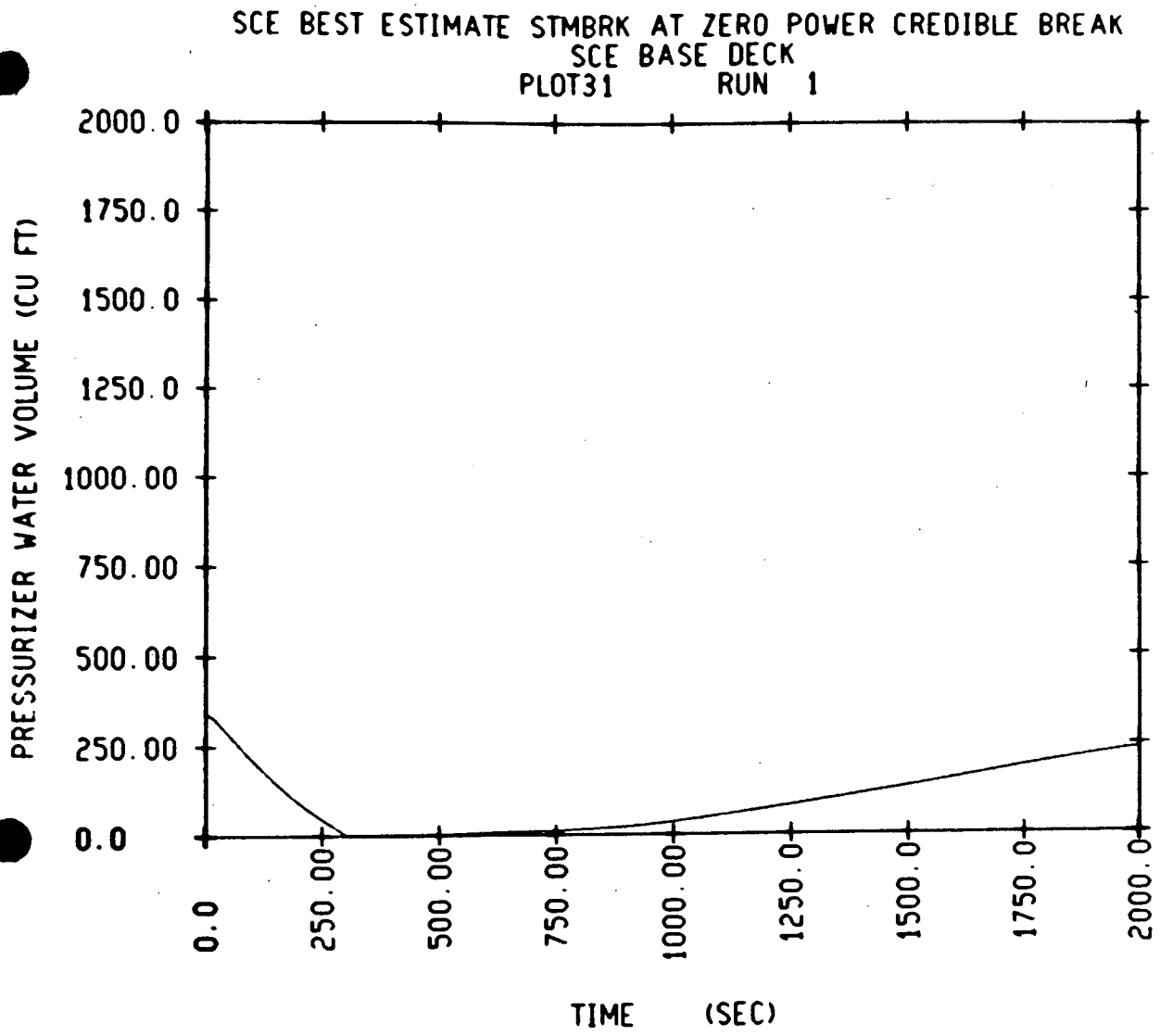

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT36 RUN 1
STEAM FLOW PLANT L1 L2
(FRAC OF PLANT NOM)
5.0000
4.0000
3.0000
2.0000
1.0000
0.0
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

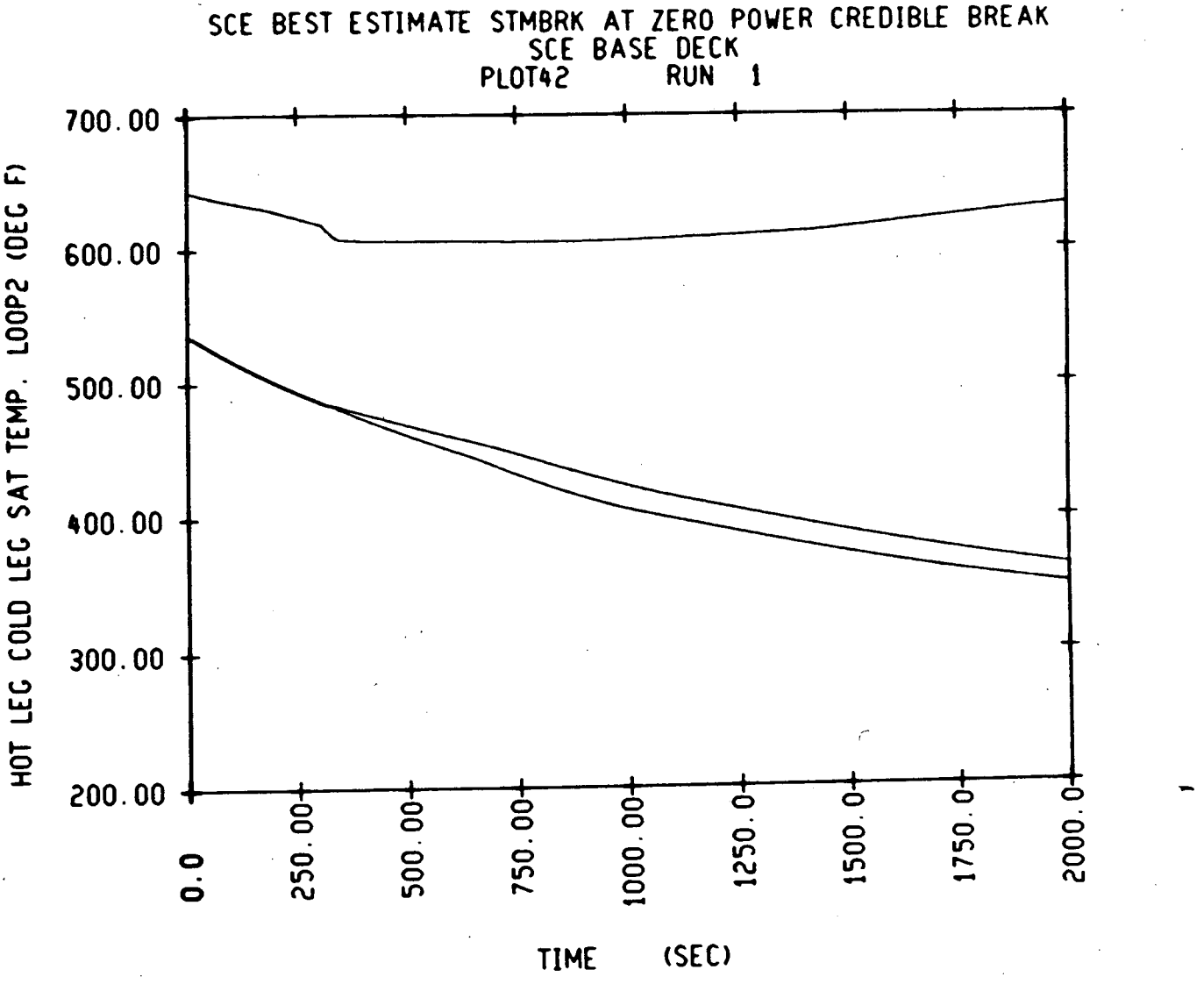

SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT32 RUN 1
1.2000
1.0000
.75000
.50000
.25000
0.0
-.10000
CORE FLOW (FRAC OF INITIAL)
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)


SCE BETTER EST. STMBRK AT 100 PC POW INTERMED BREAK
SCE BASE DECK
PLOT50 RUN 1
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
CORE BORON (PPM)
0.0
200.00
400.00
600.00
800.00
1000.00
1200.0
TIME (SEC)

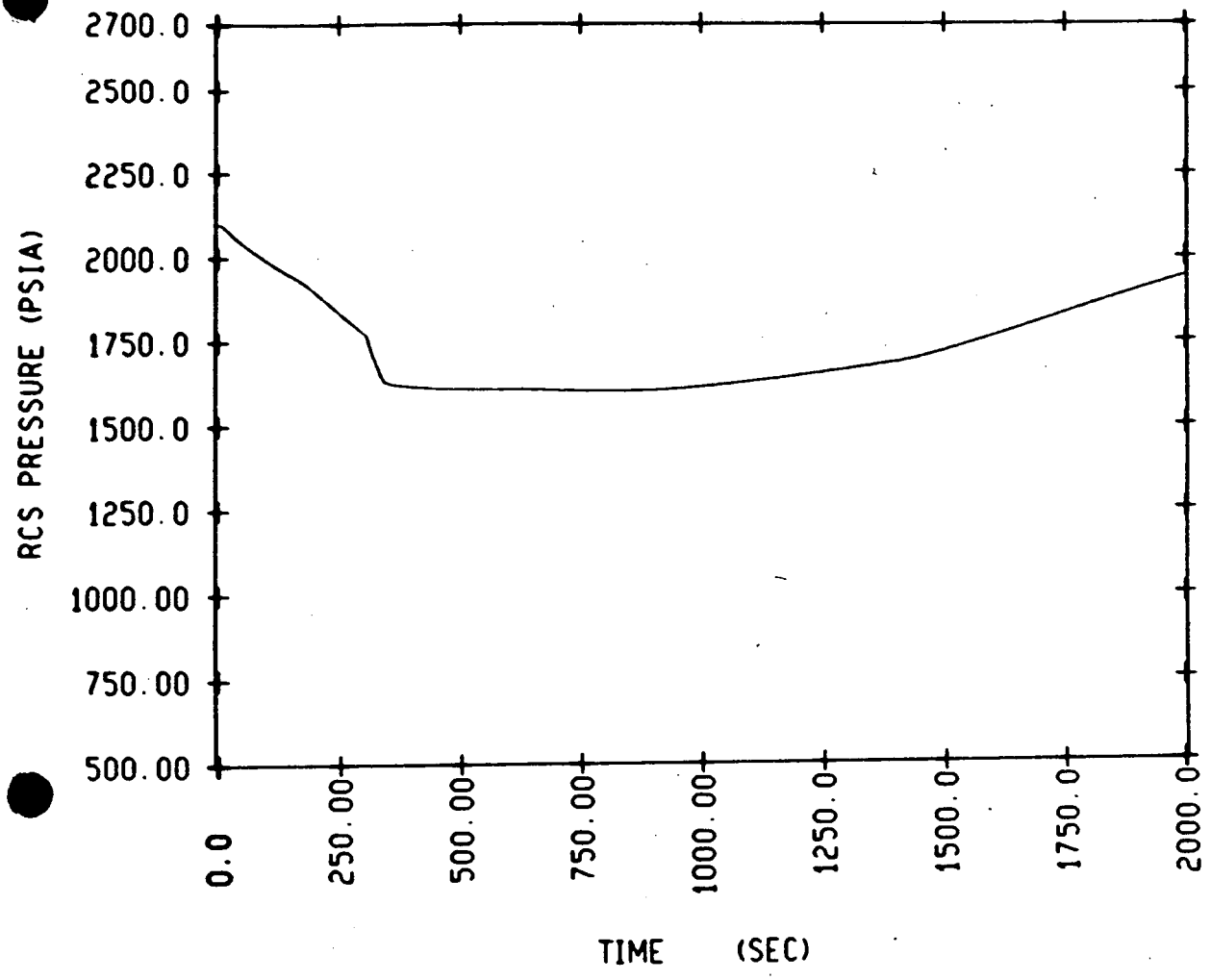
SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT27 RUN 1




SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT31 RUN 1
PRESSURIZER WATER VOLUME (CU FT)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT42 RUN 1
HOT LEG COLD LEG SAT TEMP. LOOP2 (DEG F)
700.00
600.00
500.00
400.00
300.00
200.00
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

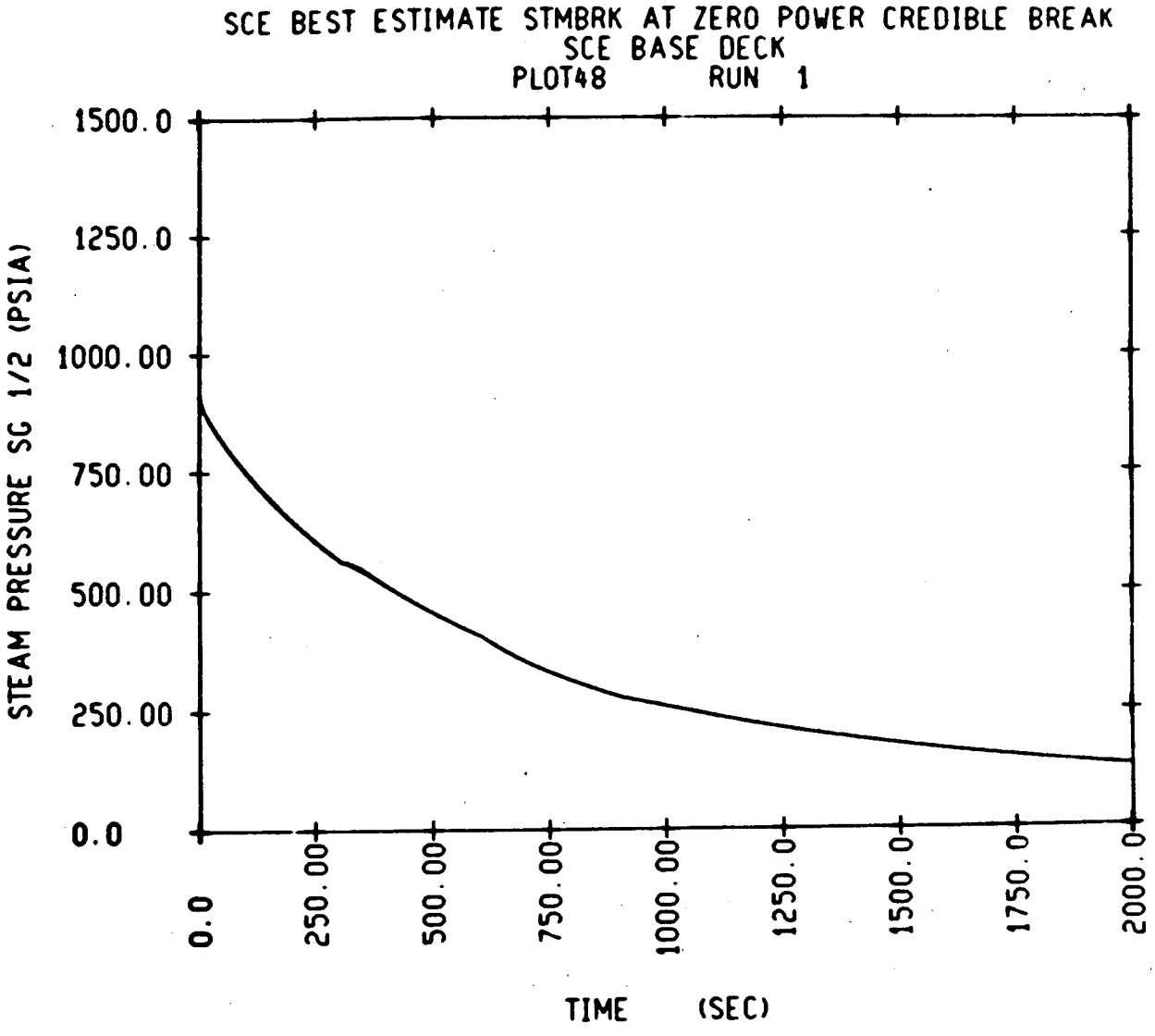
SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT29 RUN 1

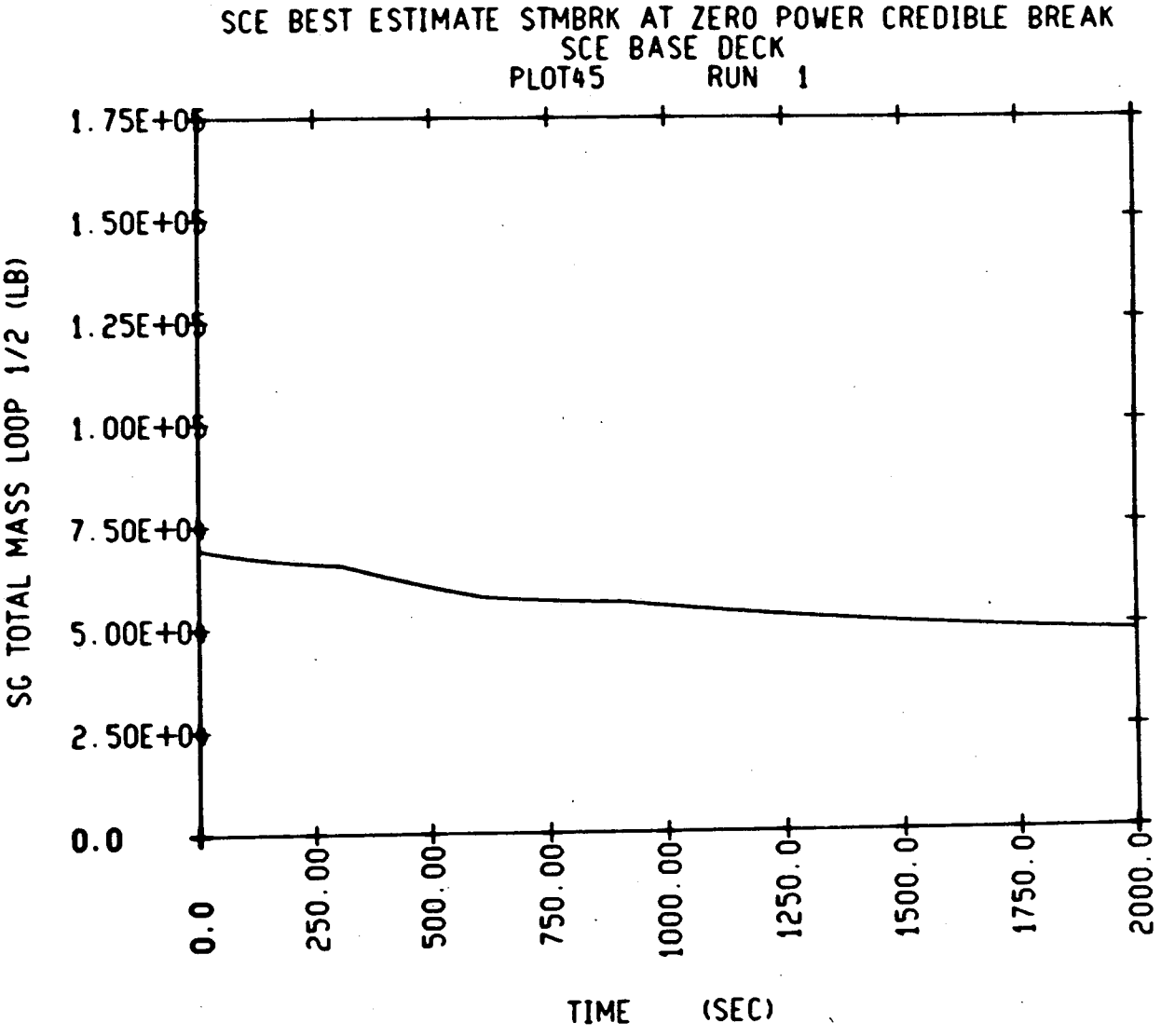


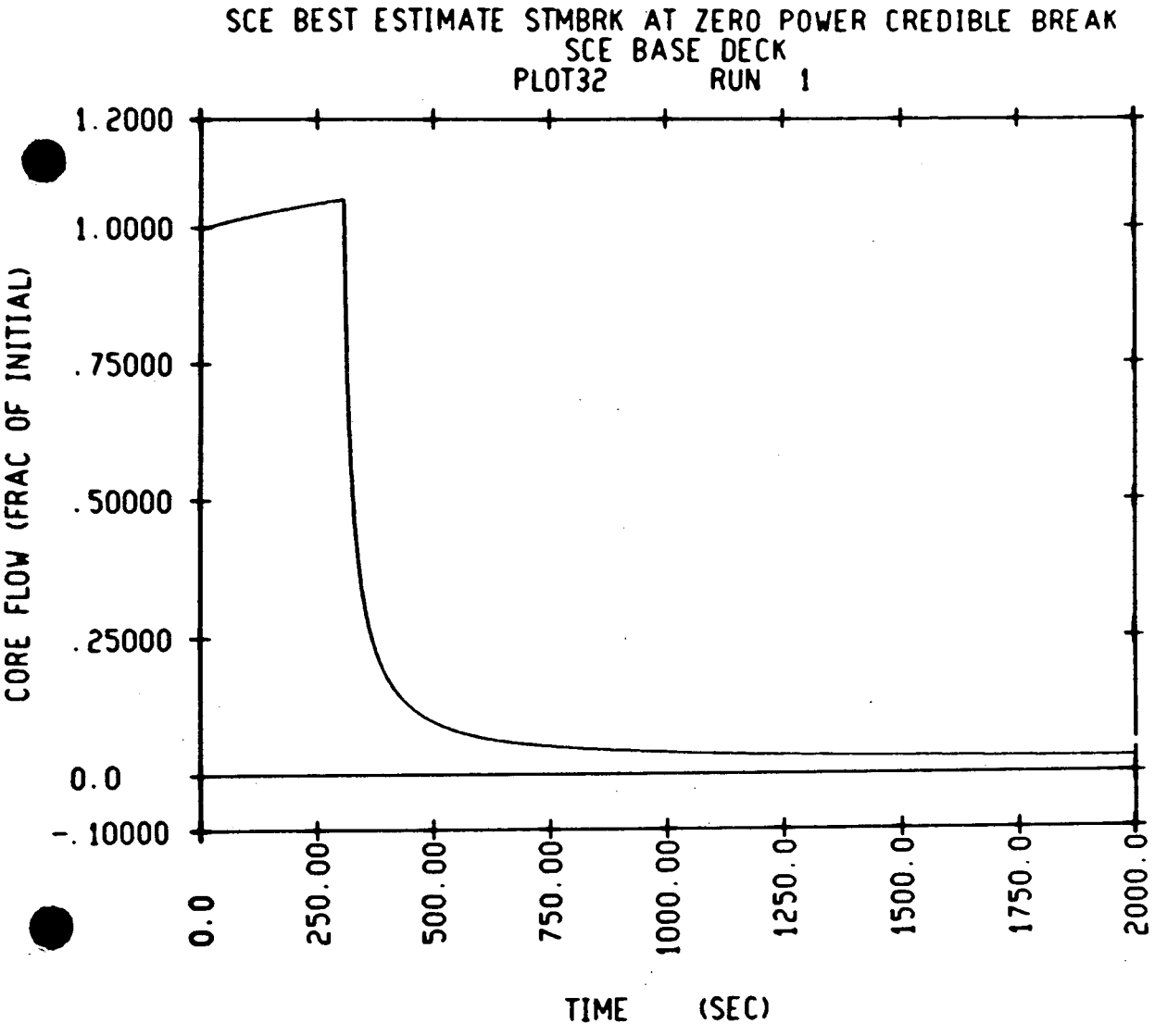
CREDIBLE ZERO POWER STEAMLINE BREAK

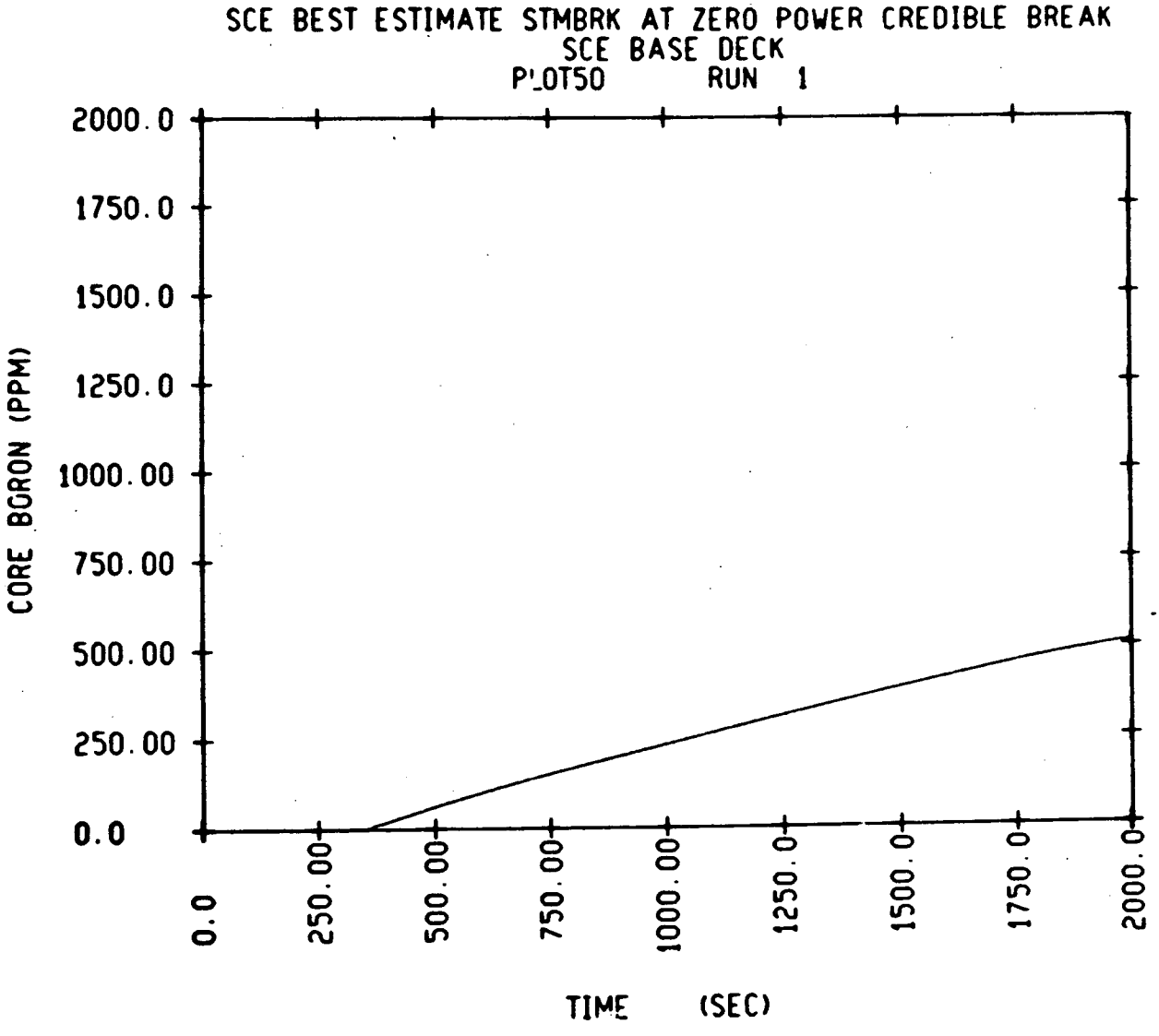
EVENT	TIME
PIPE RUPTURE	0
REACTOR TRIP (LOW PRESSURIZER PRESSURE)	236.5
RCP TRIP	238.5
PRESSURIZER EMPTIES	305.0
SI INITIATION (LOW PRESSURIZER PRESSURE)	310.4
MFW ISOLATION	312.4
SI SYSTEM ALIGNED AND UPERATING	332.4
M/D AFW PUMPS STARTED	610.4
M/D AFW PUMPS THROTTLED	910.4

CREDIBLE = 0.02 FT^2/LOOP


SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT48 RUN 1
STEAM PRESSURE SG 1/2 (PSIA)
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT45 RUN 1
SG TOTAL MASS LOOP 1/2 (LB)
1.75E+05
1.50E+05
1.25E+05
1.00E+05
7.50E+04
5.00E+04
2.50E+04
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT32 RUN 1
1.2000
1.0000
.75000
.50000
.25000
0.0
-.10000
CORE FLOW (FRAC OF INITIAL)
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)


SCE BEST ESTIMATE STMBRK AT ZERO POWER CREDIBLE BREAK
SCE BASE DECK
PLOT50 RUN 1
CORE BORON (PPM)
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
250.00
500.00
750.00
1000.00
1250.0
1500.0
1750.0
2000.0
TIME (SEC)

ENCLOSURE 2

STEAM GENERATOR TUBE RUPTURE

BASIC ACTIONS

GENERIC STEAM GENERATOR TUBE RUPTURE

1. IDENTIFY RUPTURED STEAM GENERATOR
2. ISOLATE RUPTURED STEAM GENERATOR
3. USE NON-RUPTURED STEAM GENERATORS TO COOL DOWN RCS TO 50 degrees BELOW NO-LOAD TEMPERATURE
4. DEPRESSURIZE RCS TO RUPTURED STEAM GENERATOR PRESSURE
5. TERMINATE SAFETY INJECTION FLOW
6. COOL DOWN AND DEPRESSURIZE RCS TO RHR CONDITIONS
7. CONTINUE COOLDOWN ON RHR TO COLD SHUTDOWN CONDITIONS

AREAS OF CONCERN FOR SAN ONOFRE

1. CANNOT ISOLATE RUPTURED STEAM GENERATOR

2. OVERFILL OF RUPTURED STEAM GENERATOR

3. VOIDING OF UPPER HEAD REGION

4. HIGH CAPACITY OF MAIN FEED (SI) PUMPS

5. RCPS TRIPPED ON REACTOR TRIP

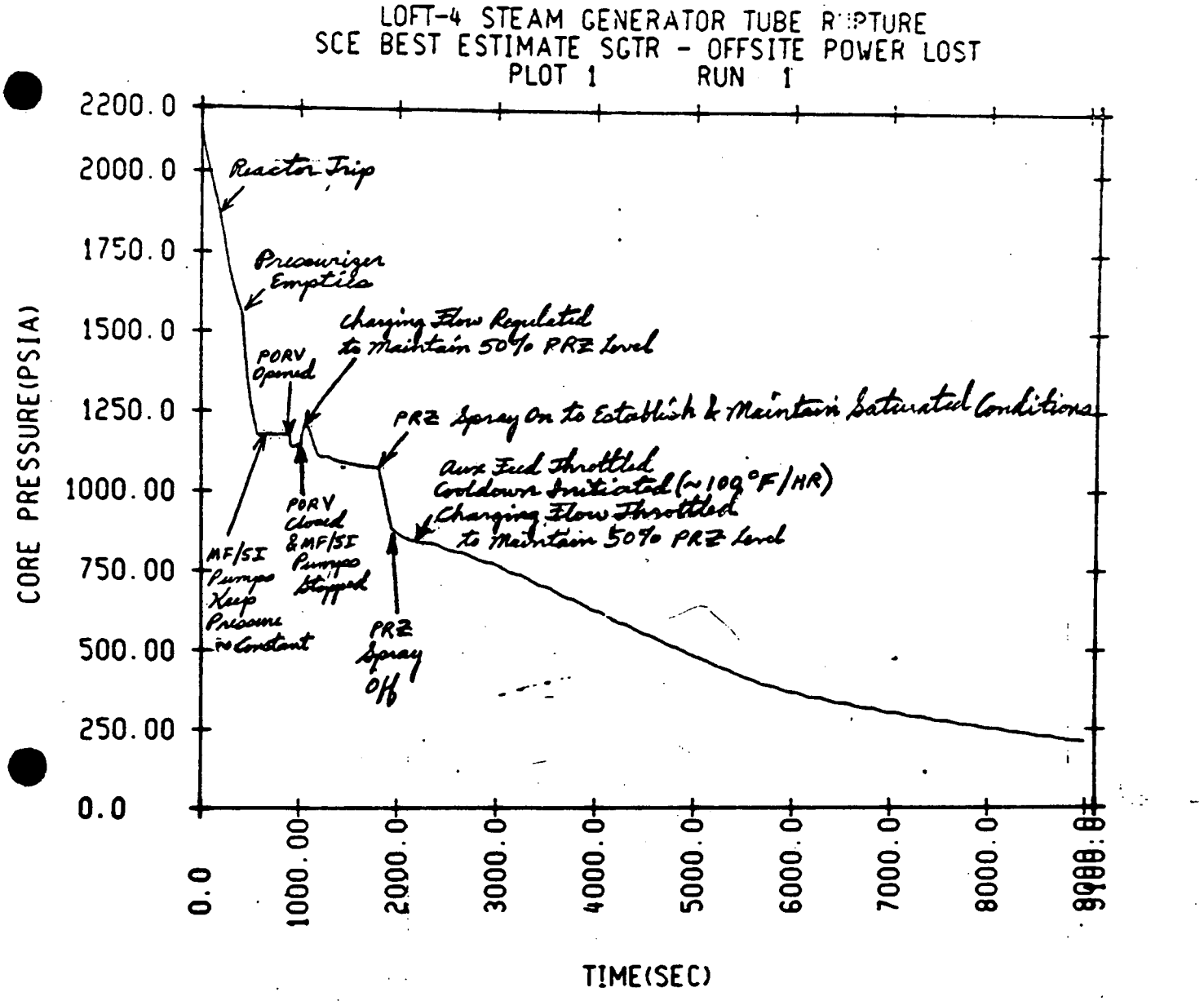
BASIC ACTIONS

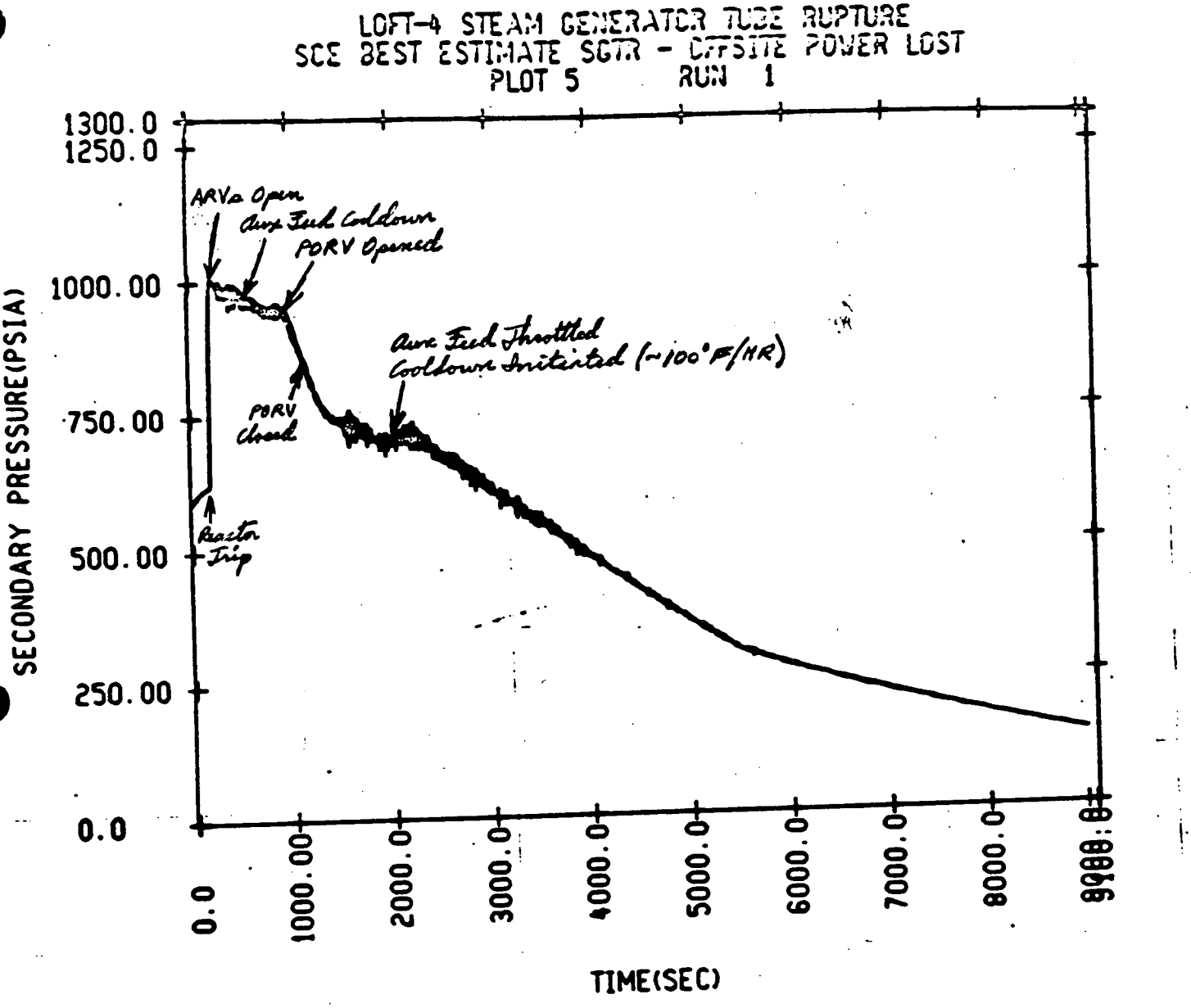
SONGS #1 STEAM GENERATOR TUBE RUPTURE

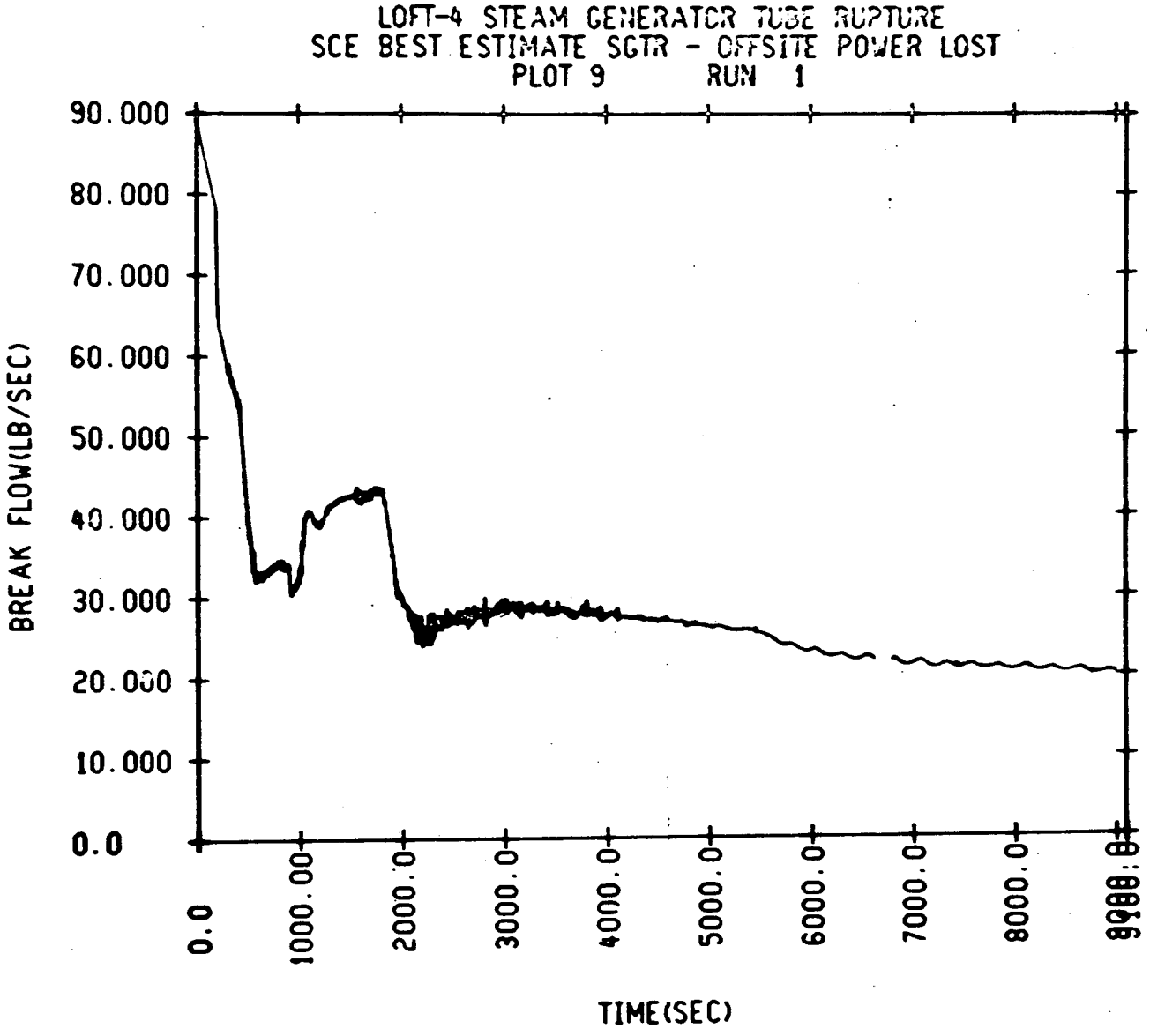
1. IDENTIFY RUPTURED STEAM GENERATOR
2. ISOLATE AFW TO RUPTURED STEAM GENERATOR
3. INITIATE MAX CHARGING FLOW TO RCS
4. DEPRESSURIZE RCS TO REFILL PRESSURIZER
5. START REACTOR COOLANT PUMPS
6. STOP SAFETY INJECTION PUMPS
7. COOL DOWN RCS AT MAXIMUM RATE WHILE MINIMIZING PRIMARY TO SECONDARY DELTA P
8. INITIATE RHR OPERATION
9. COOL RCS TO COLD SHUTDOWN CONDITIONS WITH RHR (MAINTAIN RCS PRESSURE APPROXIMATELY EQUAL TO STEAM PRESSURE)

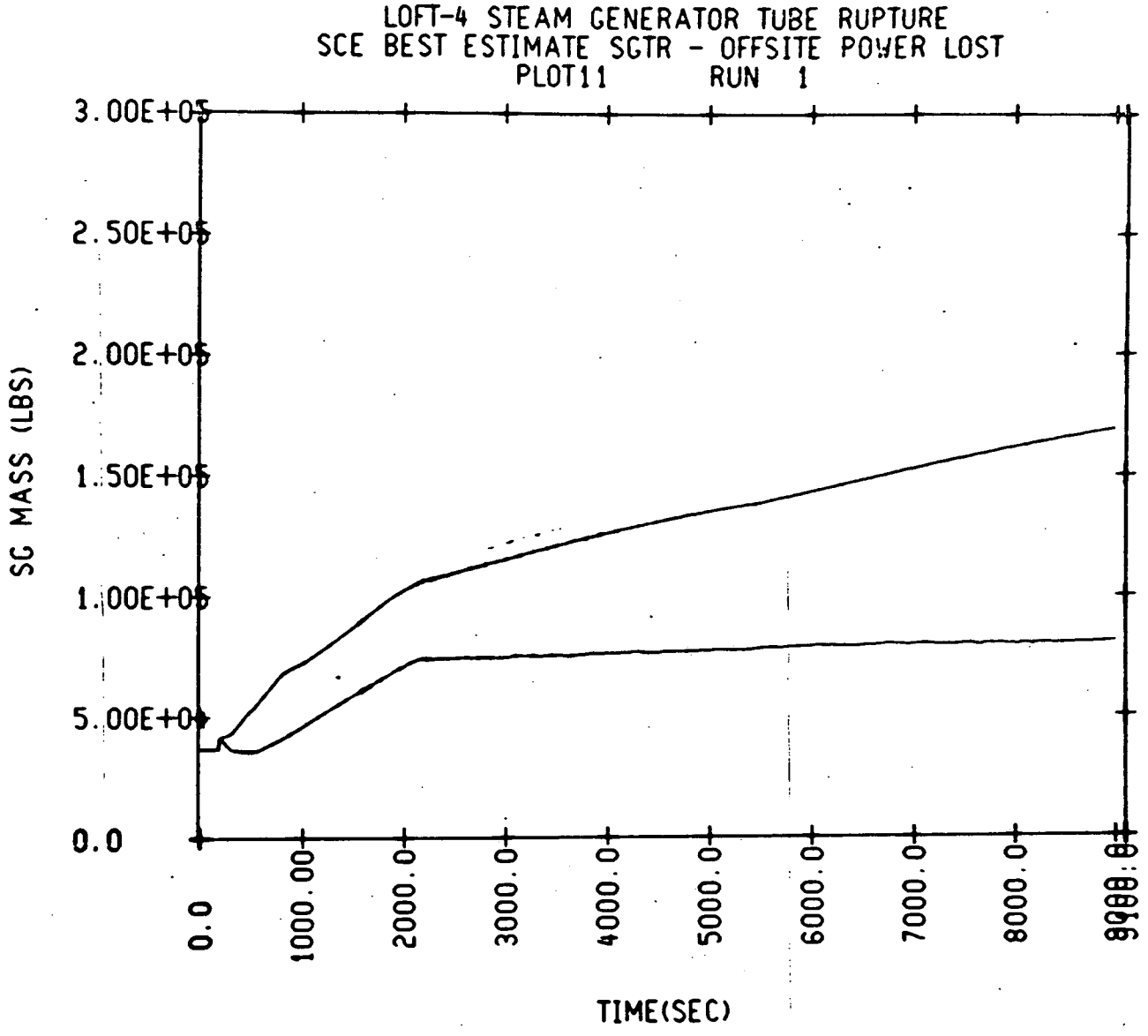
OFFSITE POWER LOST - SATURATED COOLDOWN

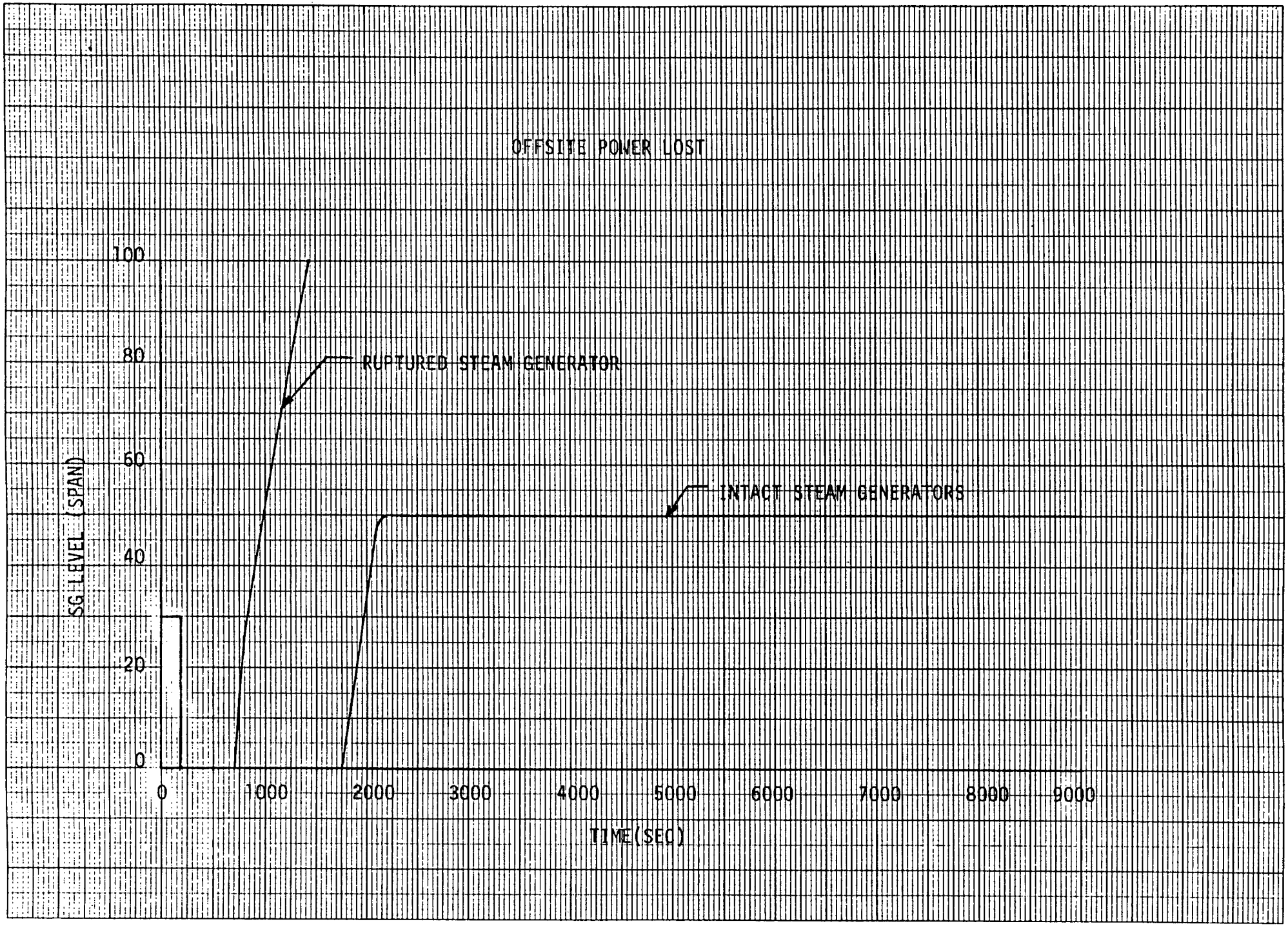
EVENT	TIME (SEC)
REACTOR TRIP	182.3
SI INITIATION	272.0
AUX. FEEDWATER INITIATION	310.0
AUX. FEEDWATER TERMINATED TO RUPTURED SG	815.0
PRESSURIZER PORV OPENED	900.0
PRESSURIZER PORV CLOSED	1016.0
MF/SI PUMPS STOPPED	1023.0
CHARGING FLOW THROTTLED TO MAINTAIN 50% LEVEL IN PRESSURIZER	1052.0
PRESSURIZER SPRAY ON	1800.0
~100°F/HR COOLDOWN INITIATED	1800.0
AUX. FEEDWATER THROTTLED TO INTACT SGS	~2100.0

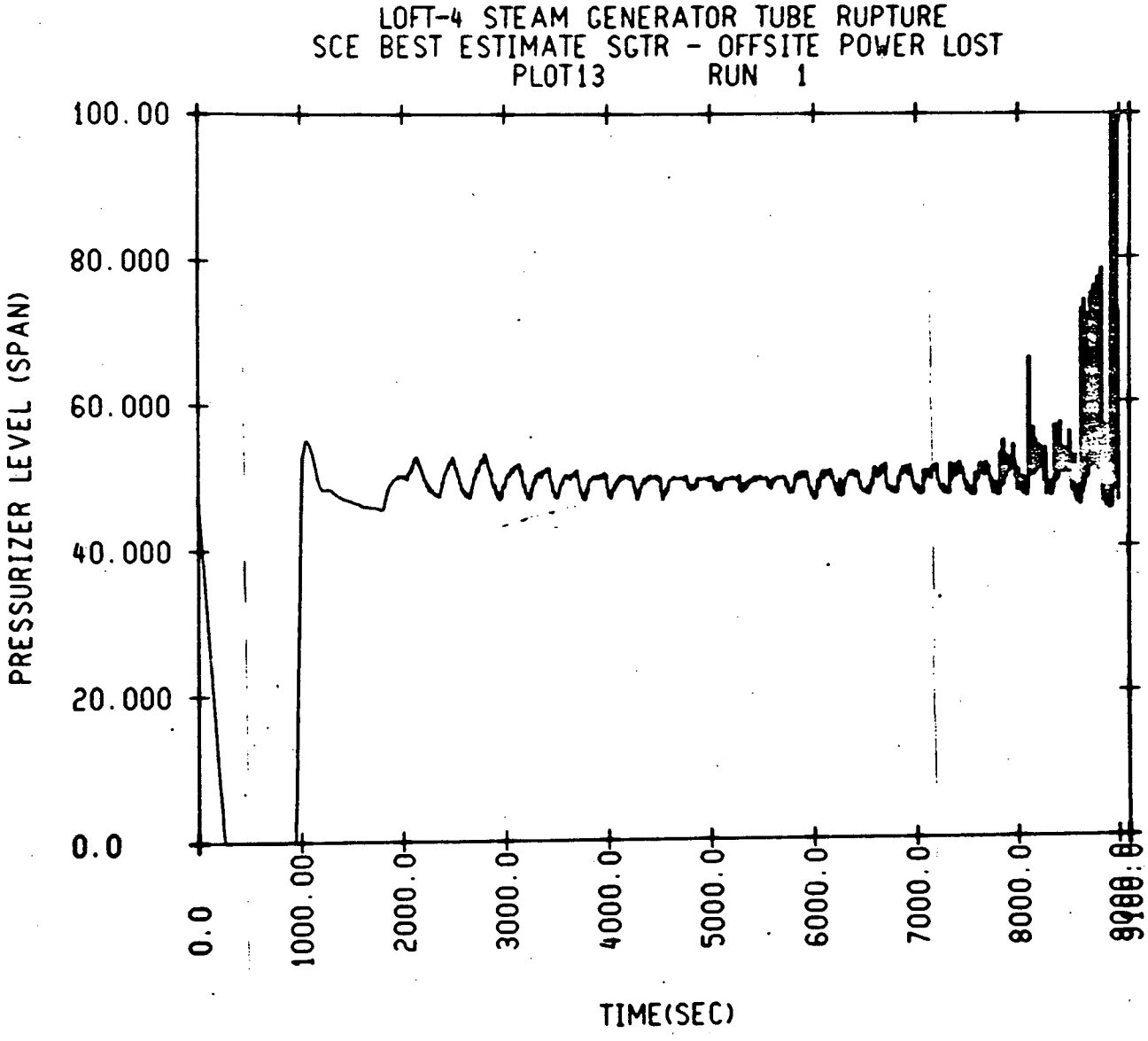

LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BEST ESTIMATE SGTR - OFFSITE POWER LOST
PLOT 1 RUN 1
CORE PRESSURE(PSIA)
2200.0
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
Reactor Trip
Pressurizer Empties
PORV Opened
Charging Flow Regulated to Maintain 50% PRZ Level
PRZ Spray On to Establish & Maintain Saturated Conditions
Aux Feed Throttled
Cooldown Initiated (~100°F/HR)
Charging Flow Throttled to Maintain 50% PRZ Level
MF/SI Pumps Keep Pressure Constant
PORV Closed & MF/SI Pumps Stopped
PRZ Spray Off
0.0
1000.00
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
9000.0
TIME(SEC)

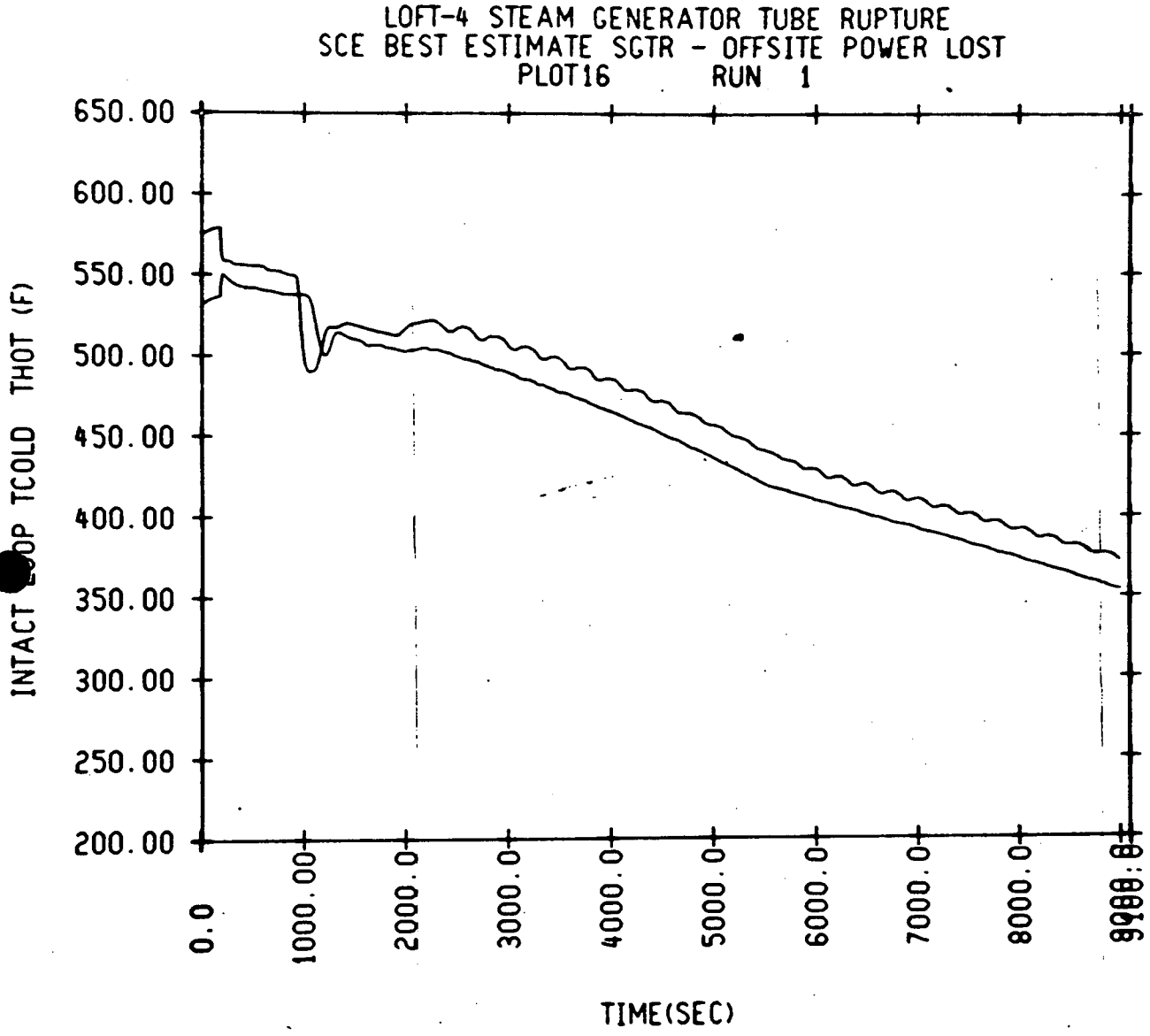

LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BEST ESTIMATE SGTR - OFFSITE POWER LOST
PLOT 5 RUN 1
SECONDARY PRESSURE(PSIA)
1300.0
1250.0
1000.00
750.00
500.00
250.00
0.0
ARVs Open
Aux Feed Cooldown
PORV Opened
PORV Closed
Aux Feed Throttled
Cooldown Initiated (~100°F/HR)
Reactor Trip
0.0
1000.00
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
TIME(SEC)


LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BEST ESTIMATE SGTR - OFFSITE POWER LOST
PLOT 9 RUN 1
BREAK FLOW(LB/SEC)
90.000
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.0
0.0
1000.00
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
TIME(SEC)


LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BEST ESTIMATE SGTR - OFFSITE POWER LOST
PLOT11 RUN 1
SG MASS (LBS)
3.00E+05
2.50E+05
2.00E+05
1.50E+05
1.00E+05
5.00E+04
0.0
0.0
1000.00
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
TIME(SEC)

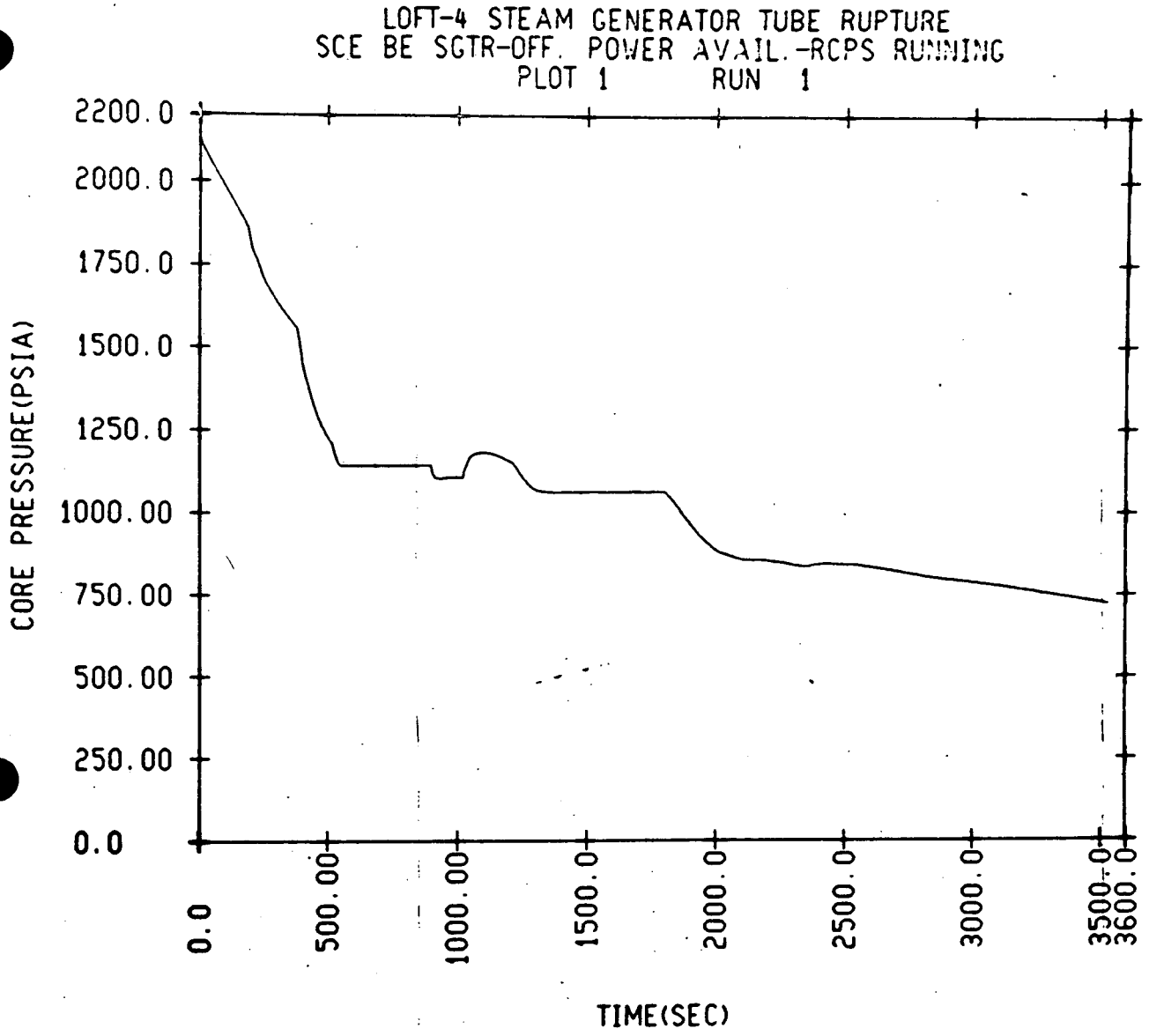

OFFSITE POWER LOST
RUPTURED STEAM GENERATOR
INTACT STEAM GENERATORS
SG LLEVEL (SPAN)
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
TIME(SEC)

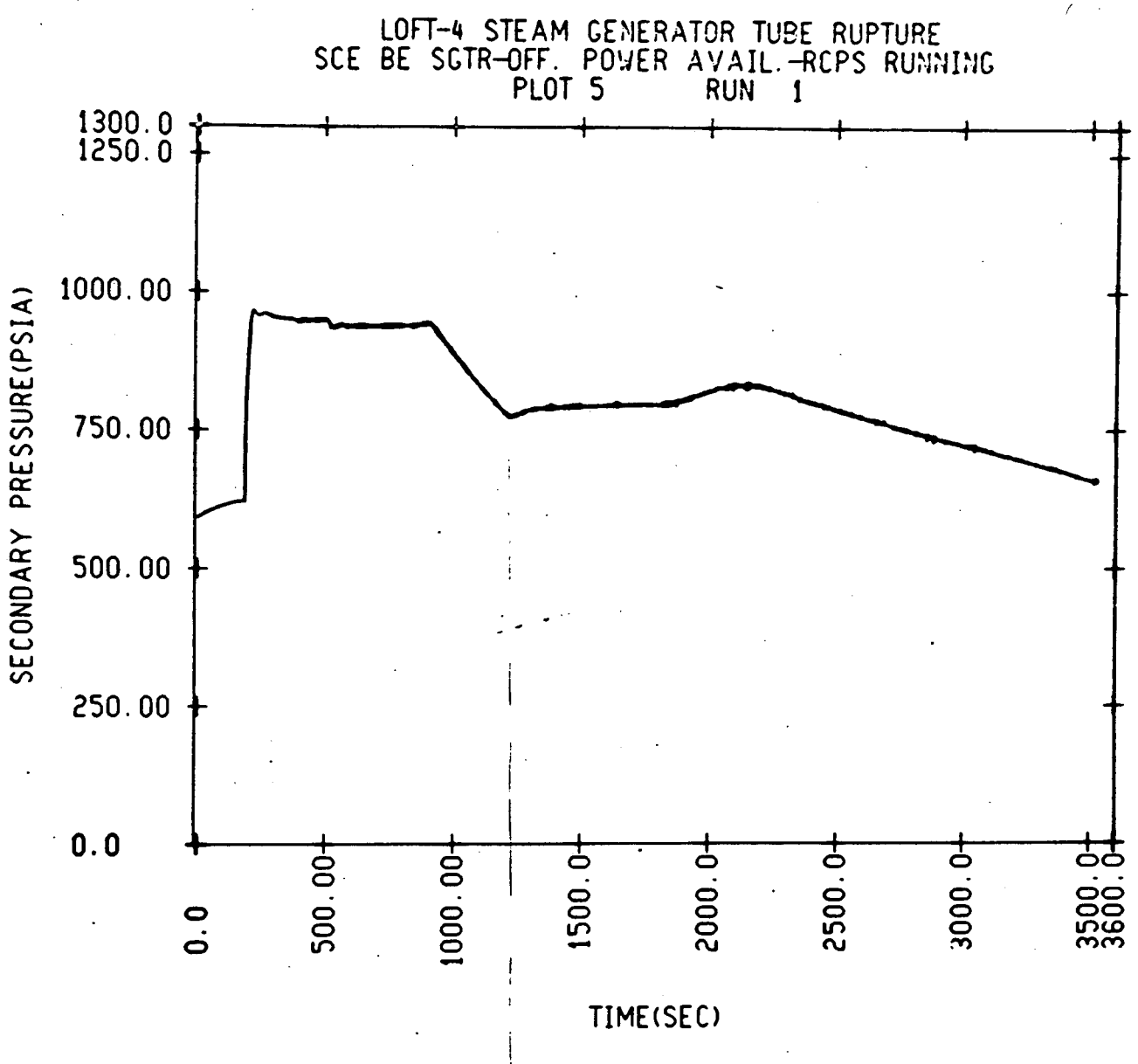

LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BEST ESTIMATE SGTR - OFFSITE POWER LOST
PLOT13 RUN 1
PRESSURIZER LEVEL (SPAN)
100.00
80.000
60.000
40.000
20.000
0.0
0.0
1000.00
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
TIME(SEC)

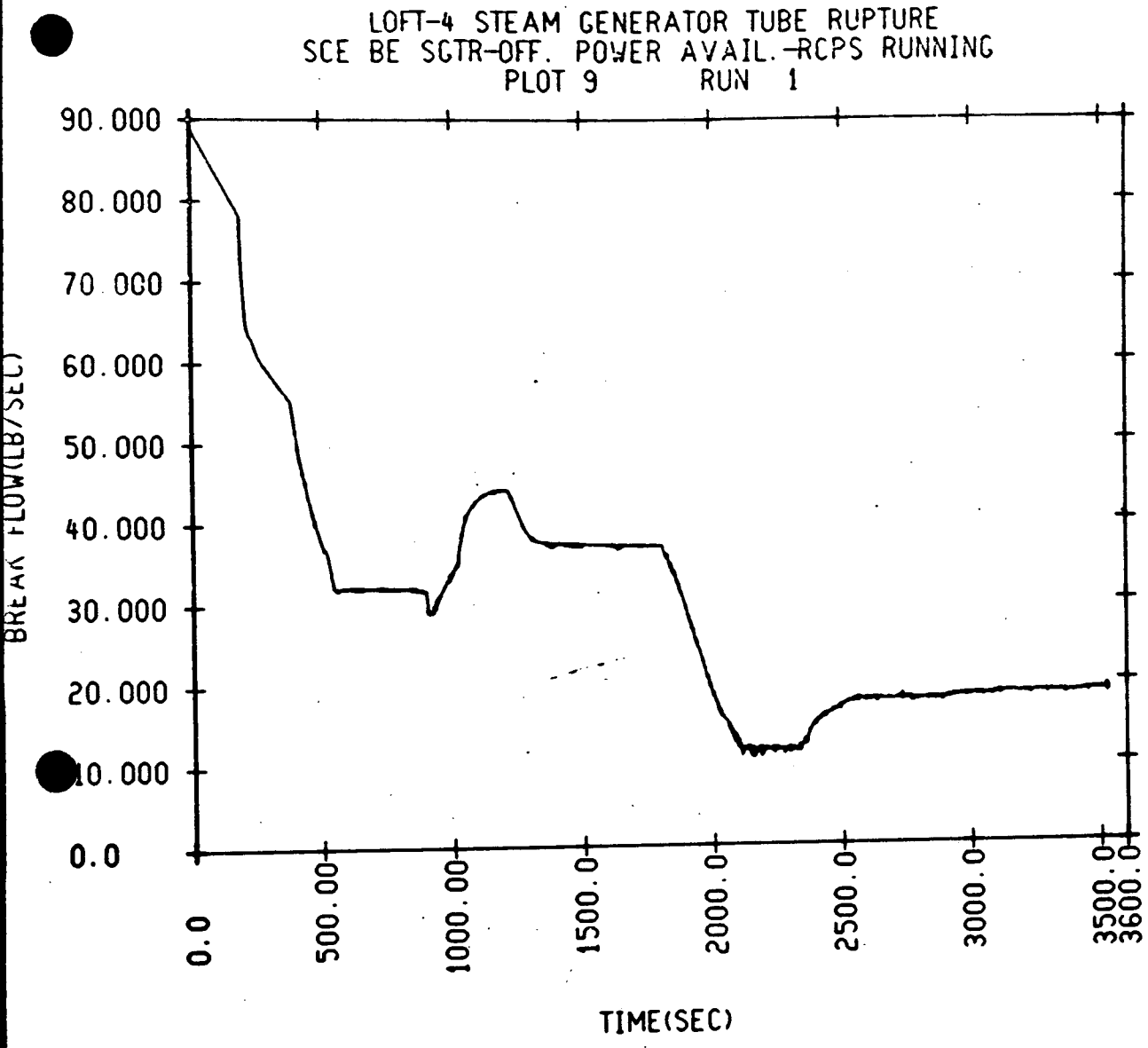

LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BEST ESTIMATE SGTR - OFFSITE POWER LOST
PLOT16 RUN 1
650.00
600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
INTACT LOOP TCOLD THOT (F)
0.0
1000.00
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
TIME(SEC)

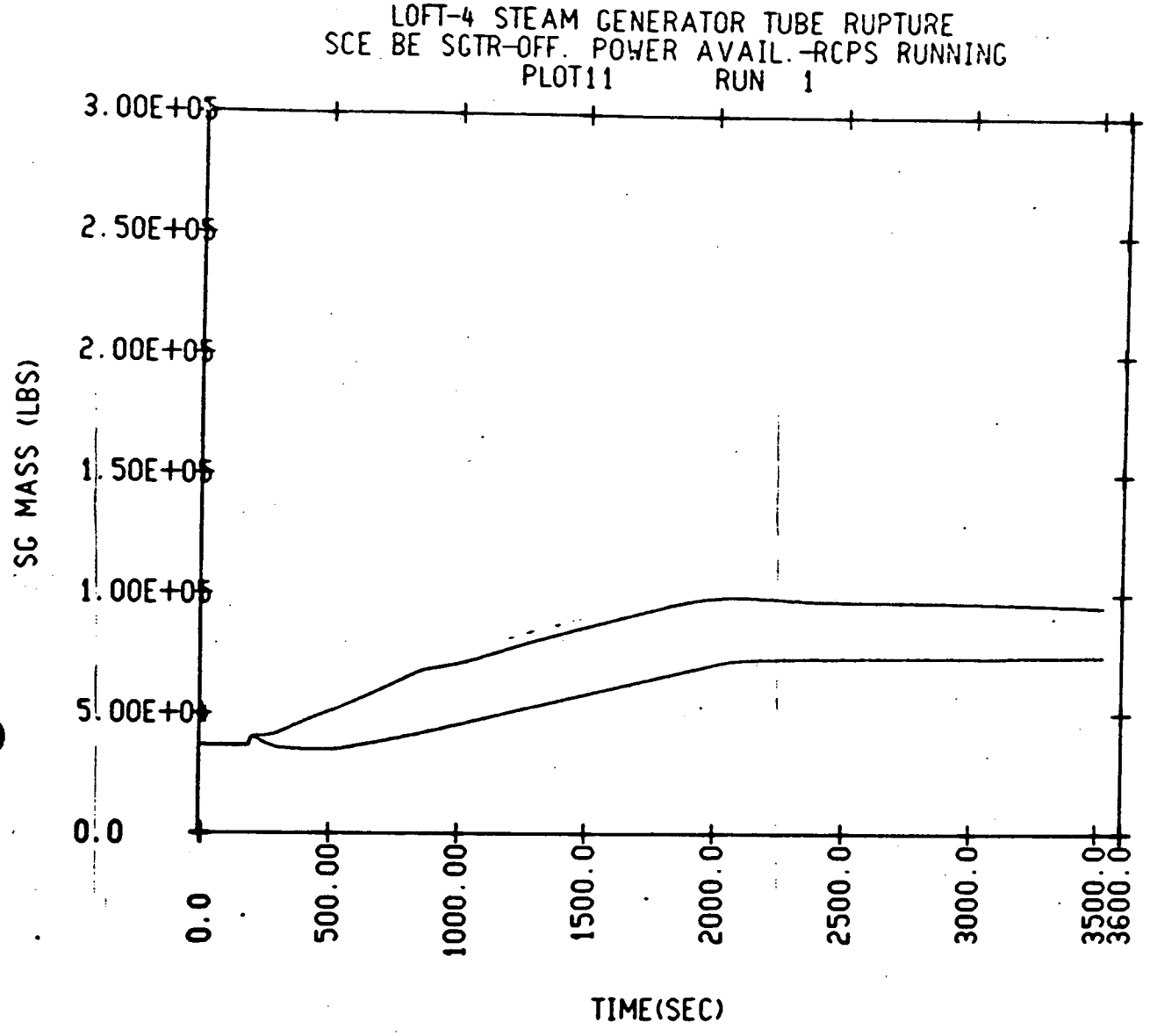
OFFSITE POWER AVAILABLE - SATURATED COOLDOWN - RCPS RUNNING

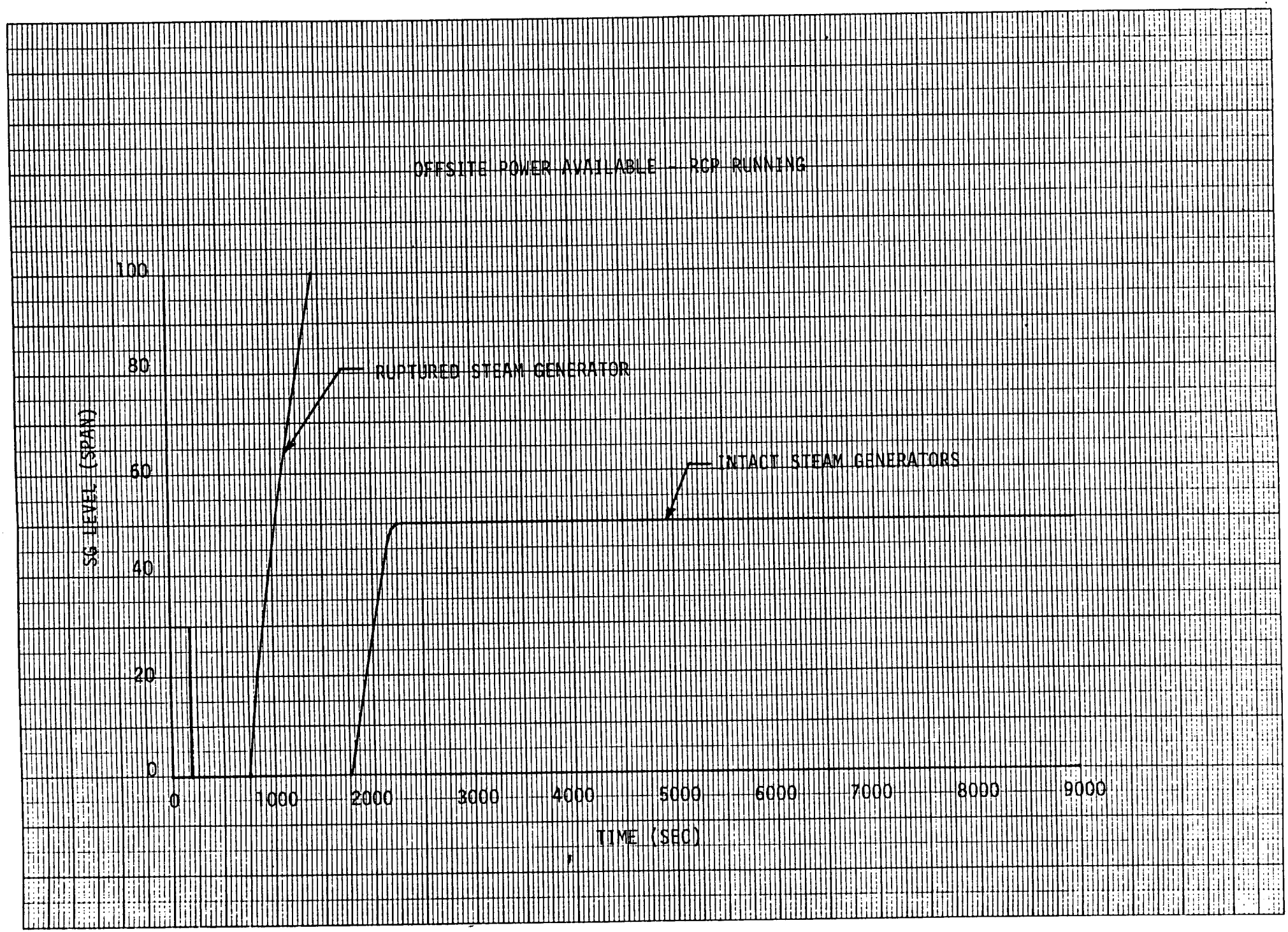
EVENT	TIME (SEC)
REACTOR TRIP	182.8
SI INITIATION	248.0
AUX. FEEDWATER INITIATION	286.0
AUX. FEEDWATER TERMINATED TO	870.0
PRESSURIZER PORV OPENED	900.0
PRESSURIZER PORV CLOSED	1023.0
MF/SI PUMPS STOPPED	1026.0
CHARGING FLOW THROTTLED TO MAINTAIN 50% LEVEL IN PRESSURIZER	1047.0
PRESSURIZER SPRAY ON	1800.0
∿100°F/HR COOLDOWN INITIATED	1800.0
AUX. FEEDWATER THROTTLED TO INTACT SGS	∿2100.0

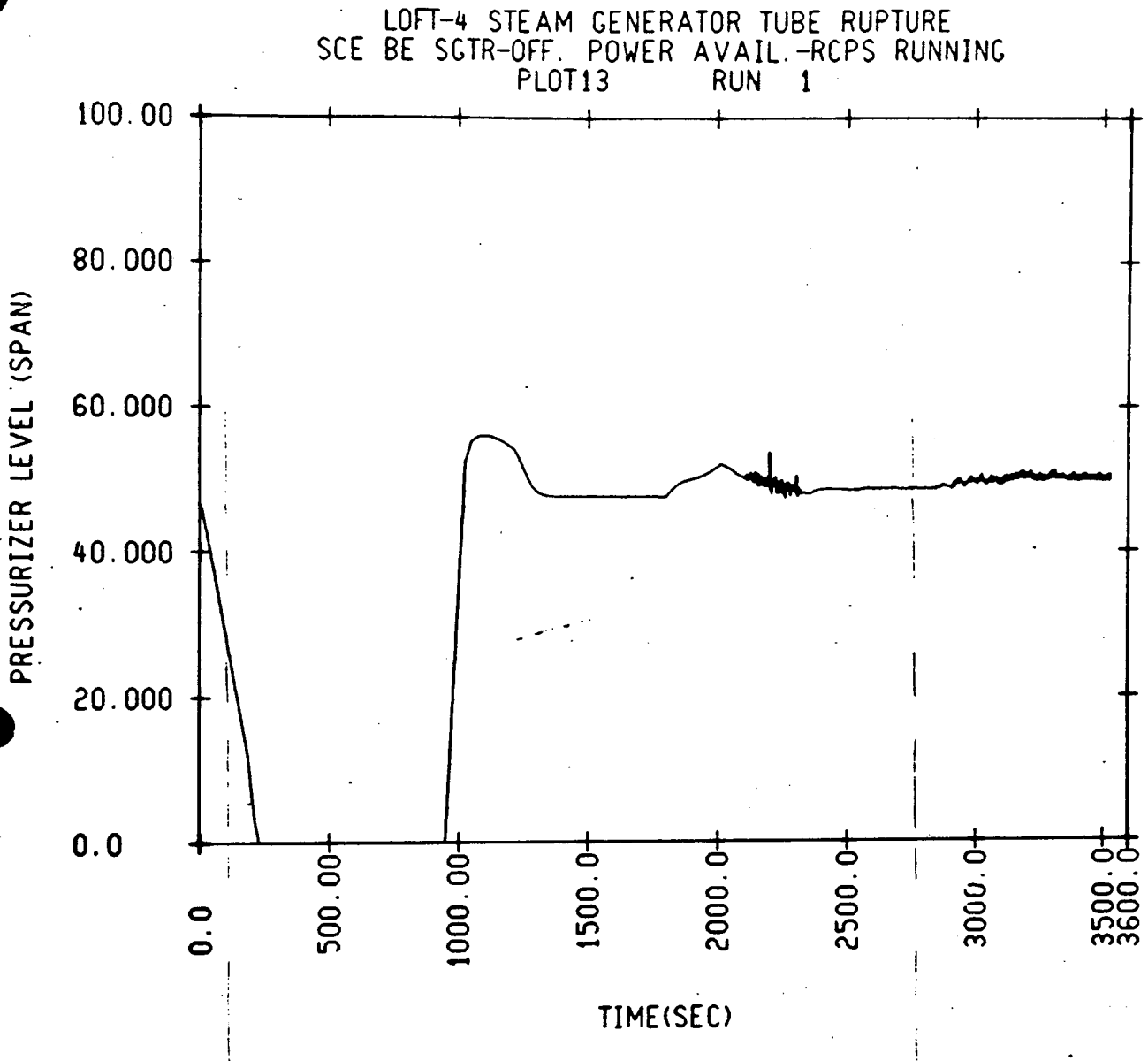

LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BE SGTR-OFF. POWER AVAIL.-RCPS RUNNING
PLOT 1 RUN 1
CORE PRESSURE(PSIA)
2200.0
2000.0
1750.0
1500.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME(SEC)

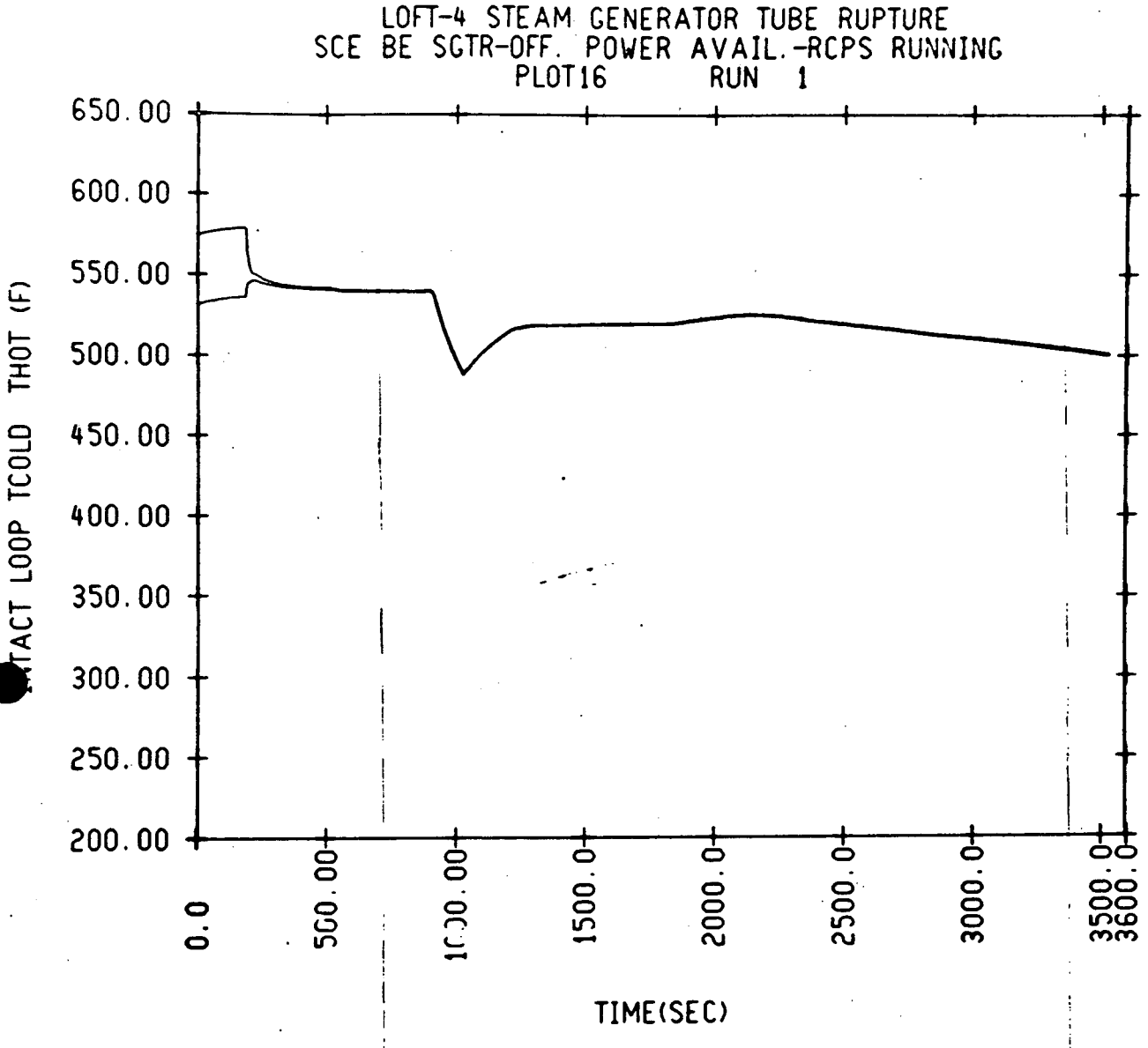

LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BE SGTR-OFF. POWER AVAIL.-RCPS RUNNING
PLOT 5 RUN 1
SECONDARY PRESSURE(PSIA)
1300.0
1250.0
1000.00
750.00
500.00
250.00
0.0
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME(SEC)


LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BE SGTR-OFF. POWER AVAIL.-RCPS RUNNING
PLOT 9 RUN 1
90.000
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.0
BREAK FLOW(LB/SEC)
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME(SEC)


LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BE SGTR-OFF. POWER AVAIL.-RCPS RUNNING
PLOT11 RUN 1
3.00E+05
2.50E+05
2.00E+05
1.50E+05
1.00E+05
5.00E+04
0.0
SG MASS (LBS)
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME(SEC)


OFFSITE POWER AVAILABLE — RCP RUNNING
RUPTURED STEAM GENERATOR
INTACT STEAM GENERATORS
SG LEVEL (SPAN)
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
TIME (SEC)


LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BE SGTR-OFF. POWER AVAIL.-RCPS RUNNING
PLOT13 RUN 1
100.00
80.000
60.000
40.000
20.000
0.0
PRESSURIZER LEVEL (SPAN)
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME(SEC)


LOFT-4 STEAM GENERATOR TUBE RUPTURE
SCE BE SGTR-OFF. POWER AVAIL.-RCPS RUNNING
PLOT16 RUN 1
650.00
600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
INTACT LOOP TCOLD THOT (F)
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME(SEC)

ENCLOSURE 3

FEED AND BLEED ANALYSIS

INSTRUCTIONS TO MITIGATE INADEQUATE CORE COOLING (ICC) RESULTING FROM A LOSS OF SECONDARY COOLING

- ASSUMES HIGH HEAD SAFETY INJECTION IS AVAILABLE

- A LOW PRESSURE WATER SOURCE IS AVAILABLE TO DEPRESSURIZED STEAM GENERATOR'S

PERFORM VITAL STEPS
OF INITIATING EVENT
OPERATING INSTRUCTION

ATTEMPT TO RESTORE
SECONDARY COOLING
A) AUX FEED
B) MAIN FEED
C) CONDENSATE

MANUALLY START SAFETY
INJECTION WHEN
RCS PARAMETERS INCREASE

OPEN PRESSURIZER PORV'S
TO DEPRESSURIZE THE RCS AND
INCREASE SI FLOW

TRIP ALL REACTOR
COOLANT PUMPS TO
MAINTAIN INVENTORY

CLOSE PRESSURIZER PORV'S

WHEN:

A) S/G LEVEL

B) RCS SUBCOOLING

TERMINATE SI WHEN:

A) PRESSURE

B) PRESSURIZER LEVEL

C) SUBCOOLING

SI REINITIATION

A) PRESSURE

B) PRESSURIZER LEVEL

C) SUBCOOLING

RE-ESTABLISH NORMAL PRESSURE AND LEVEL CONTROL

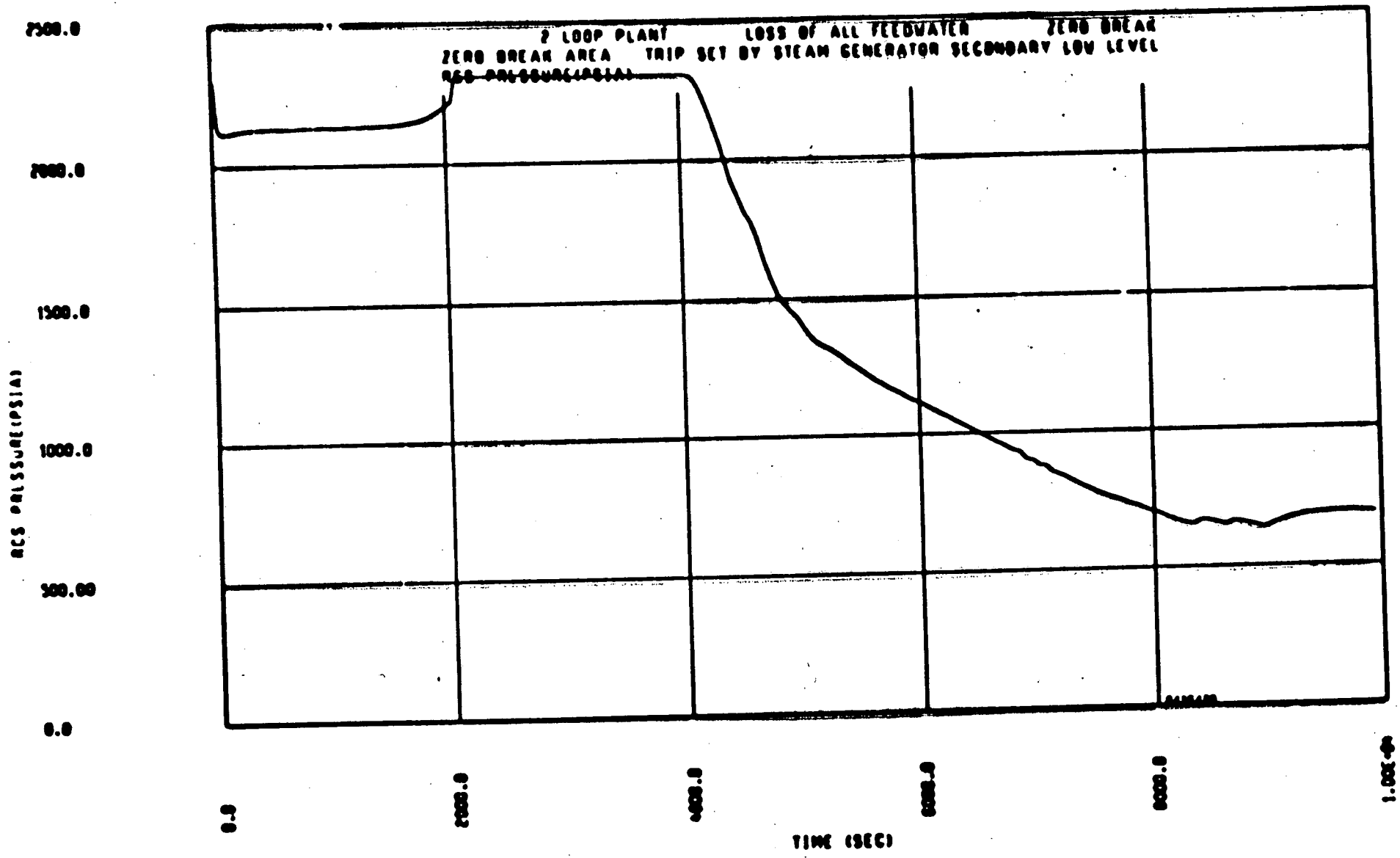
FOLLOW NORMAL COOLDOWN PROCEDURES

LOSS OF HEAT SINK

Differences of SCE Versus Generic Guidelines

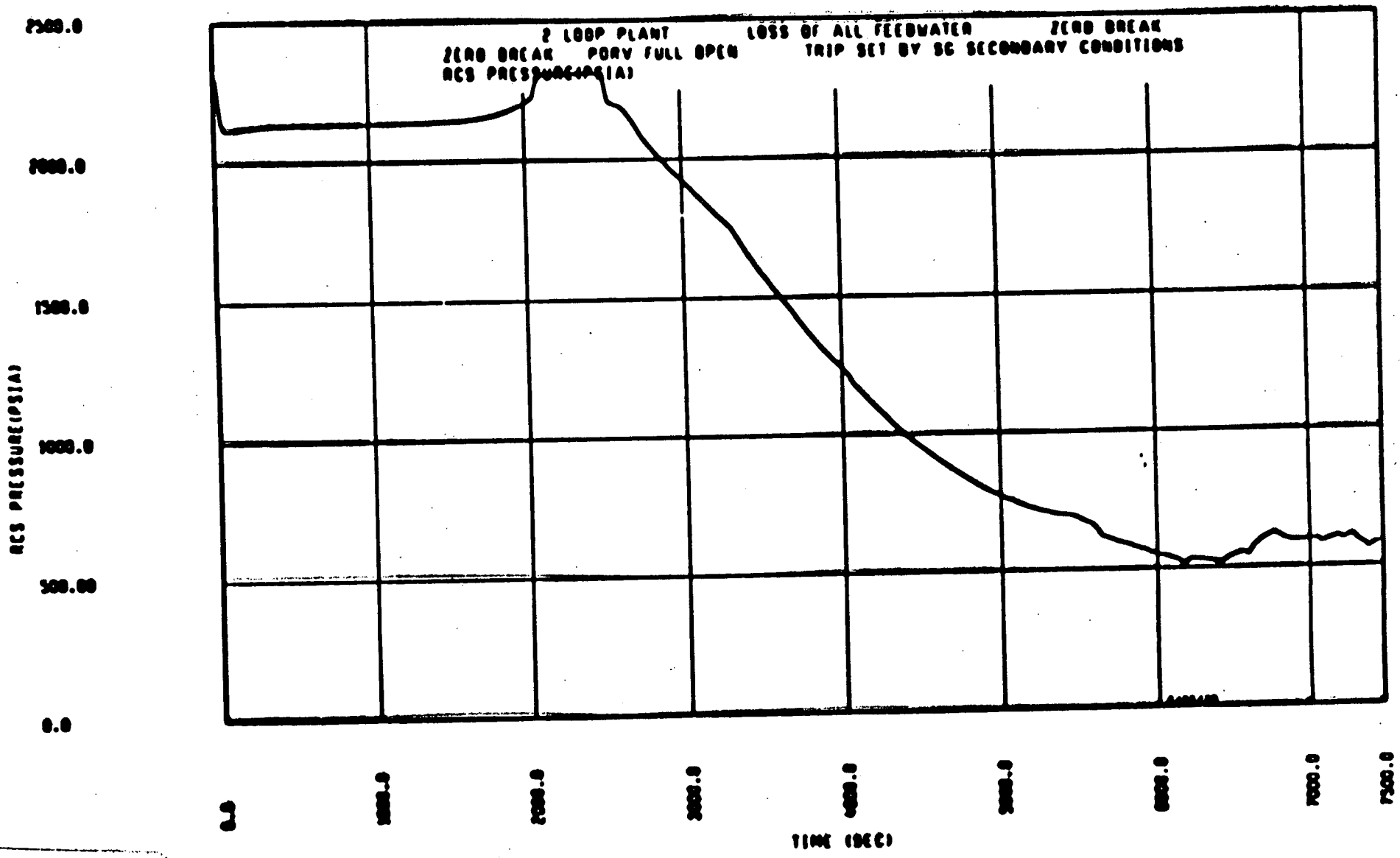
- REALIGN AND MAXIMIZE CHARGING FLOW
- ELIMINATION OF COLD LEG ACCUMULATOR CONSIDERATION
- CONTINGENCY FOR COMPLETE LOSS OF MF/SI AND MF

CASE 1: LOSS OF FEEDWATER
AUXILIARY FEEDWATER INITIATED AT 4000 SECONDS
GENERIC TWO-LOOP PLANT
CASE A SECTION 4.2 WCAP-9600



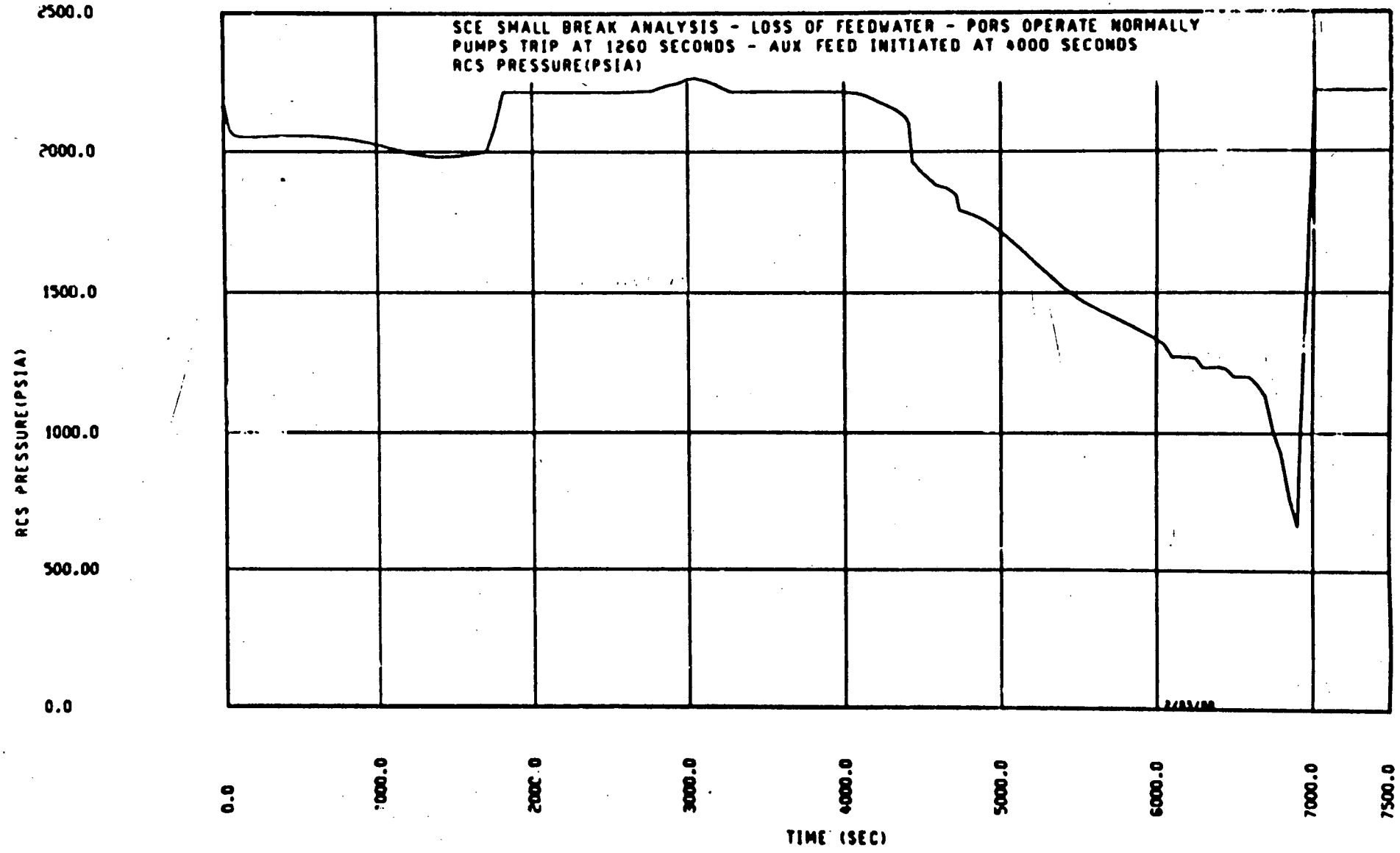
Loss of Feed
Zero Brk
Aux Feed on
@ 4000 sec

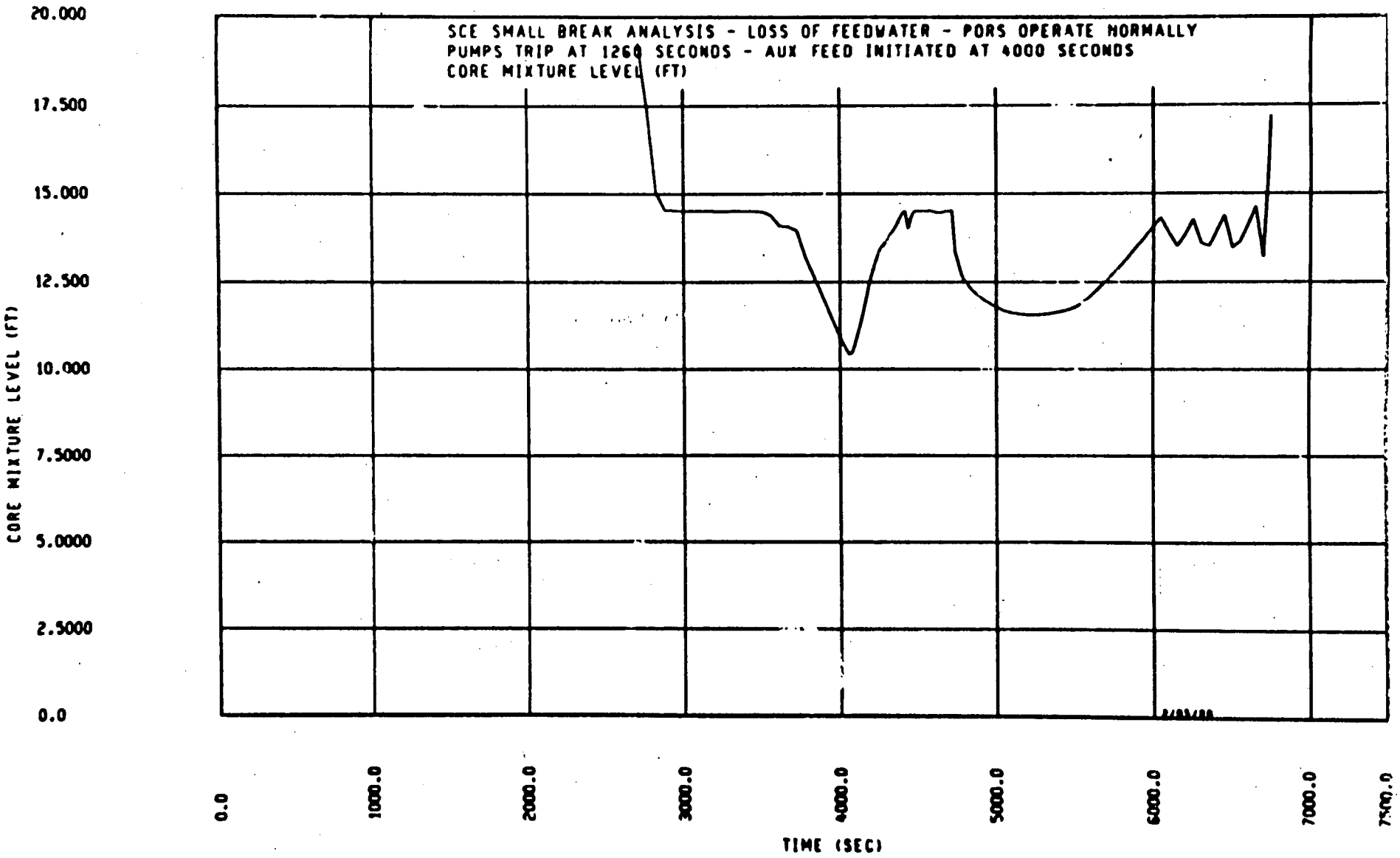
CASE 2: LOSS OF FEEDWATER
PORVs OPEN AT 2500 SECONDS
GENERIC TWO-LOOP PLANT
CASE B SECTION 4.2 WCAP-9600

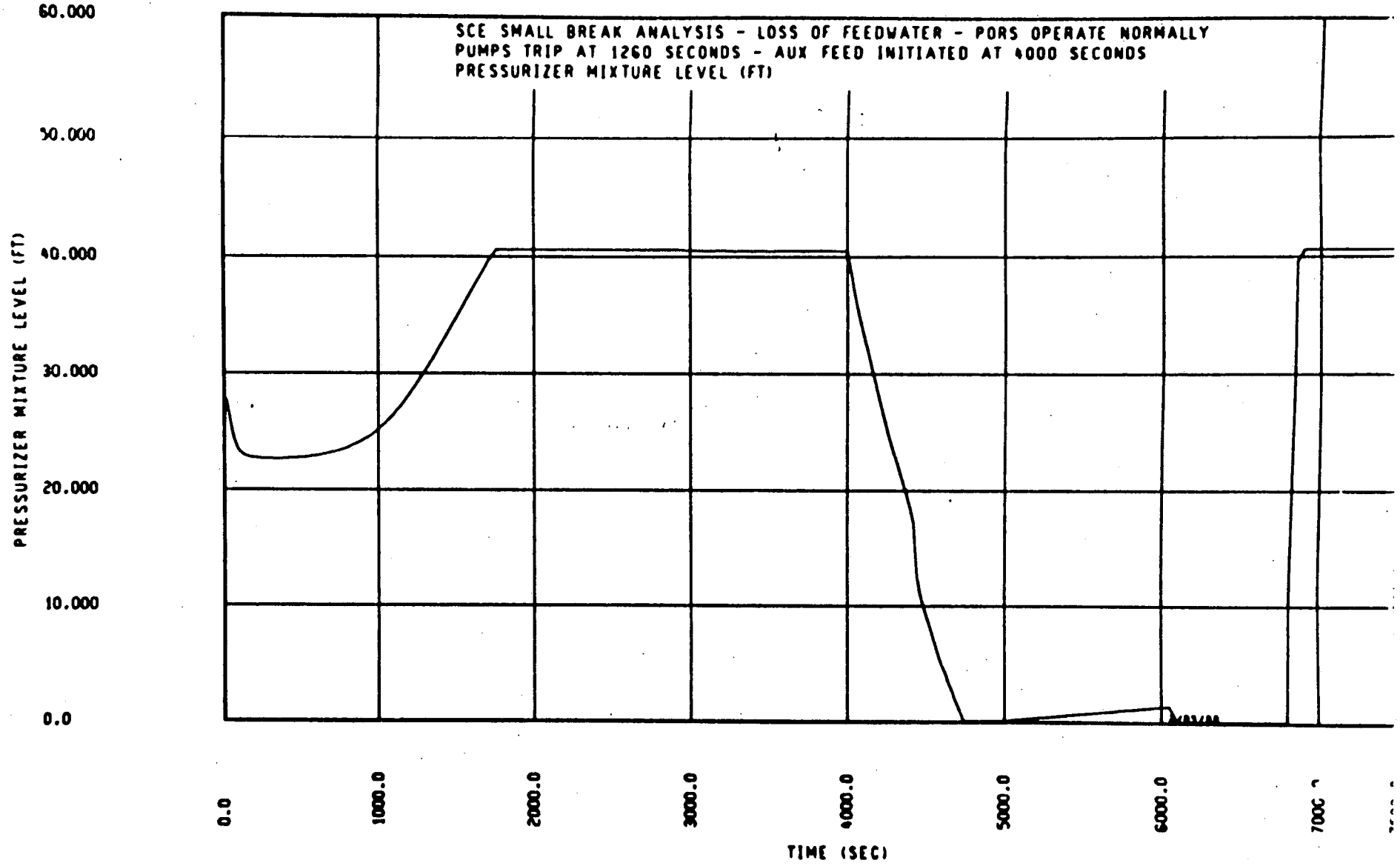


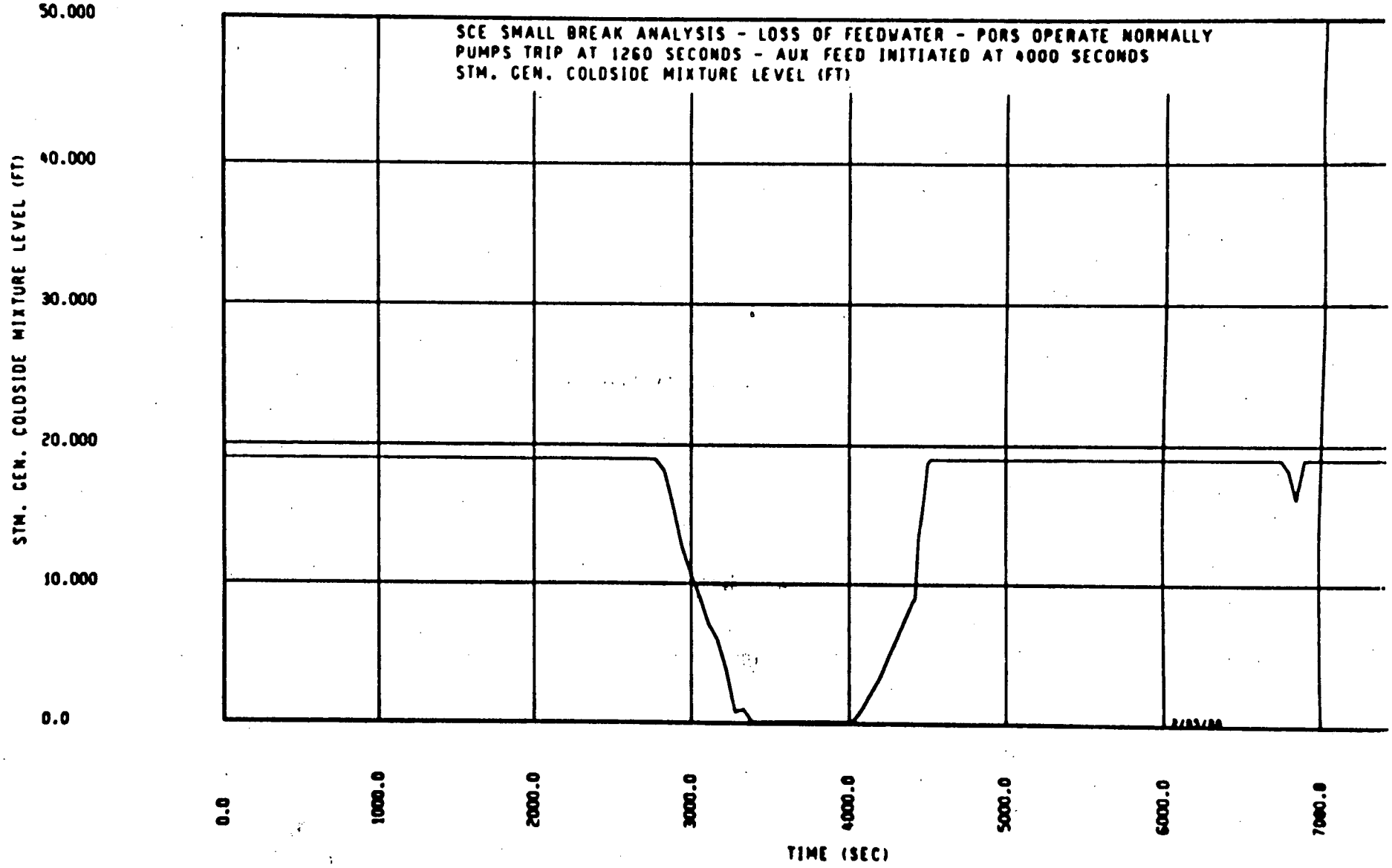
Loss of Feed
Zero Brk
PORV open @
2500 sec

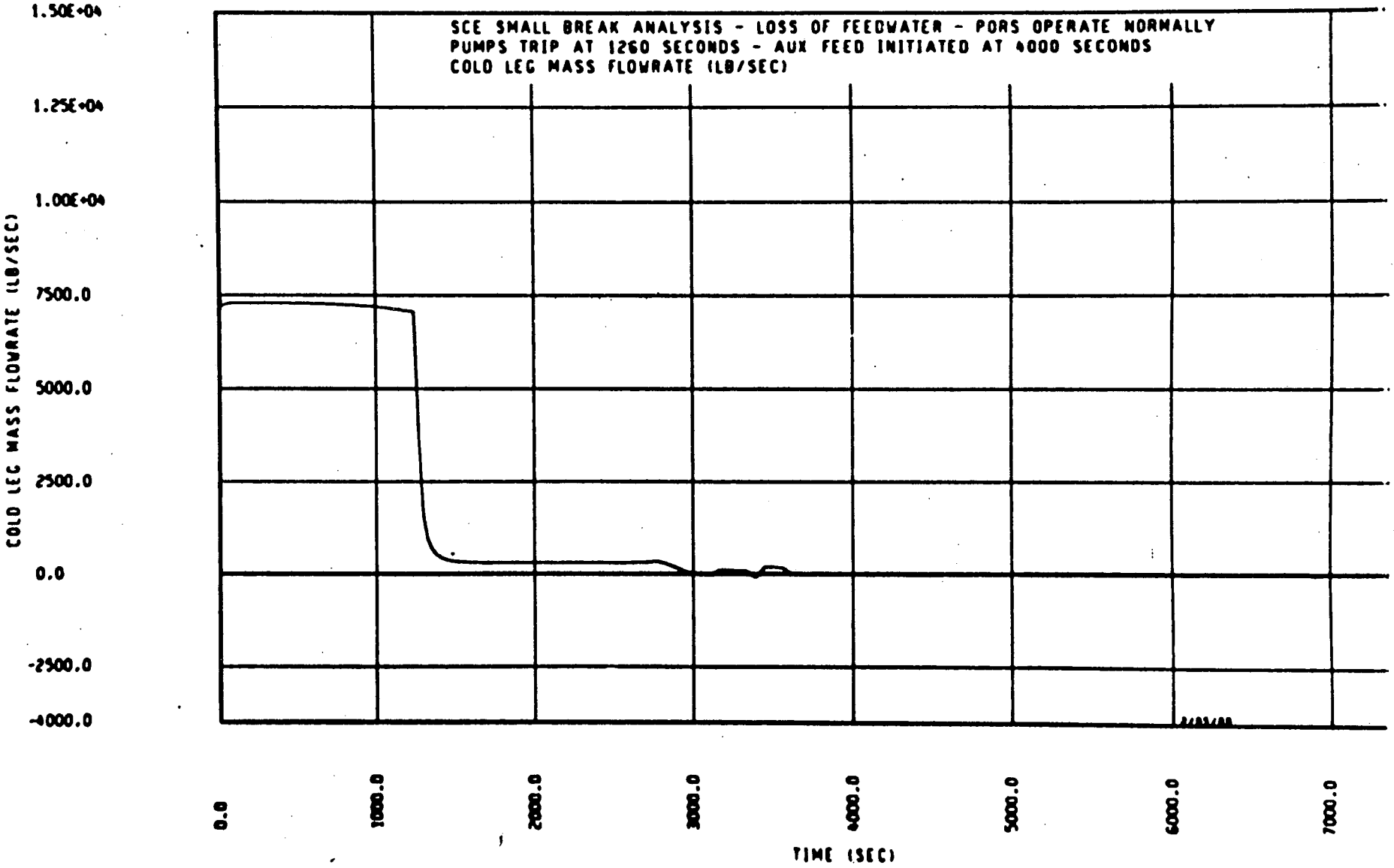
CASE 3: LOSS OF FEEDWATER
AUXILIARY FEEDWATER INITIATED AT 4000 SECONDS
SAN ONOFRE UNIT 1
SECTION 4.1 STUDY OF SMALL LOSS OF COOLANT
ACCIDENTS FOR THE SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1

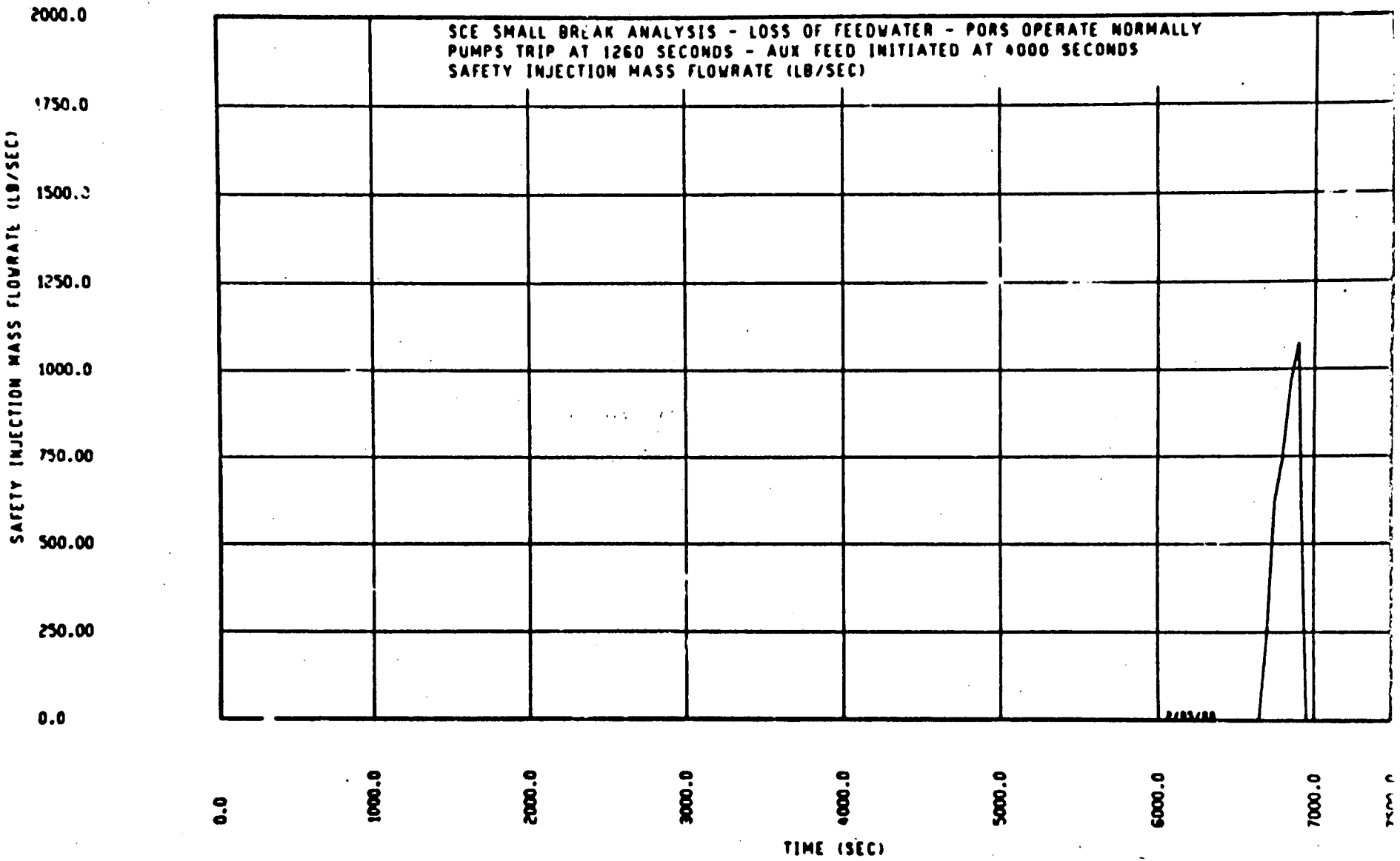

SCE SMALL BREAK ANALYSIS - LOSS OF FEEDWATER - PORS OPERATE NORMALLY
PUMPS TRIP AT 1260 SECONDS - AUX FEED INITIATED AT 4000 SECONDS
RCS PRESSURE(PSIA)
2500.0
2000.0
1500.0
1000.0
500.00
0.0
RCS PRESSURE(PSIA)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
7500.0
TIME (SEC)


SCE SMALL BREAK ANALYSIS - LOSS OF FEEDWATER - PORS OPERATE NORMALLY
PUMPS TRIP AT 1260 SECONDS - AUX FEED INITIATED AT 4000 SECONDS
CORE MIXTURE LEVEL (FT)
20.000
17.500
15.000
12.500
10.000
7.5000
5.0000
2.5000
0.0
CORE MIXTURE LEVEL (FT)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
TIME (SEC)

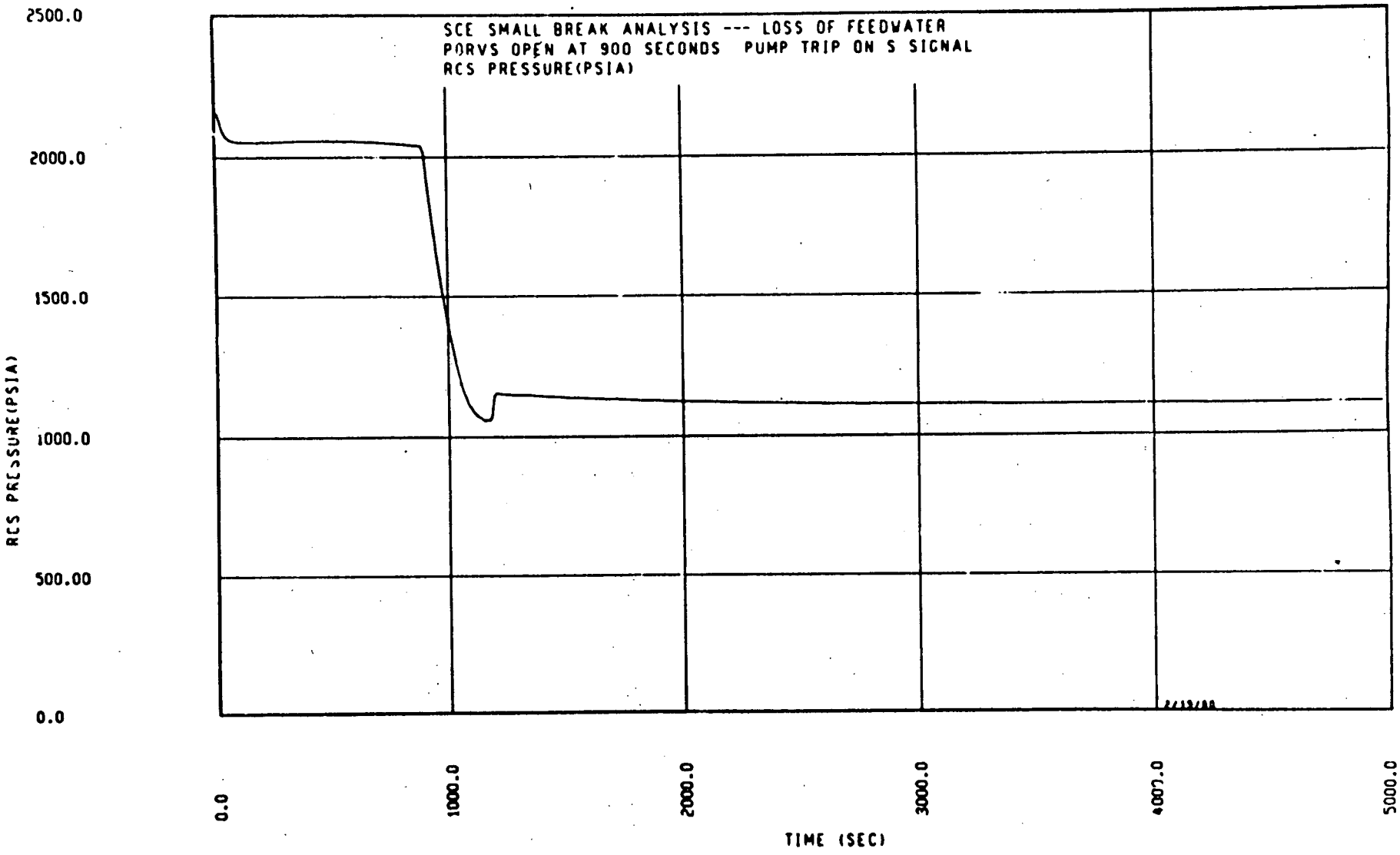

SCE SMALL BREAK ANALYSIS - LOSS OF FEEDWATER - PORS OPERATE NORMALLY
PUMPS TRIP AT 1260 SECONDS - AUX FEED INITIATED AT 4000 SECONDS
PRESSURIZER MIXTURE LEVEL (FT)
PRESSURIZER MIXTURE LEVEL (FT)
60.000
50.000
40.000
30.000
20.000
10.000
0.0
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
TIME (SEC)

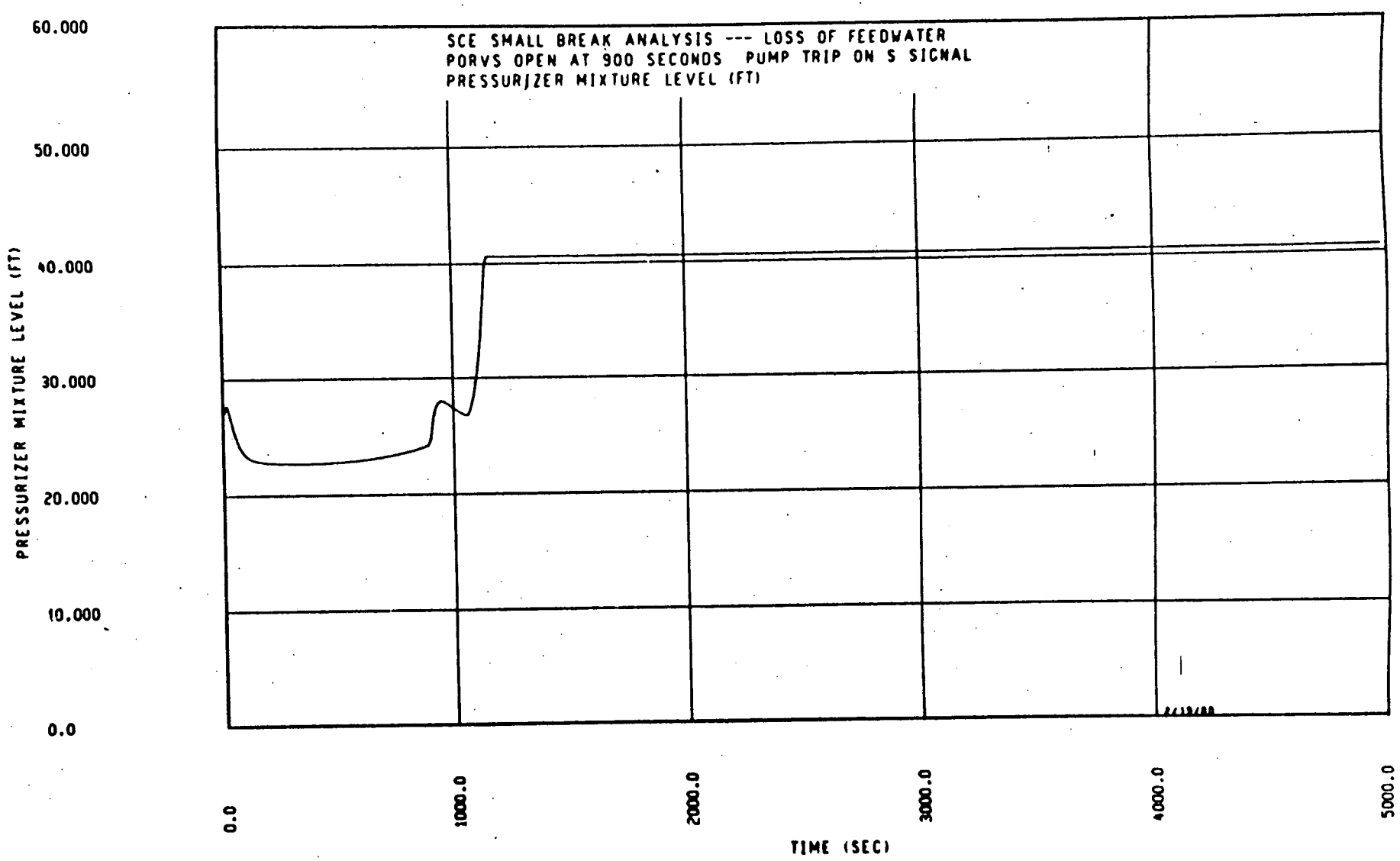

SCE SMALL BREAK ANALYSIS - LOSS OF FEEDWATER - PORS OPERATE NORMALLY
PUMPS TRIP AT 1260 SECONDS - AUX FEED INITIATED AT 4000 SECONDS
STM. GEN. COLDSIDE MIXTURE LEVEL (FT)
STM. GEN. COLDSIDE MIXTURE LEVEL (FT)
50.000
40.000
30.000
20.000
10.000
0.0
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
TIME (SEC)

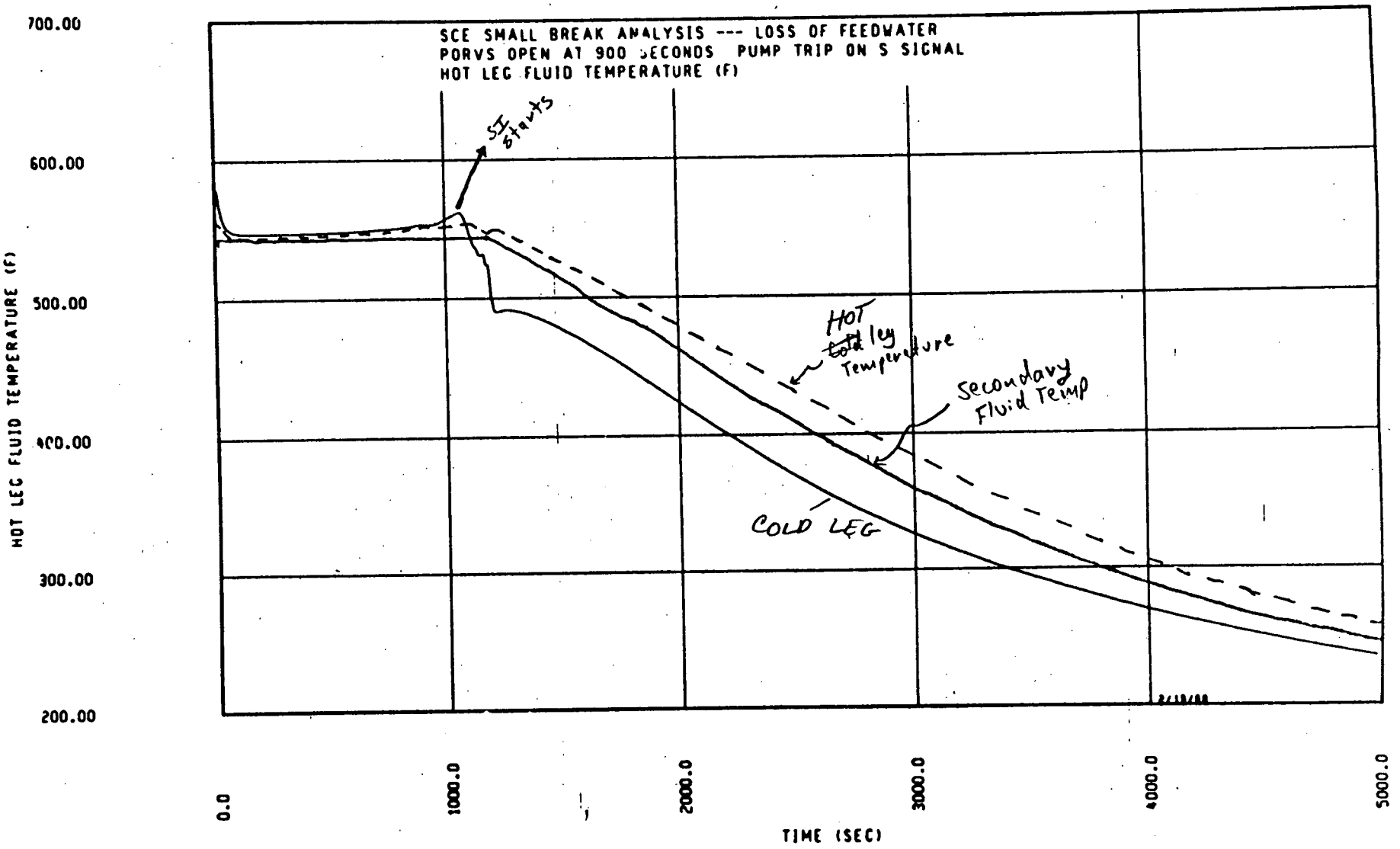

SCE SMALL BREAK ANALYSIS - LOSS OF FEEDWATER - PORS OPERATE NORMALLY
PUMPS TRIP AT 1260 SECONDS - AUX FEED INITIATED AT 4000 SECONDS
COLD LEG MASS FLOWRATE (LB/SEC)
1.50E+04
1.25E+04
1.00E+04
7500.0
5000.0
2500.0
0.0
-2500.0
-4000.0
COLD LEG MASS FLOWRATE (LB/SEC)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
TIME (SEC)

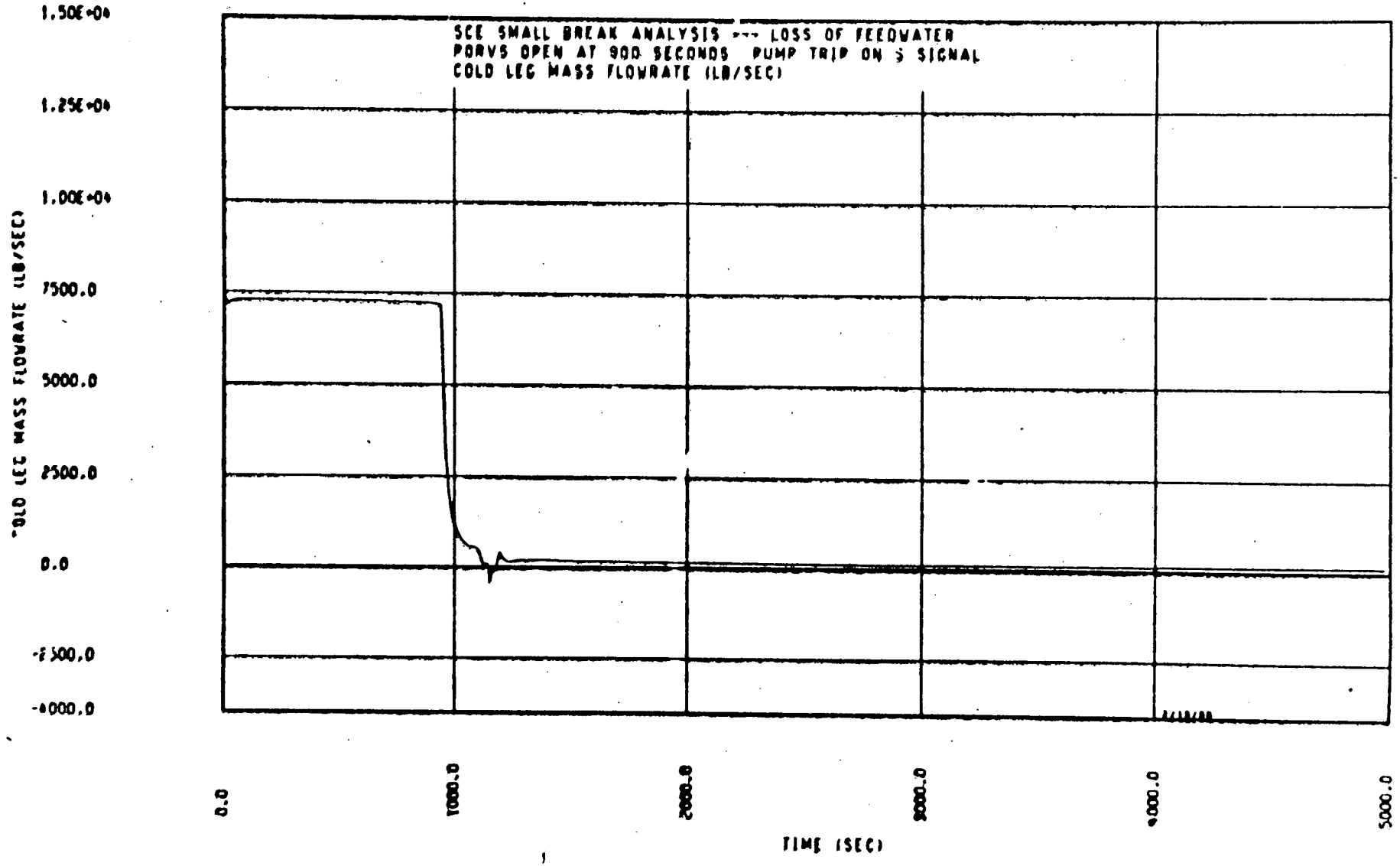

SCE SMALL BREAK ANALYSIS - LOSS OF FEEDWATER - PORS OPERATE NORMALLY
PUMPS TRIP AT 1260 SECONDS - AUX FEED INITIATED AT 4000 SECONDS
SAFETY INJECTION MASS FLOWRATE (LB/SEC)
SAFETY INJECTION MASS FLOWRATE (LB/SEC)
2000.0
1750.0
1500.0
1250.0
1000.0
750.00
500.00
250.00
0.0
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
TIME (SEC)

CASE 4: LOSS OF FEEDWATER
PORVs OPEN AT 900 SECONDS
SAN ONOFRE UNIT 1
SECTION 4.1 STUDY OF SMALL LOSS OF COOLANT
ACCIDENTS FOR THE SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1

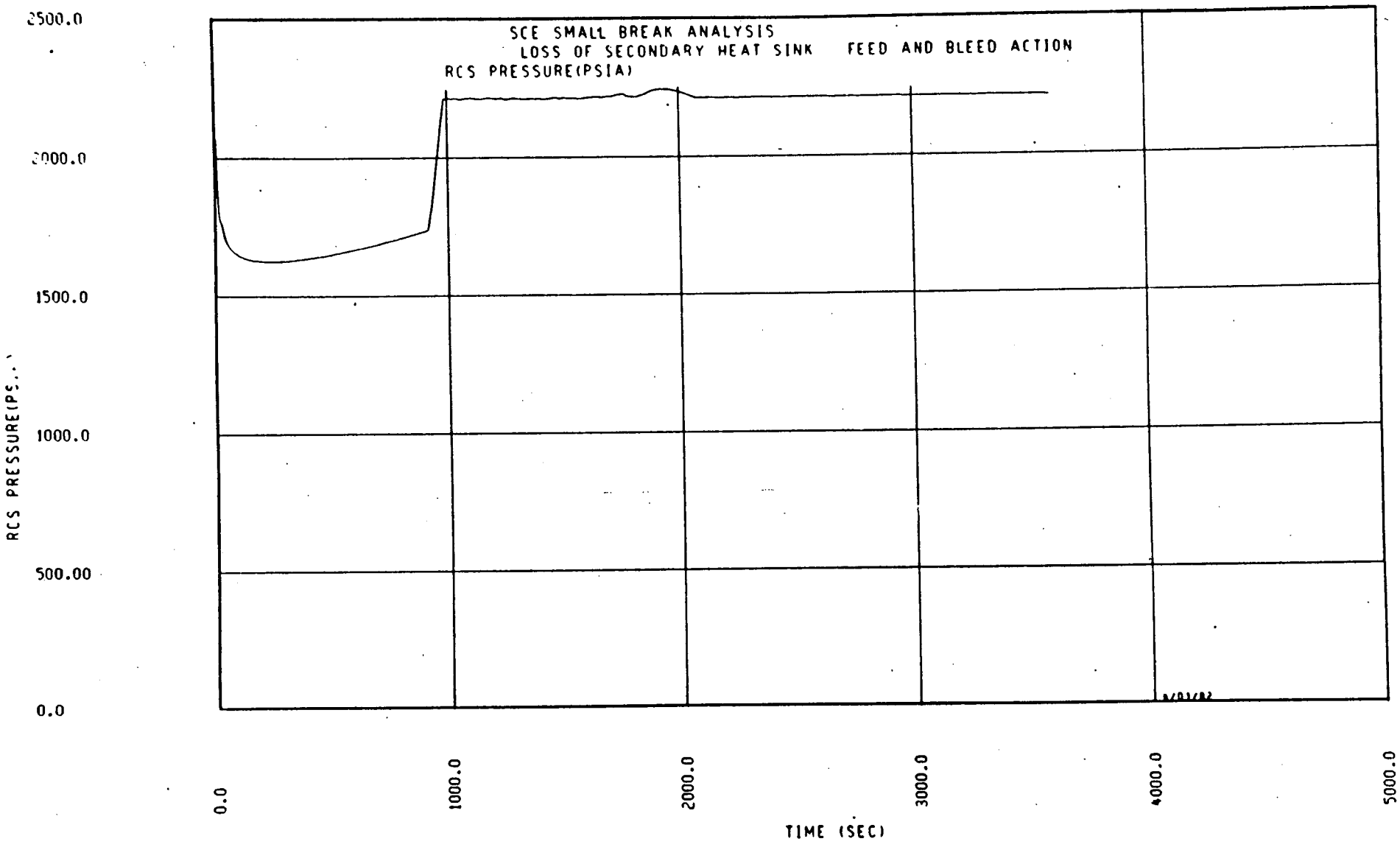

SCE SMALL BREAK ANALYSIS --- LOSS OF FEEDWATER
PORVS OPEN AT 900 SECONDS PUMP TRIP ON S SIGNAL
RCS PRESSURE(PSIA)
2500.0
2000.0
1500.0
1000.0
500.00
0.0
RCS PRESSURE(PSIA)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
TIME (SEC)

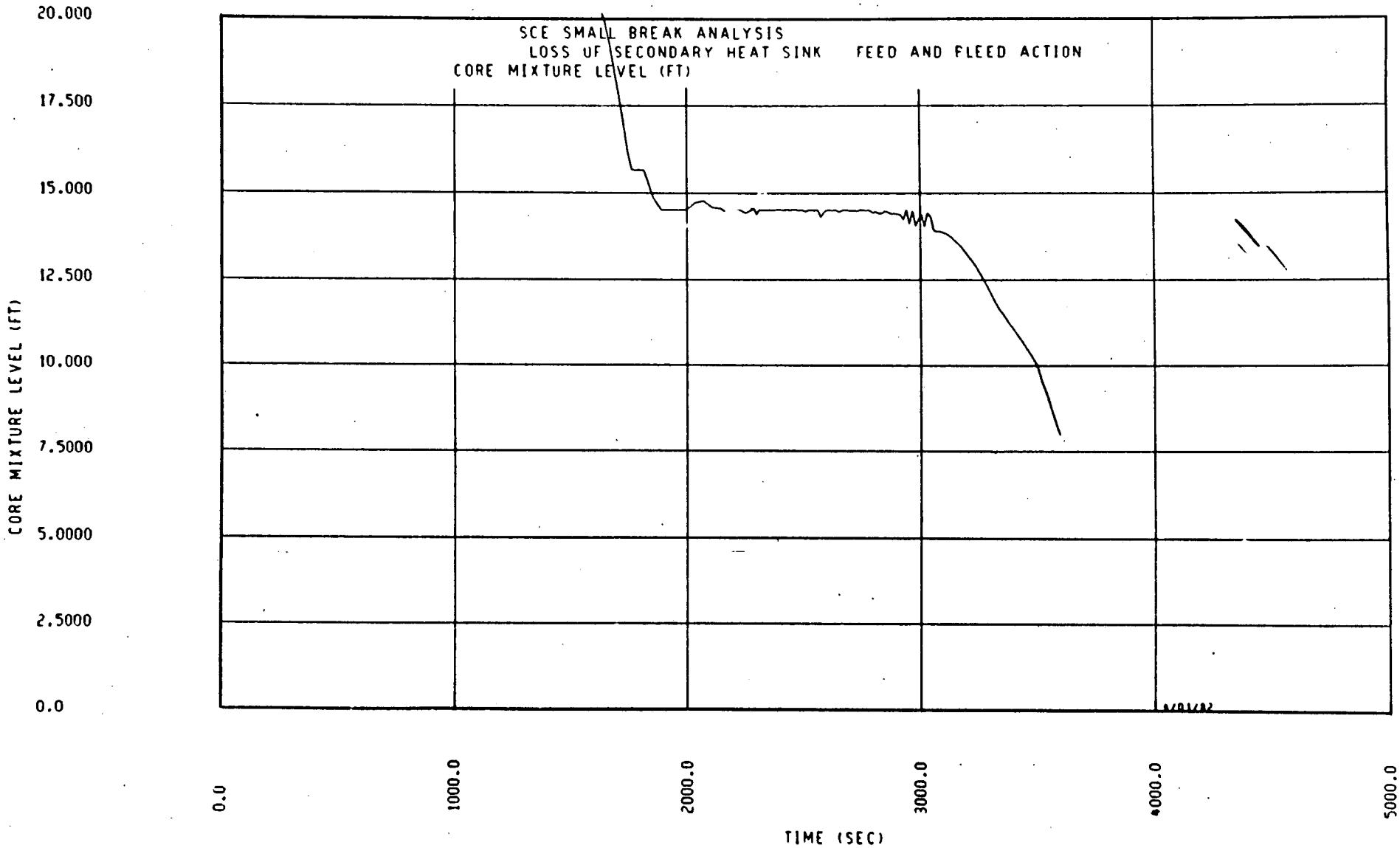

SCE SMALL BREAK ANALYSIS --- LOSS OF FEEDWATER
PORVS OPEN AT 900 SECONDS PUMP TRIP ON S SIGNAL
PRESSURIZER MIXTURE LEVEL (FT)
60.000
50.000
40.000
30.000
20.000
10.000
0.0
PRESSURIZER MIXTURE LEVEL (FT)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
TIME (SEC)


SCE SMALL BREAK ANALYSIS --- LOSS OF FEEDWATER
PORVS OPEN AT 900 SECONDS PUMP TRIP ON S SIGNAL
HOT LEG FLUID TEMPERATURE (F)
SI starts
HOT leg Temperature
Secondary Fluid Temp
COLD LEG
700.00
600.00
500.00
400.00
300.00
200.00
HOT LEG FLUID TEMPERATURE (F)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
TIME (SEC)

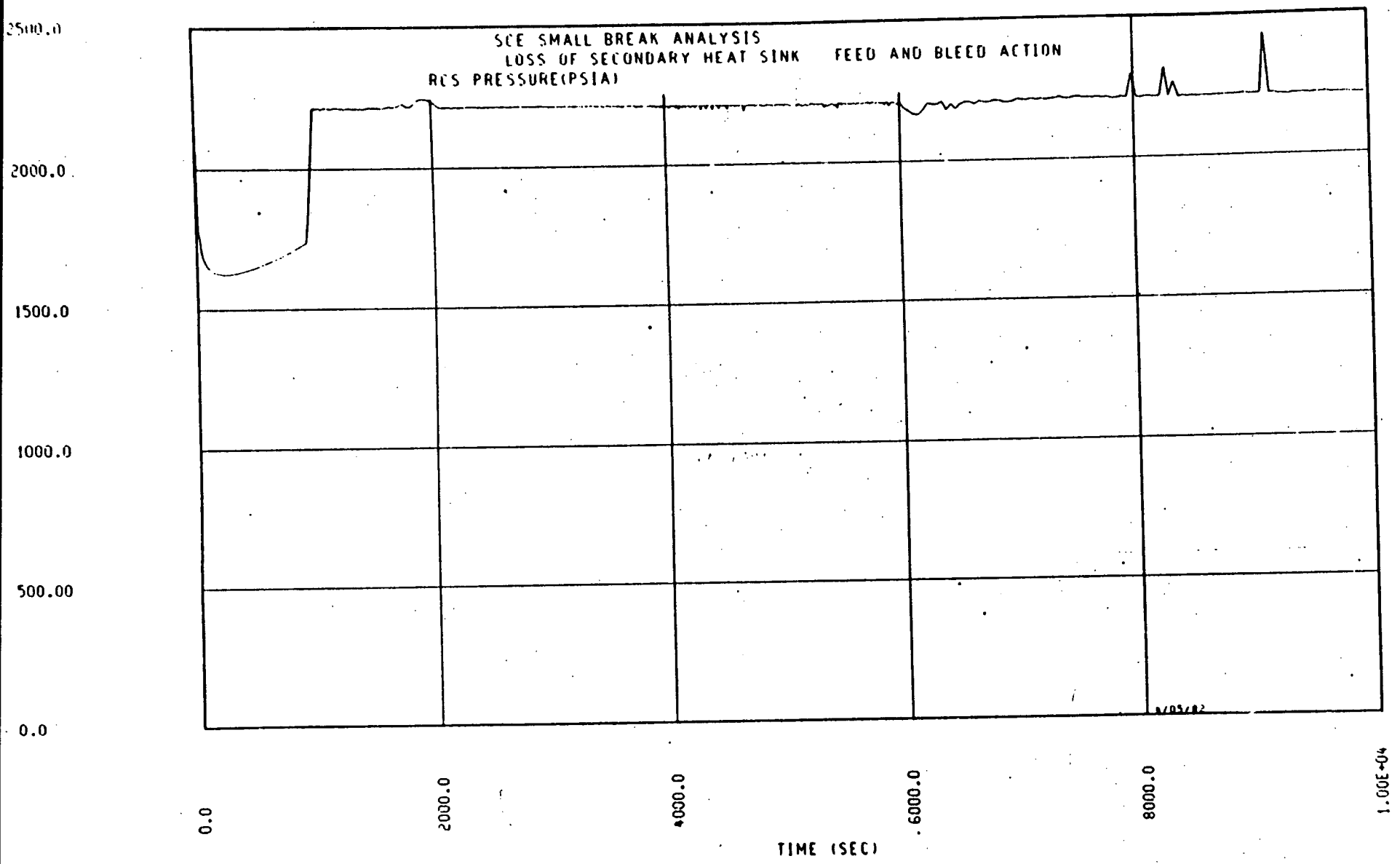

SCE SMALL BREAK ANALYSIS --- LOSS OF FEEDWATER
PORVS OPEN AT 900 SECONDS PUMP TRIP ON S SIGNAL
COLD LEG MASS FLOWRATE (LB/SEC)
1.50E+04
1.25E+04
1.00E+04
7500.0
5000.0
2500.0
0.0
-2500.0
-5000.0
COLD LEG MASS FLOWRATE (LB/SEC)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
TIME (SEC)

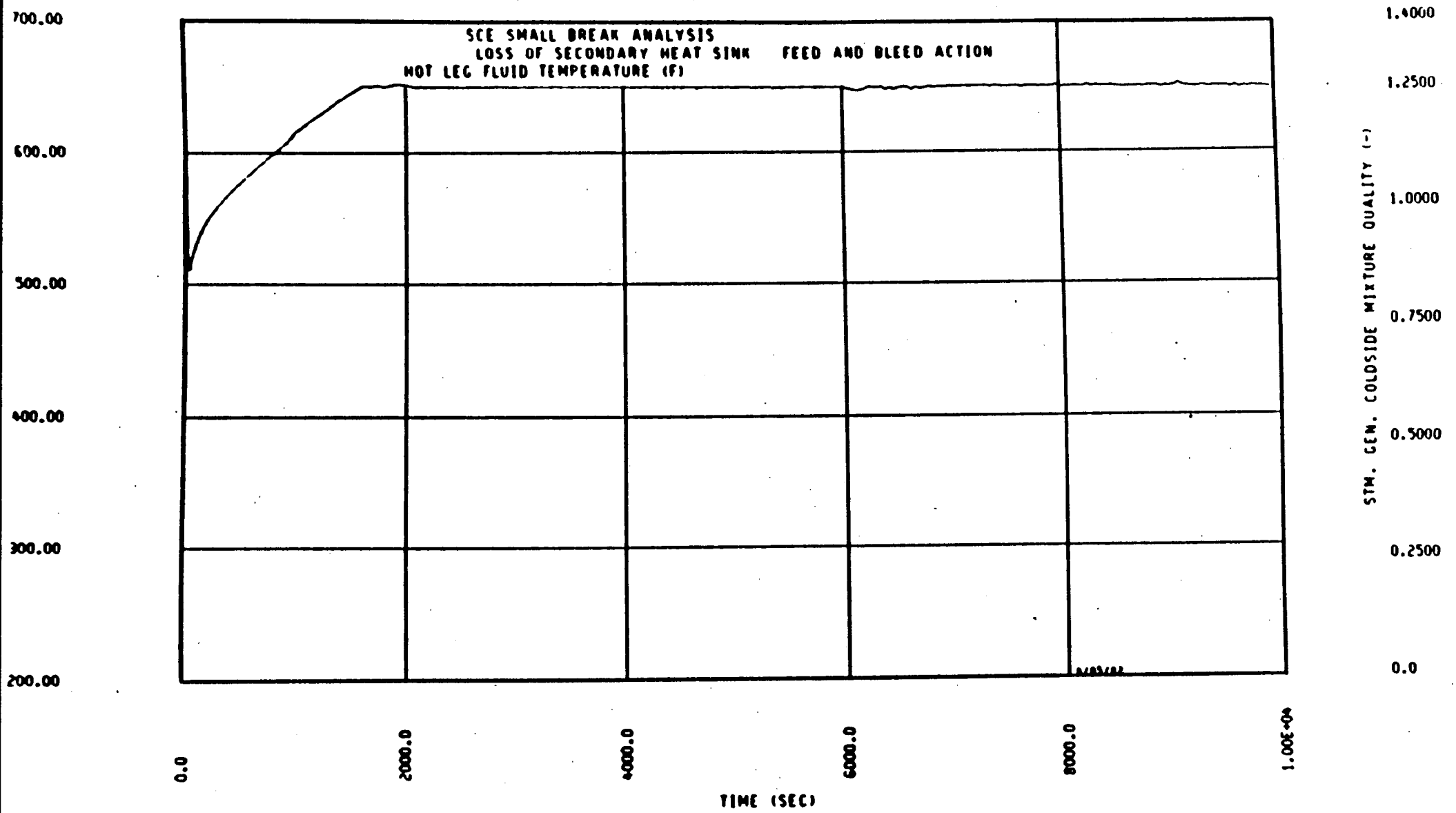
CASE 5: COINCIDENT STEAMLINE BREAK, FEEDLINE BREAK,
LOSS OF SAFETY INJECTION, LOSS OF AUXILIARY FEEDWATER
SAN ONOFRE UNIT 1
NO BLEED AND FEED ACTION

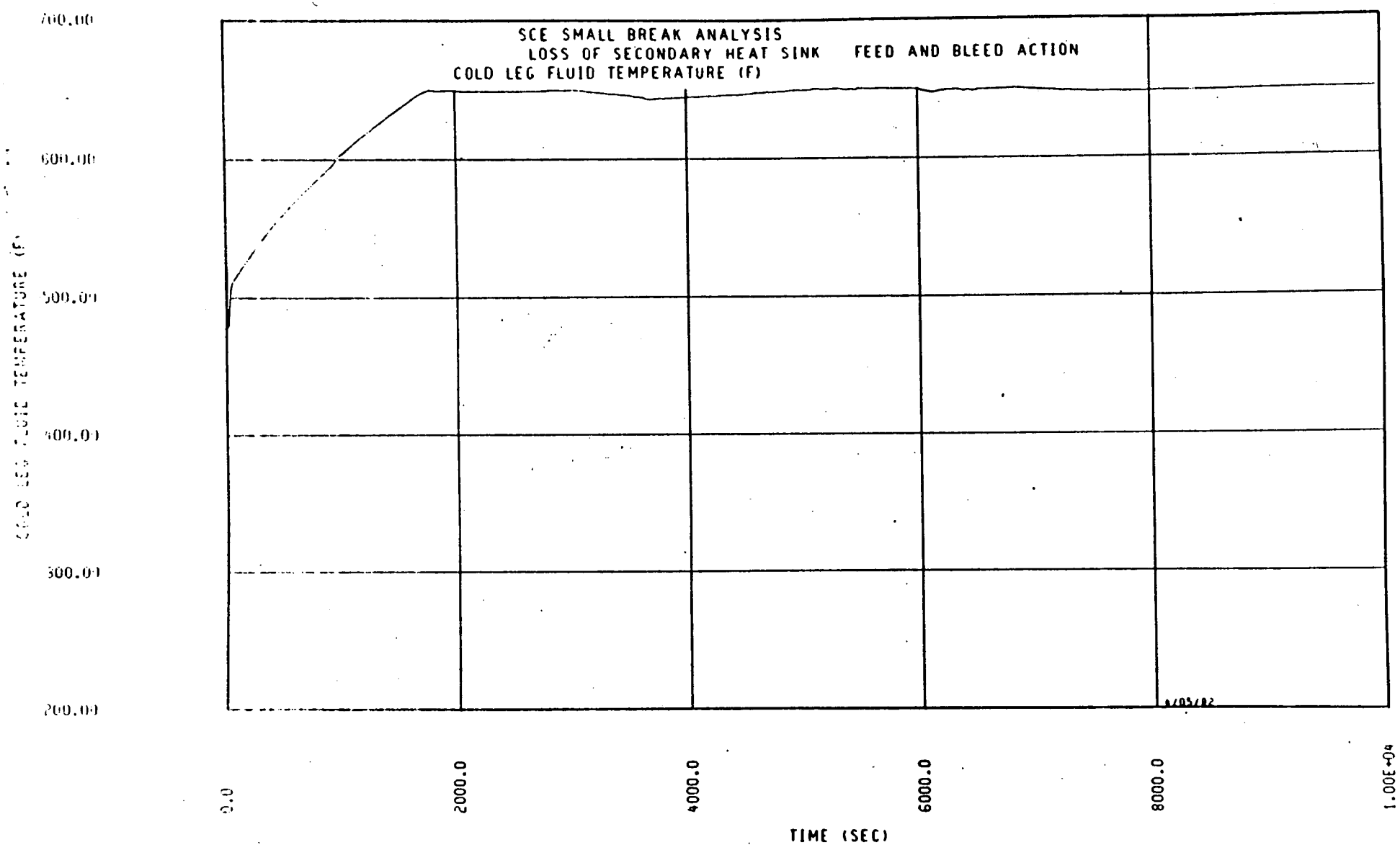

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
RCS PRESSURE(PSIA)
2500.0
2000.0
1500.0
1000.0
500.00
0.0
RCS PRESSURE(PS...
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
TIME (SEC)

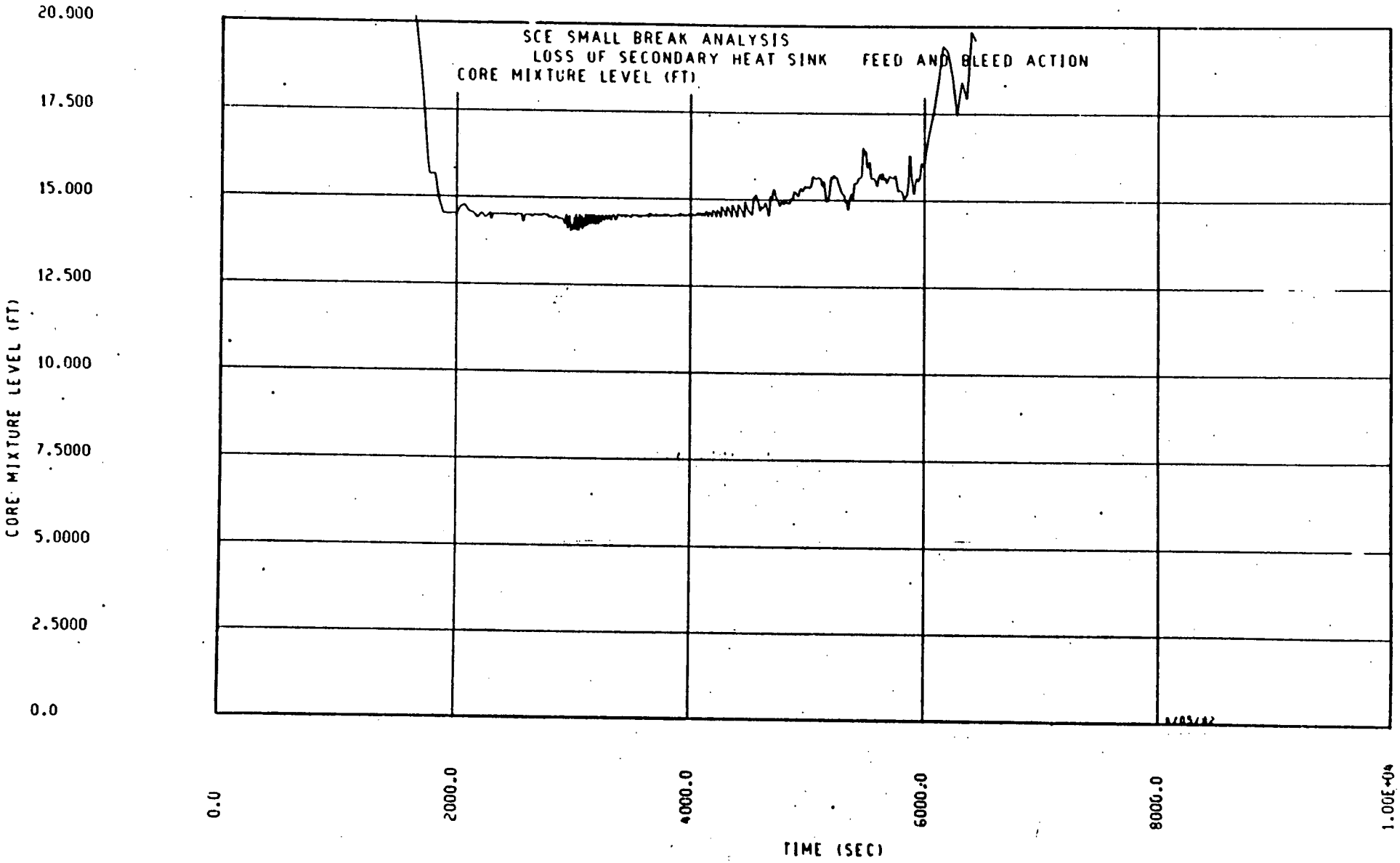

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
CORE MIXTURE LEVEL (FT)
20.000
17.500
15.000
12.500
10.000
7.5000
5.0000
2.5000
0.0
CORE MIXTURE LEVEL (FT)
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
TIME (SEC)

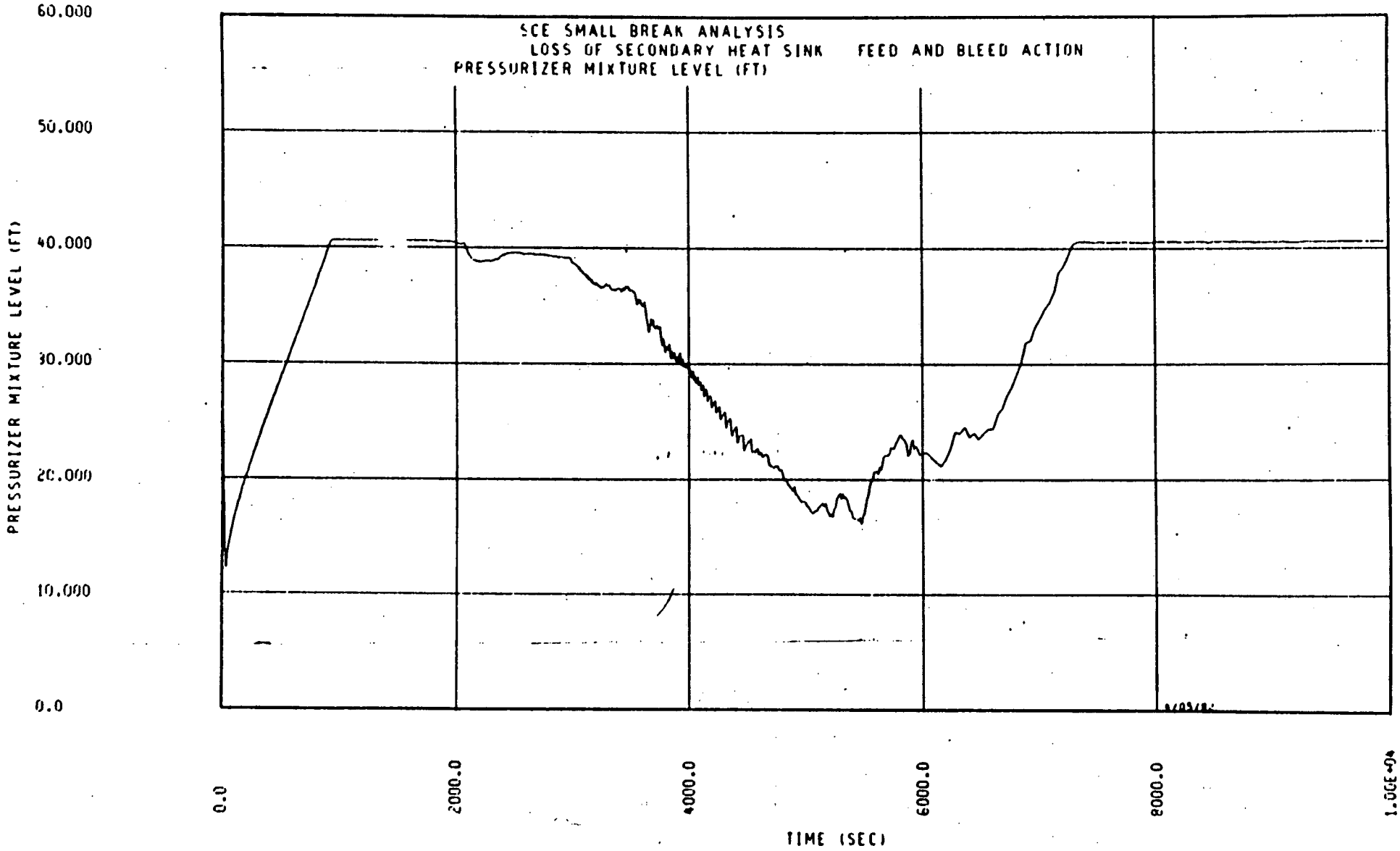
CASE 6: COINCIDENT STEAMLINE BREAK, FEEDLINE BREAK,
LOSS OF SAFETY INJECTION, LOSS OF AUXILIARY FEEDWATER
SAN ONOFRE UNIT 1
BLEED AND FEED ACTION INITIATED AT 3000 SECONDS

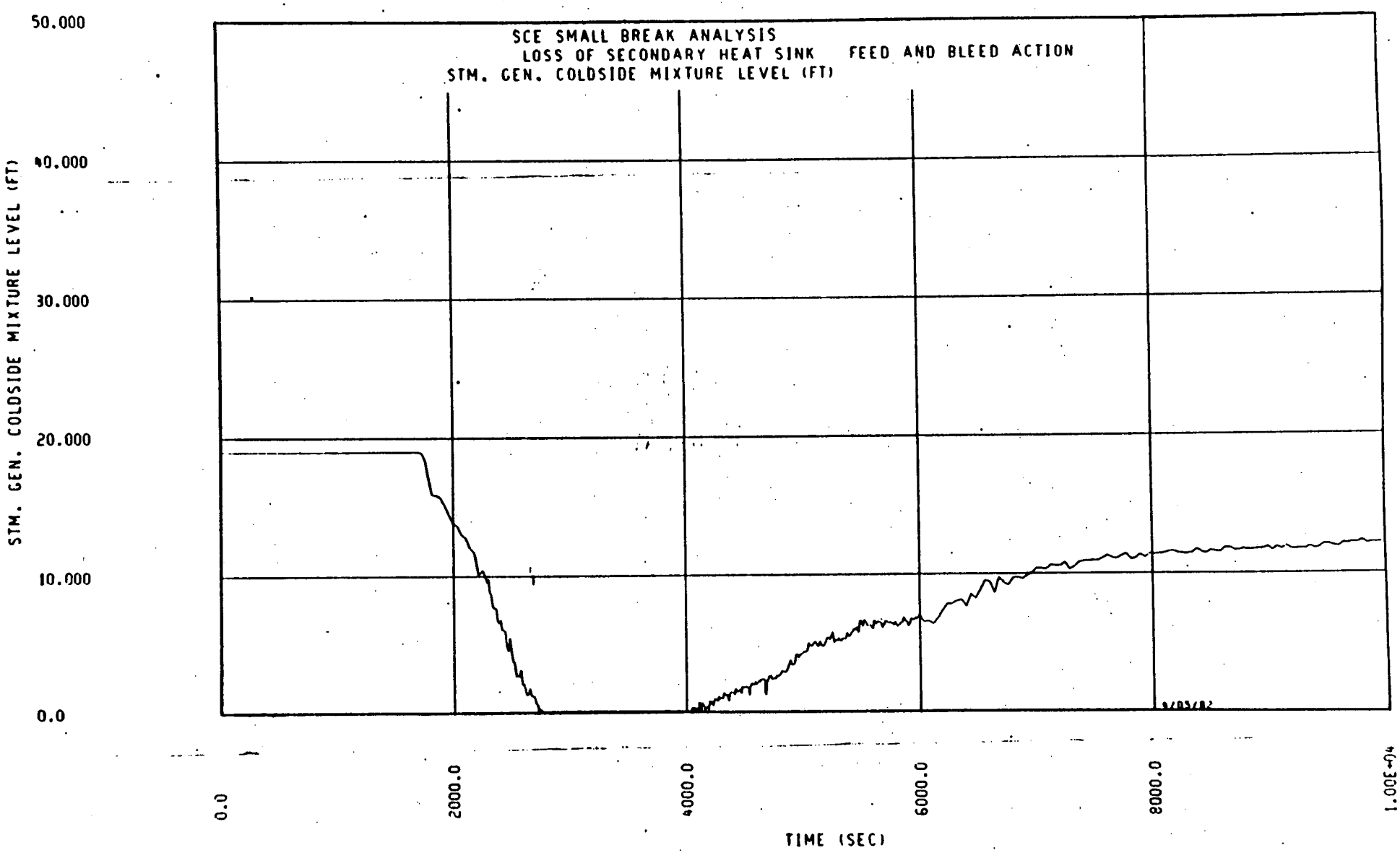

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
RCS PRESSURE(PSIA)
2500.0
2000.0
1500.0
1000.0
500.00
0.0
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)

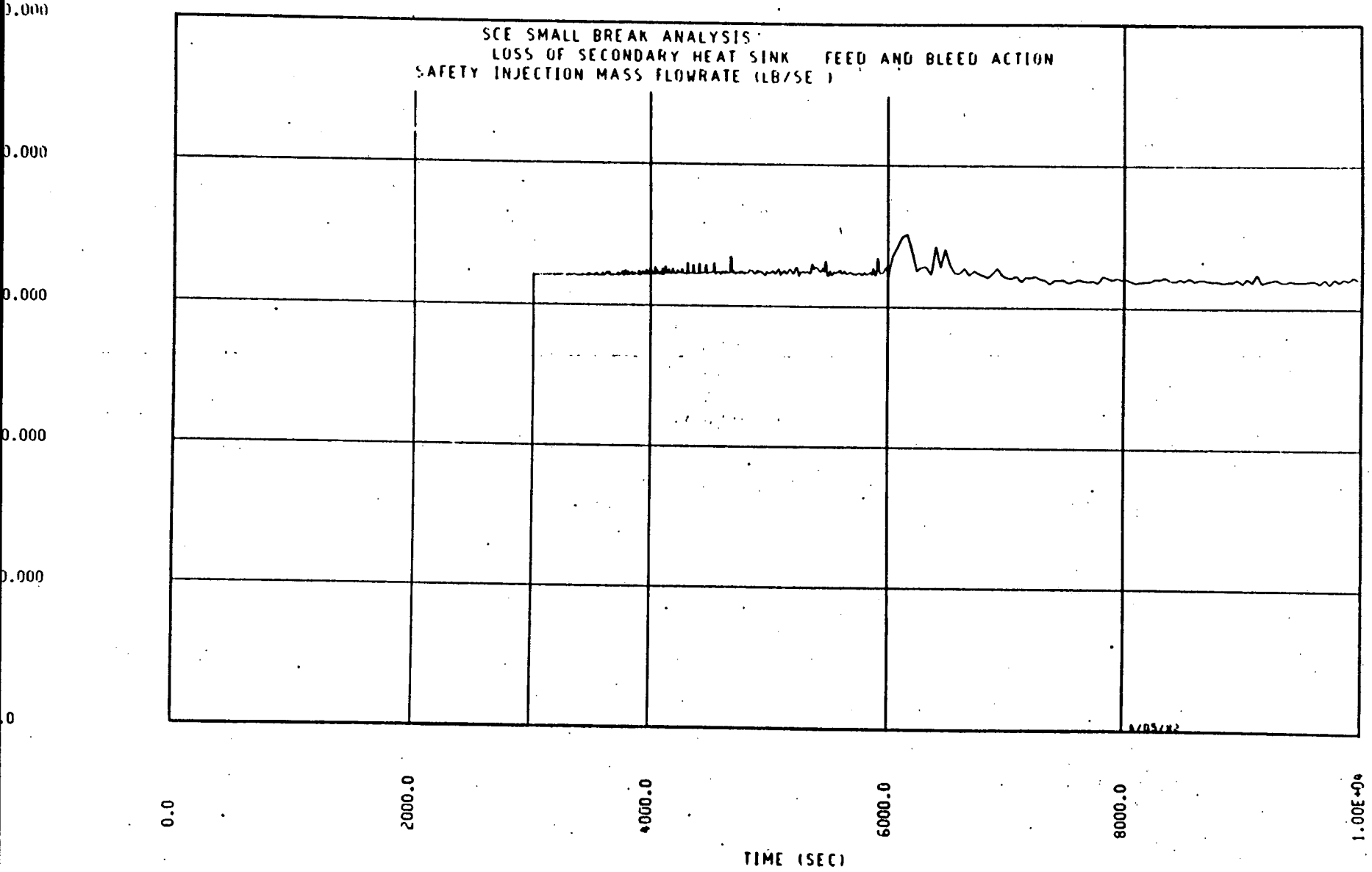

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
HOT LEG FLUID TEMPERATURE (F)
700.00
600.00
500.00
400.00
300.00
200.00
1.4000
1.2500
1.0000
0.7500
0.5000
0.2500
0.0
STM. GEN. COLDSIDE MIXTURE QUALITY (-)
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)


SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
COLD LEG FLUID TEMPERATURE (F)
700.00
600.00
500.00
400.00
300.00
200.00
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)


SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
CORE MIXTURE LEVEL (FT)
20.000
17.500
15.000
12.500
10.000
7.5000
5.0000
2.5000
0.0
CORE MIXTURE LEVEL (FT)
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)

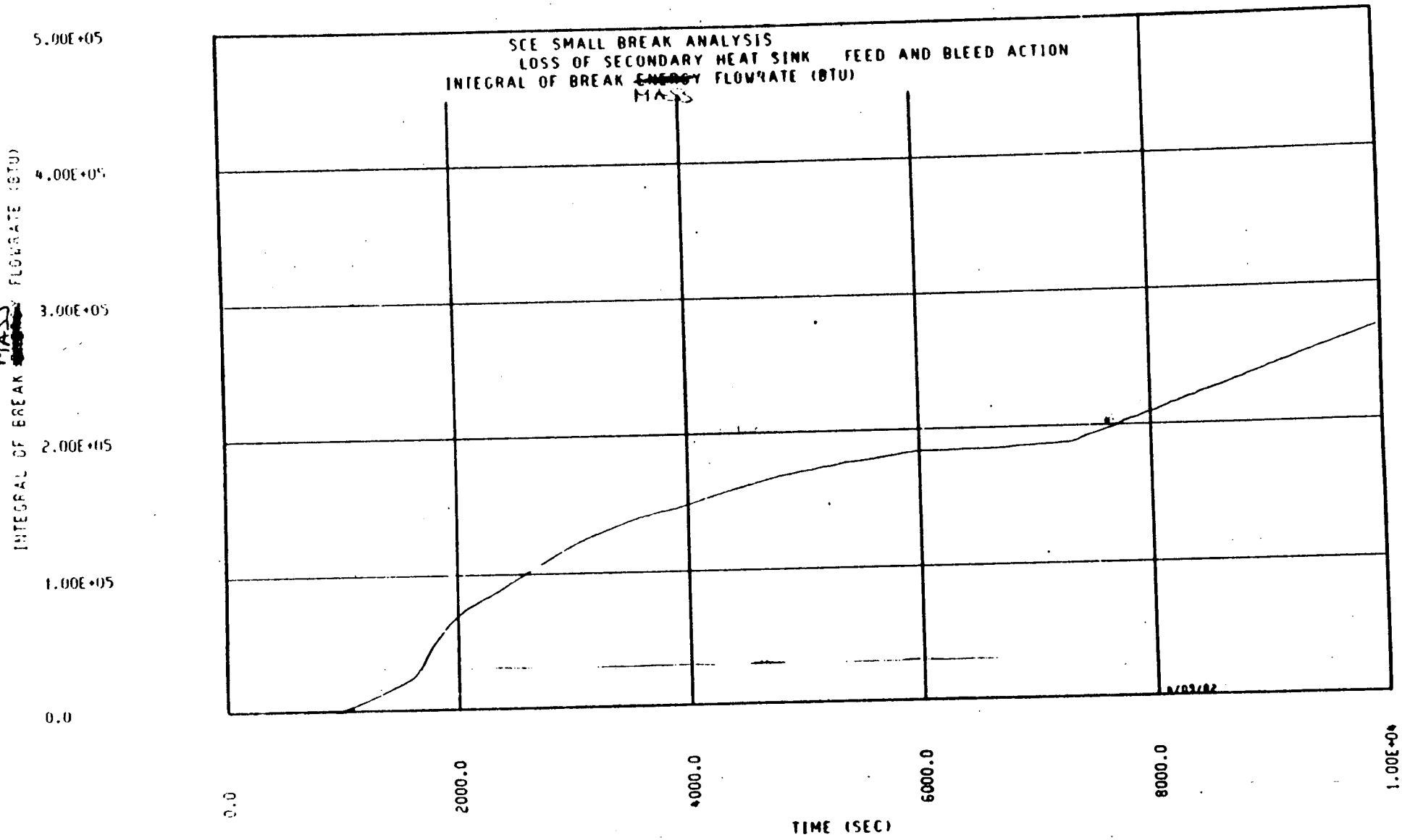

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
PRESSURIZER MIXTURE LEVEL (FT)
60.000
50.000
40.000
30.000
20.000
10.000
0.0
PRESSURIZER MIXTURE LEVEL (FT)
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)

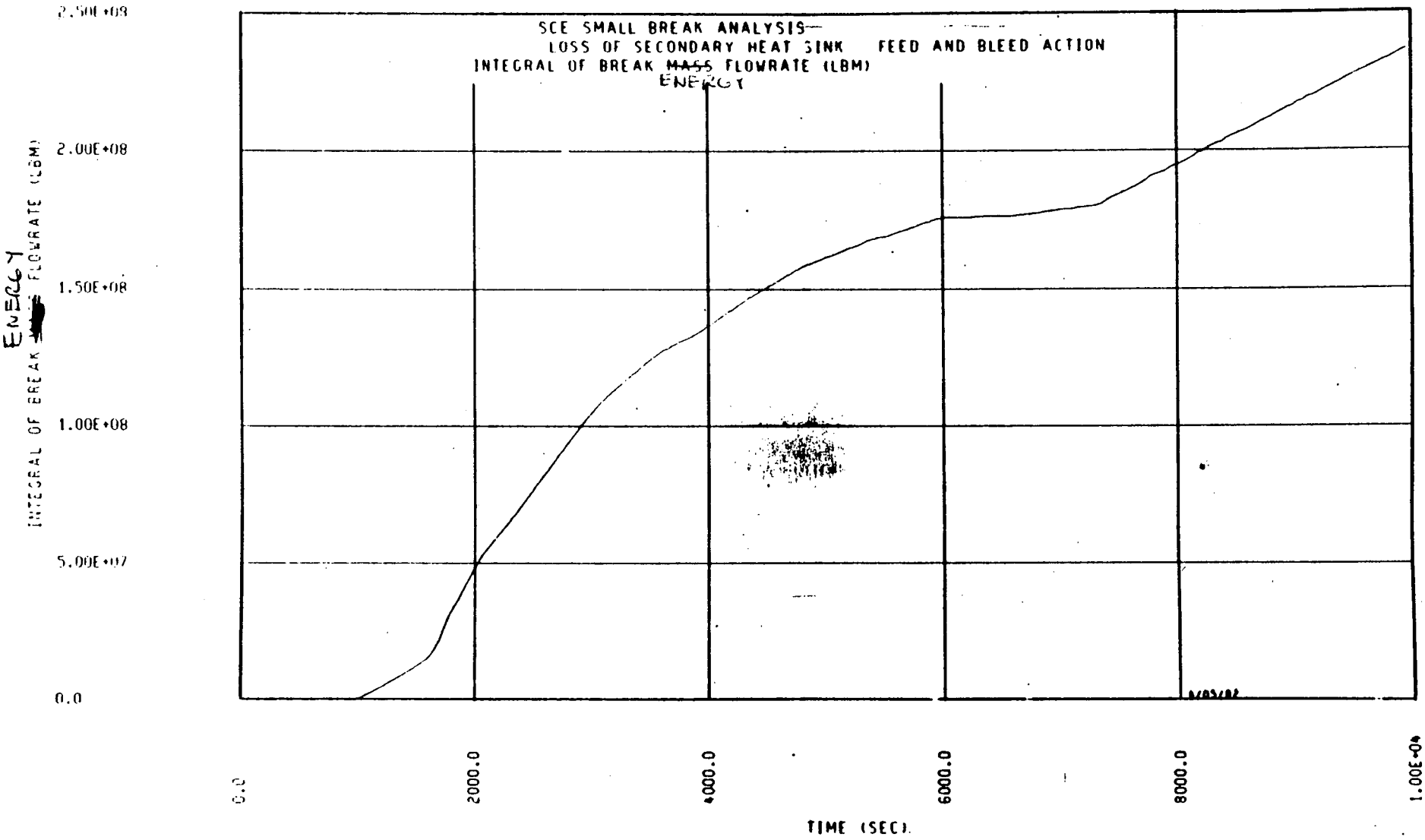

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
STM. GEN. COLDSIDE MIXTURE LEVEL (FT)
STM. GEN. COLDSIDE MIXTURE LEVEL (FT)
50.000
40.000
30.000
20.000
10.000
0.0
0.0
2000.0
4000.0
6000.0
8000.0
1.000E+04
TIME (SEC)

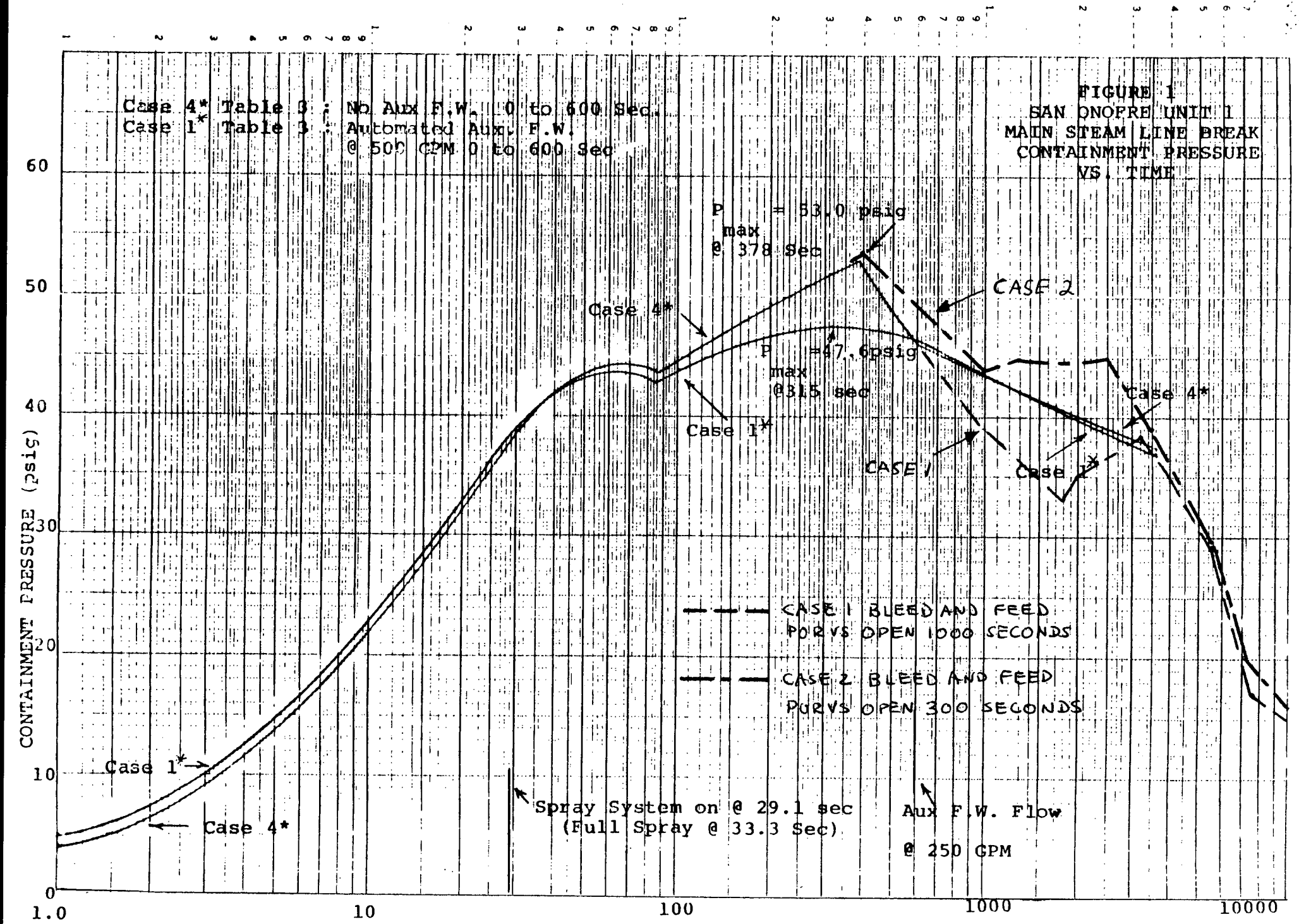

SCE SMALL BREAK ANALYSIS
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
SAFETY INJECTION MASS FLOWRATE (LB/SE)
0.000
0.000
0.000
0.000
0
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)

CONTAINMENT PRESSURE RESPONSE

PORV MASS & ENERGY RELEASE
CASE #4 BLEED & FEED




SCE SMALL BREAK ANALYSIS—
LOSS OF SECONDARY HEAT SINK FEED AND BLEED ACTION
INTEGRAL OF BREAK ~~MASS~~ ENERGY FLOWRATE (LBM)
Energy
INTEGRAL OF BREAK FLOWRATE (LBM)
2.50E+08
2.00E+08
1.50E+08
1.00E+08
5.00E+07
0.0
0.0
2000.0
4000.0
6000.0
8000.0
1.00E+04
TIME (SEC)



ENCLOSURE 4

PRESSURIZED THERMAL SHOCK ANALYSIS

The following transient development assumptions were used in the final simulation of the hypothetical LSB accident as input to the LOFTRAN computer code.

1. Break area is 1.12 Square Feet
2. Initially at hot zero power conditions
3. No decay heat
4. Thick metal was modeled
5. 450 GPM aux feed flow to all SG's until termination
6. Feedwater, aux feed and SI temp is 60°F
7. Initial steam generator mass is 70491 lbm/SG (50% narrow range span)
8. Initial pressurizer water volume is 345 cubic feet (10% of span)
9. Steam break back pressure is 14.7 psia
10. SI terminated at 10, 20, and 30 min.
11. RCP's are tripped at 10 sec.
12. SI pumps started at 10 sec.
13. No pressurizer heaters or spray modeled
14. Charging flow terminated at 10, 20, and 30 min.
15. Aux feed terminated when SG's reached 50% narrow range span (3110 sec.)

FIGURE 1

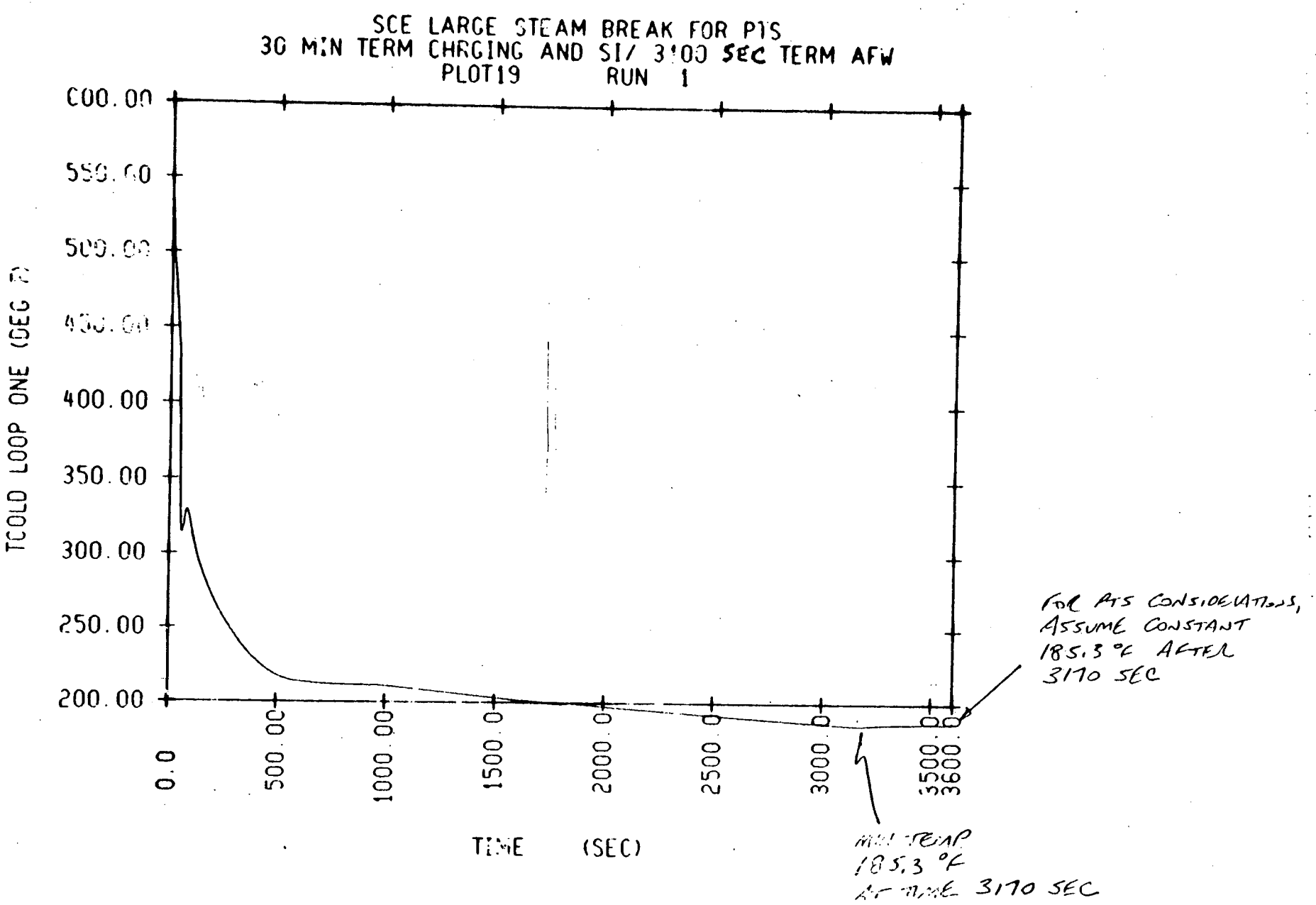

SCE LARGE STEAM BREAK FOR PTS
30 MIN TERM CHRGING AND SI/ 3100 SEC TERM AFW
PLOT19 RUN 1
TCOLD LOOP ONE (DEG F)
600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME (SEC)
FOR ATS CONSIDERATIONS, ASSUME CONSTANT 185.3 °F AFTER 3170 SEC
MIN TEMP 185.3 °F AT TIME 3170 SEC

Figure 3

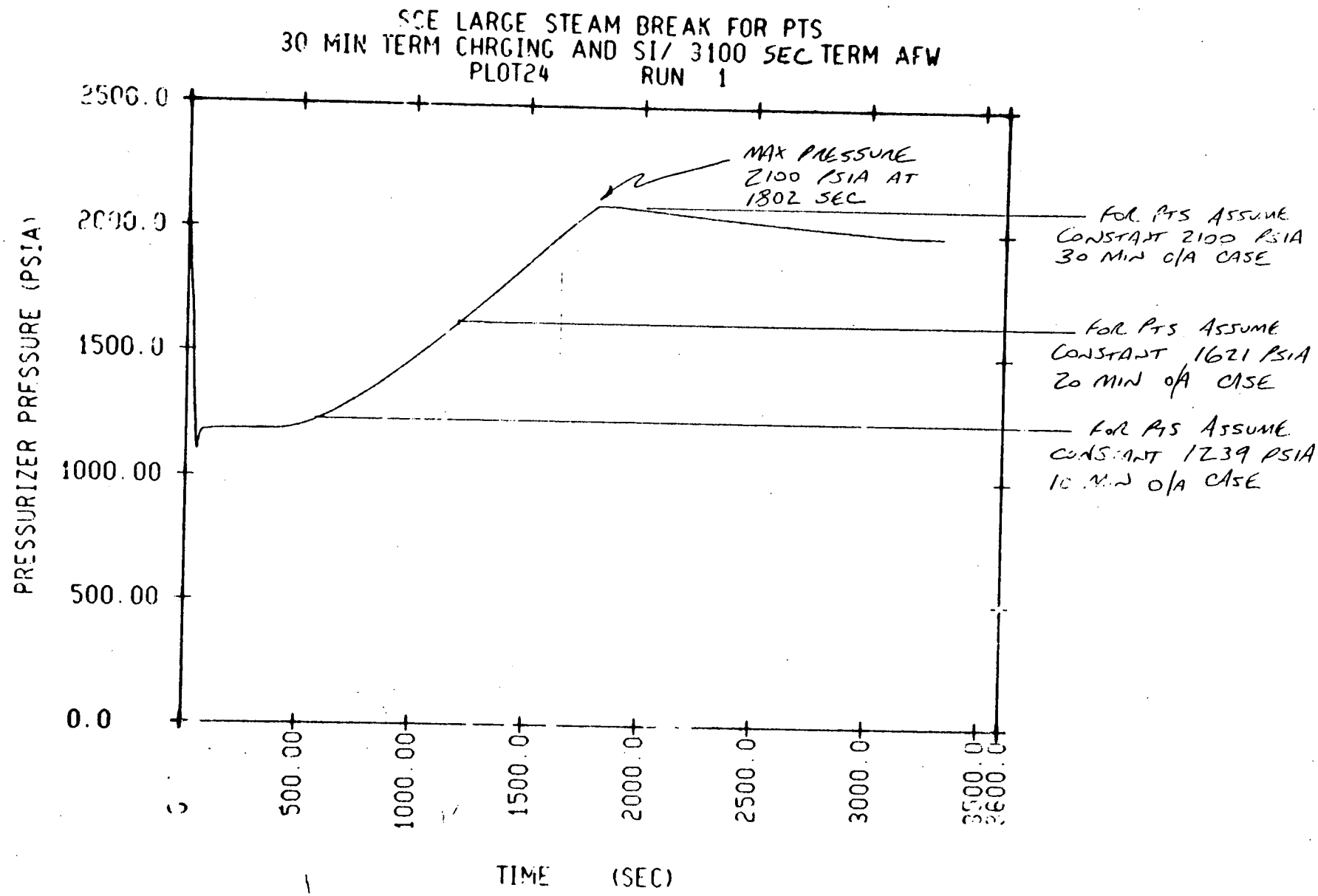

SCE LARGE STEAM BREAK FOR PTS
30 MIN TERM CHRGING AND SI/ 3100 SEC TERM AFW
PLOT24 RUN 1
PRESSURIZER PRESSURE (PSIA)
2500.0
2000.0
1500.0
1000.00
500.00
0.0
500.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME (SEC)
MAX PRESSURE 2100 PSIA AT 1802 SEC
FOR PTS ASSUME CONSTANT 2100 PSIA 30 MIN O/A CASE
FOR PTS ASSUME CONSTANT 1621 PSIA 20 MIN O/A CASE
FOR PTS ASSUME CONSTANT 1239 PSIA 10 MIN O/A CASE

Figure 8

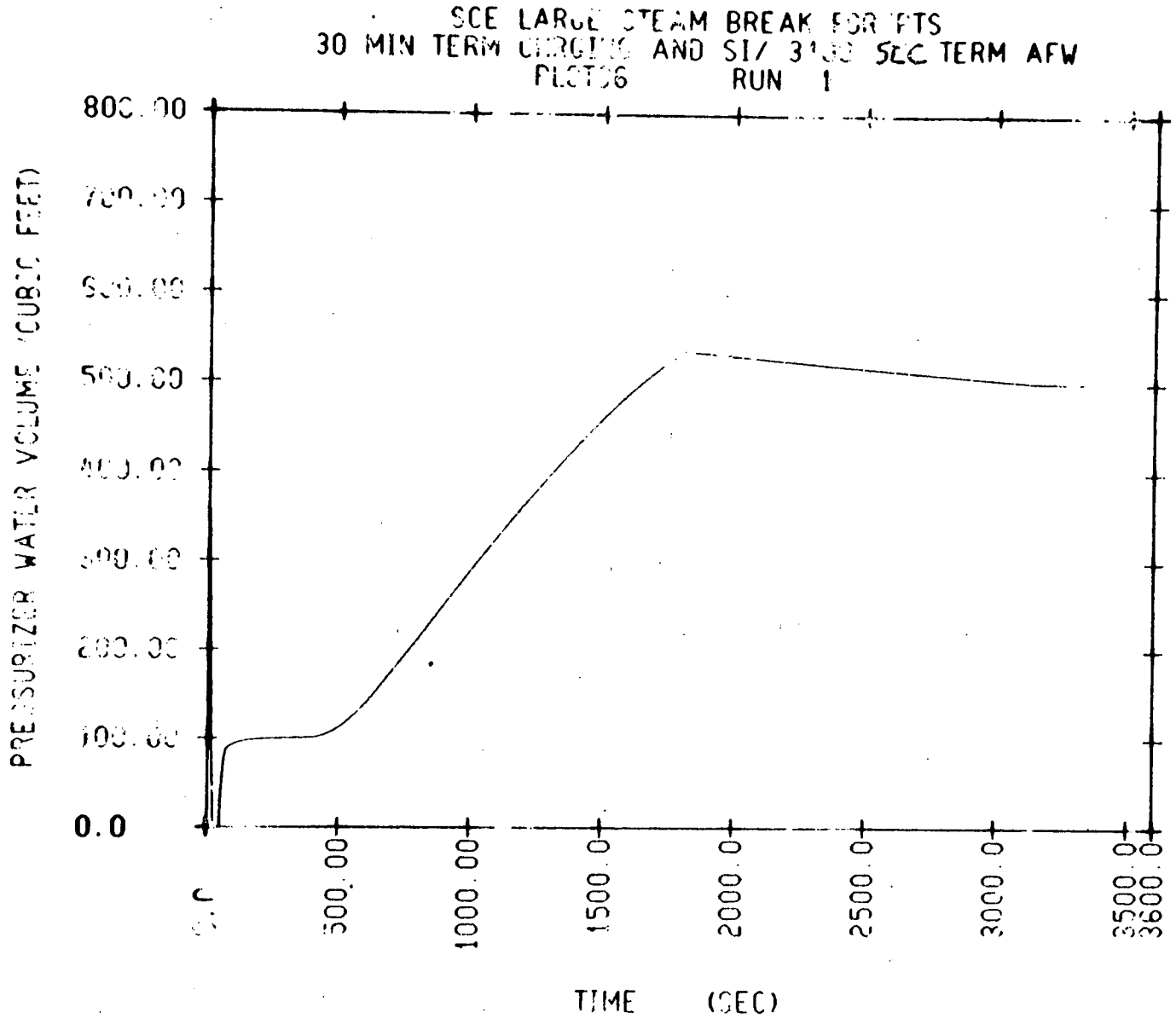

SCE LARGE STEAM BREAK FOR FTS
30 MIN TERM
AND SI/
SEC TERM AFW
PLOT36
RUN 1
PRESSURIZER WATER VOLUME (CUBIC FEET)
800.00
0.0
300.00
1000.00
1500.0
2000.0
2500.0
3000.0
3500.0
3600.0
TIME (SEC)

TABLE 1

RESULTS OF SAN ONOFRE - UNIT 1 FRACTURE ANALYSIS FOR A POSTULATED LARGE STEAMLINE BREAK ACCIDENT EVENT

Analysis Case	Operator Action Time	Flaw Location	Minimum Total Number of Acceptable Effective Full Power Years (EFPY) of Operation[a] With Benefit of Warm Prestressing (WPS)	Minimum Total Number of Acceptable Effective Full Power Years (EFPY) of Operation[a] Without Benefit of Warm Prestressing (WPS)
1	10 min (215°F, 1239 psia)	Base Metal	24[b]	22*
		Longitudinal Weld	WPS Not Required	24
2	20 min (210°F, 1621 psia)	Base Metal	24	14*
		Longitudinal Weld	24	21*

NOTE: (a) The results shown reflect the minimum total of EFPY of plant operation before conservative acceptance criteria [Ref. 1,2] are exceeded. The accumulated EFPY for the San Onofre vessel was 8.97 years as of 10/31/81. No crack initiation occurred for any of the results reported. That is, cracks less than 1" did not initiate. For those values marked with an asterik(*), one more additional EFPY resulted in cracks less than 1" initiating and not arresting within 75% of the vessel wall thickness.

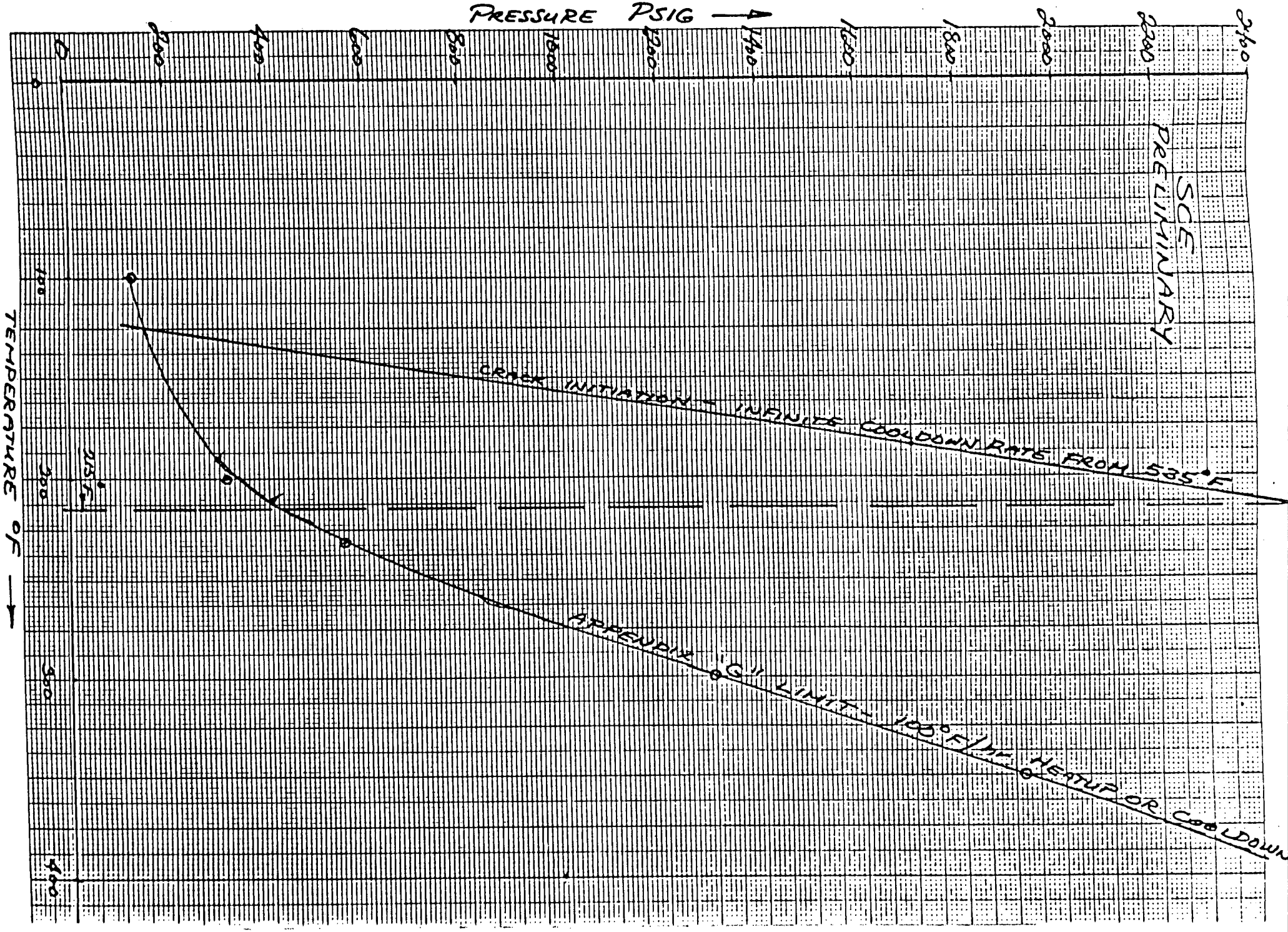
(b) 24 EFPY corresponds to 30 calendar year of operation at a 0.8 plant usage factor (capacity factor).

TABLE 3-1
RESULTS OF SAN ONOFRE UNIT 1 FRACTURE ANALYSES FOR POSTULATED THERMAL SHOCK TRANSIENTS

Transient	Minimum Number of Additional Years Acceptability Demonstrated	Benefits of Warmprestressing Used	Inputs to Analysis Vessel Geometry	Location	Material Properties	Transient Characteristic	Fluence Profile	Trend Curve
Large LOCA	18*	YES	plant specific	plant specific	plant specific	plant specific (2)	plant specific	low nickel
Small LOCA	18*	YES	"	"	"	limiting generic 3 loop, 2" break no mixing	"	"
Large Steam Break	18*	NO	"	"	"	quasi-plant specific (2)	"	"
Small Steam Break	18*	NO	"	"	"	generic	"	"
Rancho Seco	18*	NO	"	"	"	--	"	"

*This number of year corresponds to the remaining vessel design lifetime, assuming a plant design life of 30 calendar years and load factor of 0.8. As indicated in Section 5, fracture mechanics analyses were also completed for a design life of 40 calenda years which showed that vessel integrity criteria are met. Hence the useful life of the vessel is not limited by vessel integrity considerations.

WF:3163



ENCLOSURE 5

EMERGENCY OPERATING INSTRUCTIONS

PROCEDURE	SONGS 1 NUMBER
Reactor Trip OR SI	SO1-1.2-1.0
Reactor Trip Response	SO1-1.2-1.01
SI Termination Following Spurious Safety Injection	SO1-1.2-1.03
Loss of Reactor Coolant	SO1-1.2-1.1
SI Termination Following Loss of Reactor Coolant	SO1-1.2-1.11
Post-LOCA Cooldown and Depressurization	SO1-1.2-1.12
Transfer to Cold Leg Injection and Recirculation	SO1-1.2-1.13
Transfer to Hot Leg Recirculation	SO1-1.2-1.14
Loss of Secondary Coolant	SO1-1.2-1.2
SI Termination Following Loss of Secondary Coolant	SO1-1.2-1.21
Containment Spray Recirculation Following Loss of Secondary Coolant	SO1-1.2-1.22
Loss of RHR Due to Loss of Secondary Coolant In Containment	SO1-1.2-1.23
Steam Generator Tube Rupture	SO1-1.2-1.3
Response to Inadequate Core Cooling	SO1-1.2-14
Response to Loss of Secondary Heat Sink	SO1-1.2-15
Anticipated Transient Without Scram	SO1-1.2-16