ATTACHMENT A

EXISTING TECHNICAL SPECIFICATION
TABLE 3.3.1-1
SAN ONOFRE UNIT 2

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level – High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	≤ 111.0% RTP
2. Logarithmic Power Level – High[a]	2[b]	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ .93% RTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2385 psia
4. Pressurizer Pressure – Low[c]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1700 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.4 psig
6. Steam Generator 1 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia
7. Steam Generator 2 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia

(continued)

(a) Trip may be bypassed when logarithmic power is > 1E-4% RTP. Bypass shall be automatically removed when logarithmic power is ≤ 1E-4% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.

(b) When any RTCB is closed.

(c) The setpoint may be decreased to a minimum value of 300 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed before pressurizer pressure exceeds 500 psia (the corresponding bistable allowable value is ≤ 472 psia).

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator 1 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
9. Steam Generator 2 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
10. Reactor Coolant Flow – Low[(d)]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	Ramp: ≤ 0.231 psid/sec. Floor: ≥ 12.1 psid Step: ≤ 7.25 psid
11. Local Power Density – High[(d)]	1,2	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
12. Departure From Nucleate Boiling Ratio (DNBR) – Low[(d)]	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.31

(d) Trip may be bypassed when logarithmic power is < 1E-4% RTP. Bypass shall be automatically removed when logarithmic power is ≥ 1E-4% RTP. During testing pursuant to LCO 3.1.12, trip may be bypassed below 5% RTP. Bypass shall be automatically removed when logarithmic power is ≥ 5% RTP.

ATTACHMENT B

EXISTING TECHNICAL SPECIFICATION
TABLE 3.3.1-1
SAN ONOFRE UNIT 3

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level – High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	≤ 111.0% RTP
2. Logarithmic Power Level – High(a)	2(b)	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ .93% RTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2385 psia
4. Pressurizer Pressure – Low(c)	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1700 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.4 psig
6. Steam Generator 1 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia
7. Steam Generator 2 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia

(continued)

(a) Trip may be bypassed when THERMAL POWER is > 1E-4% RTP. Bypass shall be automatically removed when THERMAL POWER is ≤ 1E-4% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.

(b) When any RTCB is closed.

(c) The setpoint may be decreased to a minimum value of 300 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed before pressurizer pressure exceeds 500 psia (the corresponding bistable allowable value is ≤ 472 psia).

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator 1 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
9. Steam Generator 2 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
10. Reactor Coolant Flow – Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	Ramp: ≤ 0.231 psid/sec. Floor: ≥ 12.1 psid Step: ≤ 7.25 psid
11. Local Power Density – High[d]	1,2	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
12. Departure From Nucleate Boiling Ratio (DNBR) – Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.31

(d) Trip may be bypassed when THERMAL POWER is < 1E-4% RTP. Bypass shall be automatically removed when THERMAL POWER is ≥ 1E-4% RTP. During testing pursuant to LCO 3.1.12, trip may be bypassed below 5% RTP. Bypass shall be automatically removed when THERMAL POWER is ≥ 5% RTP.

ATTACHMENT C

PROPOSED TECHNICAL SPECIFICATION
TABLE 3.3.1-1
SAN ONOFRE UNIT 2
(REDLINE AND STRIKEOUT)

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level – High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	≤ 111.0% RTP
2. Logarithmic Power Level – High[a]	2[b]	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ .93% RTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2385 psia
4. Pressurizer Pressure – Low[c]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1700 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.4 psig
6. Steam Generator 1 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia
7. Steam Generator 2 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia

(continued)

(a) ~~Trip may be bypassed when logarithmic power is > 1E-4% RTP. Bypass shall be automatically removed when logarithmic power is ≤ 1E-4% RTP.~~ Trip must be enabled when logarithmic power is < 4E-5% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.

(b) When any RTCB is closed.

(c) The setpoint may be decreased to a minimum value of 300 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed before pressurizer pressure exceeds 500 psia (the corresponding bistable allowable value is ≤ 472 psia).

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator 1 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
9. Steam Generator 2 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
10. Reactor Coolant Flow – Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	Ramp: ≤ 0.231 psid/sec. Floor: ≥ 12.1 psid Step: ≤ 7.25 psid
11. Local Power Density – High[d]	1,2	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
12. Departure From Nucleate Boiling Ratio (DNBR) – Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.31

(d) ~~Trip may be bypassed when logarithmic power is < 1E-4% RTP. Bypass shall be automatically removed when logarithmic power is ≥ 1E-4% RTP.~~ Trip must be enabled when logarithmic power is > 1.5E-4% RTP. During testing pursuant to LCO 3.1.12, trip may be bypassed below 5% RTP. Bypass shall be ~~automatically~~ removed when logarithmic power is ≥ 5% RTP.

ATTACHMENT D

PROPOSED TECHNICAL SPECIFICATION
TABLE 3.3.1-1
SAN ONOFRE UNIT 3
(REDLINE AND STRIKEOUT)

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level – High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	≤ 111.0% RTP
2. Logarithmic Power Level – High[(a)]	2[(b)]	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ .93% RTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2385 psia
4. Pressurizer Pressure – Low[(c)]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1700 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.4 psig
6. Steam Generator 1 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia
7. Steam Generator 2 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia

(continued)

(a) ~~Trip may be bypassed when THERMAL POWER is > 1E-4% RTP. Bypass shall be automatically removed when THERMAL POWER is ≤ 1E-4% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.~~Trip must be enabled when ~~THERMAL POWER~~ logarithmic power is * < 4E-5% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.

(b) When any RTCB is closed.

(c) The setpoint may be decreased to a minimum value of 300 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed before pressurizer pressure exceeds 500 psia (the corresponding bistable allowable value is ≤ 472 psia).

* PCN 500

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator 1 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
9. Steam Generator 2 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
10. Reactor Coolant Flow – Low(d)	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	Ramp: ≤ 0.231 psid/sec. Floor: ≥ 12.1 psid Step: ≤ 7.25 psid
11. Local Power Density – High(d)	1,2	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
12. Departure From Nucleate Boiling Ratio (DNBR) – Low(d)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.31

(d) Trip ~~may be bypassed~~ must be enabled when ~~THERMAL POWER~~ logarithmic power is * > 1.5E-4% ~~< 1E-4%~~ RTP. ~~Bypass shall be automatically removed when THERMAL POWER is ≥ 1E-4% RTP.~~ During testing pursuant to LCO 3.1.12, trip may be bypassed below 5% RTP. Bypass shall be ~~automatically~~ removed when ~~THERMAL POWER~~ logarithmic power is * ≥ 5% RTP.

* PCN 500

ATTACHMENT E

PROPOSED TECHNICAL SPECIFICATION
TABLE 3.3.1-1
SAN ONOFRE UNIT 2

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level – High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	≤ 111.0% RTP
2. Logarithmic Power Level – High[(a)]	2[(b)]	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ .93% RTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2385 psia
4. Pressurizer Pressure – Low[(c)]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1700 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.4 psig
6. Steam Generator 1 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia
7. Steam Generator 2 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia

(continued)

(a) Trip must be enabled when logarithmic power is < 4E-5% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.

(b) When any RTCB is closed.

(c) The setpoint may be decreased to a minimum value of 300 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed before pressurizer pressure exceeds 500 psia (the corresponding bistable allowable value is ≤ 472 psia).

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator 1 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
9. Steam Generator 2 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
10. Reactor Coolant Flow – Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	Ramp: ≤ 0.231 psid/sec. Floor: ≥ 12.1 psid Step: ≤ 7.25 psid
11. Local Power Density – High[d]	1,2	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
12. Departure From Nucleate Boiling Ratio (DNBR) – Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.31

(d) Trip must be enabled when logarithmic power is > 1.5E-4% RTP. During testing pursuant to LCO 3.1.12, trip may be bypassed below 5% RTP. Bypass shall be removed when logarithmic power is ≥ 5% RTP.

ATTACHMENT F

PROPOSED TECHNICAL SPECIFICATION
TABLE 3.3.1-1
SAN ONOFRE UNIT 3

Table 3.3.1-1 (page 1 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Linear Power Level – High	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	≤ 111.0% RTP
2. Logarithmic Power Level – High[(a)]	2[(b)]	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ .93% RTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2385 psia
4. Pressurizer Pressure – Low[(c)]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1700 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.4 psig
6. Steam Generator 1 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia
7. Steam Generator 2 Pressure-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 729 psia

(continued)

(a) Trip must be enabled when logarithmic power is < 4E-5% RTP. Trip may be manually bypassed during physics testing pursuant to LCO 3.1.12.

(b) When any RTCB is closed.

(c) The setpoint may be decreased to a minimum value of 300 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed before pressurizer pressure exceeds 500 psia (the corresponding bistable allowable value is ≤ 472 psia).

Table 3.3.1-1 (page 2 of 2)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator 1 Level - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
9. Steam Generator 2 Level - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 20%
10. Reactor Coolant Flow - Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	Ramp: ≤ 0.231 psid/sec. Floor: ≥ 12.1 psid Step: ≤ 7.25 psid
11. Local Power Density - High[d]	1,2	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
12. Departure From Nucleate Boiling Ratio (DNBR) - Low[d]	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.31

(d) Trip must be enabled when logarithmic power is > 1.5E-4% RTP. During testing pursuant to LCO 3.1.12, trip may be bypassed below 5% RTP. Bypass shall be removed when logarithmic power is ≥ 5% RTP.

ATTACHMENT G

PROPOSED SAFETY ANALYSIS REPORT TEXT
SAN ONOFRE UNITS 2 & 3

15.4 REACTIVITY AND POWER DISTRIBUTION ANOMALIES

15.4.1 MODERATE FREQUENCY INCIDENTS

15.4.1.1 Uncontrolled CEA Withdrawal from a Subcritical or Low Power Condition

15.4.1.1.1 Identification of Causes and Frequency Classification

The estimated frequency of a control element assembly (CEA) withdrawal from subcritical or low power conditions classifies it as a moderate frequency incident as defined in reference 1 of section 15.0. An uncontrolled withdrawal of CEAs is assumed to occur as a result of a single failure in the control element drive mechanism (CEDM), control element drive mechanism control system (CEDMCS), or as a result of operator error.

An analysis of the uncontrolled CEA withdrawal, both from a subcritical and low power conditions, is presented here.

In accordance with the direction given in Sections 15.0 and 15.0.7, additional information which completes the presentation of this event is provided in Section 15.10.4.1.1.

15.4.1.1.2 Sequence of Events and Systems Operation

The withdrawal of CEAs from subcritical or low power conditions adds reactivity to the reactor core, causing both the core power level and the core heat flux to increase together with corresponding increases in reactor coolant temperatures and reactor coolant system (RCS) pressure. The withdrawal motion of CEAs also produces a time-dependent redistribution of core power. These transient variations in core thermal parameters result in the system's approach to the specified fuel design limits and RCS and secondary system pressure limits, thereby requiring the protective action of the reactor protection system (RPS).

The reactivity insertion rate accompanying the uncontrolled CEA withdrawal is dependent primarily upon the CEA withdrawal rate and the CEA worth since, at subcritical and lower power conditions, the normal reactor feedback mechanisms do not occur until power generation in the core is large enough to cause changes in the fuel and moderator temperatures. The reactivity insertion rate determines the rate of approach to the fuel design limits. Depending on the system initial conditions and reactivity insertion rate, the uncontrolled CEA withdrawal transient is terminated by either a high logarithmic power trip (for the subcritical initial condition), a high power level trip, high pressurizer pressure trip, a low departure from nucleate boiling ratio (low DNBR/VOPT), or a high local power density trip. The secondary system pressure increases following reactor trip and is limited by the steam generator safety valves.

Table 15.4-1 and 15.4-2 give the sequence of events for the limiting CEA withdrawal transient from subcritical (10^{-8}% Power) and low power (1% power) conditions, respectively. The sequence of events past 75.7 seconds shown in table 15.4-1 is from cycle 1. They are representative of the latest cycle (see section 15.0.7).

10^{-5}%

Table 15.4-1
SEQUENCE OF EVENTS FOR THE UNCONTROLLED CEA WITHDRAWAL
FROM SUBCRITICAL CONDITIONS

Time (sec)	Event	Setpoint or Value
0.0	Initiation of Uncontrolled Sequential CEA Withdrawal	---
33.8 ~~53.0~~	Reactor Reaches Critically	---
58.3 ~~74.8~~	Reactor Reaches High Logarithmic Power Trip Setpoint	4 ~~2~~% of Rated
58.7 ~~75.2~~ (a)	Reactor Trip Generated	---
59.7 ~~75.5~~ (a)	CEAs Begin to Drop	---
59.7 ~~75.6~~ (a)	Peak Reactor Core Power Reached	122% ~~65%~~ of 3410 MWt
59.8 ~~75.7~~ (a)	Peak Reactor Core Heat Flux Reached	45.2 ~~9.7%~~ of 3410 MWt
59.8 ~~75.7~~	Minimum DNBR Occurs	> 1.31
~~76.0~~	~~Peak RCS Pressure Occurs~~	~~2549 psia~~
~~90.0~~	~~Minimum Pressurizer Steam Volume~~	~~850 ft^3~~

(a) Original accident analysis assumed a 0.3 second delay between the time the reactor trip is generated and the CEAs begin to drop. Present analyses allow up to 1.01 second holding coil delay time as part of the overall average 3.4 second CEA drop time. Both SONGS Units 2 and 3 CEA drop time measurements have very little margin to the current technical specification limit of 3.2 seconds. As discussed in Section 15.0.2, three (3) CEA drop time curves were used for the safety analysis with the longest delay time of 1.01 seconds for a drop time of 3.4 seconds. Core operating limit supervisory system (COLSS) and core protection calculator system (CPCS) are to be modified to accommodate any loss or gain in thermal margins based on the measured average CEA drop time in accordance with the revised Technical Specification 3.1.5. The additional delay results in increases in peak core power and peak heat flux. However, the acceptance criteria for this event continue to be satisfied and the conclusions of the analysis remain valid.

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Table 15.4-2
SEQUENCE OF EVENTS FOR THE UNCONTROLLED CEA WITHDRAWAL FROM LOW POWER CONDITIONS

Time (sec)	Event	Setpoint or Value
0.0	CEAW Initiated	---
150.5	High Pressurizer Pressure Trip Condition	2475 psia
151.4[a]	High Pressurizer Pressure/VOPT Reactor Trip Occurs	---
151.7[a]	Scram CEAs Begin to Drop	---
152.1	Pressurizer Safety Valves Open	2525 psia
152.9	Peak RCS Pressure	2640 psia
153.1	Peak Core Power	75.4% of 3410 MWt
153.8	Peak Core Heat Flux	61.8% of 3410 MWt
153.8	Minimum DNBR	> 1.31
155.7	Pressurizer Safety Valves Close	2400 psia

[a] Original accident analysis assumed a 0.3 second delay between the time the reactor trip is generated and the CEAs begin to drop. Present analyses allow up to 1.01 second holding coil delay time as part of the overall average 3.4 second CEA drop time. Both SONGS Units 2 and 3 CEA drop time measurements have very little margin to the current technical specification limit of 3.2 seconds. As discussed in Section 15.0.2, three (3) CEA drop time curves were used for the safety analysis with the longest delay time of 1.01 seconds for a drop time of 3.4 seconds. Core operating limit supervisory system (COLSS) and core protection calculator system (CPCS) are to be modified to accommodate any loss or gain in thermal margins based on the measured average CEA drop time in accordance with the revised Technical Specification 3.1.5. Sufficient conservatism exists in the CPC variable overpower trip (VOPT) to compensate for the additional delay. The conclusions of the analysis remain valid.

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Time (sec)	Event	Setpoint or Value
0.00	CEAW Initiated	-
34.40	VOPT Trip Condition	35 % of Rated
34.80	Reactor Trip Occurs	-
35.81	Scram CEAs Begin to Drop	-
35.82	Peak Core Power Fuel Centerline Temperature	107.19 % of Rated < 4706 °F
35.98	Peak Core Heat Flux	47.66 % of Rated
35.98	Minimum DNBR	>1.31

Insert A

15.4.1.1.3 Core and System Performance

A. Mathematical Model

The nuclear steam supply system (NSSS) response to a CEA withdrawal from subcritical or low power conditions was simulated using the CESEC III computer program described in section 15.0. The thermal margin on DNBR in the reactor core was simulated using the CETOP-D computer program described in section 15.0 with the CE-1 CHF correlation described in chapter 4.

B. Input Parameters and Initial Conditions

The input parameters and initial conditions used to analyze the NSSS response to a CEA withdrawal from subcritical and low power conditions are discussed in section 15.0. In particular, those parameters which were unique to the analysis for each event discussed below are listed in tables 15.4-3 and 15.4-4 for a CEA withdrawal from subcritical and low power conditions, respectively.

1. CEA Withdrawal Event From Low Power-Conditions

The initial conditions and NSSS characteristics assumed in this analysis have been determined to be the limiting set of conditions allowed by the limiting conditions for operation (LCOs) in terms of providing the closest and fastest approach to the fuel design limits for a CEA withdrawal from low power level. The initial conditions which provide the closest and most rapid approach to the fuel design limits correspond to a zero power core inlet temperature of 520°F, a core inlet flow of 120% of design flow, and the minimum RCS pressure of 2000 psia. The initial RCS pressure is chosen to be the lowest allowed pressure within the LCOs since this ~~allows the transient response to the CEA withdrawal to proceed for a longer time by delaying actuation of the high pressurizer pressure trip (maximum trip point of 2422 psia including uncertainties)~~. The initial core average axial power distribution assumed in the analysis corresponds to an axial shape index (ASI) of ~~-0.81~~. Studies have shown that this initial shape undergoes a significant and rapid shift to the top of the core during the transient. A one pin radial peaking factor of ~~2.38~~, including uncertainties, is also conservatively assumed for this analysis. The radial peaking factor is the highest radial peak expected for any CEA configuration and time in core lifetime.

95 ~~%~~ %

560

is more limiting for minimum DNBR

-0.86

2.3

3.809×10^{-5} MW

Parametric analyses have indicated that the lowest initial power level of 10^{-4}% subcritical core condition, results in the closest and fastest approach to the fuel design limits during the CEA withdrawal transient. Initially subcritical, zero power CEA withdrawal transients are terminated by the high logarithmic power level trip while those initiated from a power level just above the high logarithmic power level trip bypass setting of 10^{-4}% power are terminated by a high pressurizer pressure trip, CPC low DNBR (VOPT) trip, or high local power density trip at a much later time into the transient. At power levels above 10^{-4}%, reactivity feedback mechanisms prevail and provide a dampening effect on the severity of the transient. The most positive moderator temperature coefficient of $+0.5 \times 10^{-4}$ $\Delta k/k/°F$ is assumed for this analysis. Also, a conservative fuel temperature coefficient multiplier of 0.75 was used.

(Analytical Limit of $\geq$ [illegible] Power

10^{-5}%

The regulating CEAs are initially in the fully inserted position when the CEA withdrawal is initiated. Based on calculated CEA worths and the maximum CEA withdrawal rate of the CEA drive system, the assumed rate is conservative. For this analysis, the reactivity insertion is the maximum expected rate of 1.1×10^{-4} $\Delta\rho$/s for a CEA withdrawal from low power conditions. This rate corresponds to approximately twice the largest insertion rate expected from the sequential withdrawal of the CEA groups with 40% overlap at the maximum speed of 30 in/minute.

Table 15.4-3
ASSUMPTIONS FOR THE UNCONTROLLED CEA WITHDRAWAL
FROM SUBCRITICAL CONDITIONS

Parameter	Value	
Initial Core Power Level, MWt 3.809×10^{-5}	~~3470 x [illegible]~~	
Initial Inlet Coolant Temperature, °F	560 ~~520~~	
Initial Core Mass Flow Rate, ~~10^6 lbm/hr~~ gpm (90% of nominal)	~~150.2~~	356,400
Initial RCS Pressure, psia	-2000	
Moderator Temperature Coefficient, $10^{-4}\Delta\rho$/°F	0.5	
Fuel Temperature Coefficient Multiplier	~~0.75~~	0.86
~~Minimum CEA Worth at Trip, %$\Delta\rho$~~	~~-4.0~~	
Maximum Reactivity ~~Addition~~ Insertion Rate, x $10^{-4}\Delta\rho$/sec	~~1.9~~	2.96

Table 15.4-4
ASSUMPTIONS FOR THE UNCONTROLLED CEA WITHDRAWAL
FROM LOW POWER CONDITIONS

Parameter	Value
Initial Core Power Level, ~~MWt~~ 10^{-5} Mwt	33.9 ~~34.78~~
Initial Inlet Coolant Temperature, °F	560 ~~520~~
Initial Core Mass Flow Rate ~~10^6 lbm/hr~~ (95% of nominal), gpm	316,200 ~~150.2~~
Initial RCS Pressure, psia	2000
Moderator Temperature Coefficient, $10^{-4}\Delta\rho$/°F	0.5
Fuel Temperature Coefficient Multiplier	0.86 ~~0.75~~
Minimum CEA Worth at Trip, %$\Delta\rho$	-5.15
Maximum Reactivity ~~Addition~~ Insertion Rate, x $10^{-4}\Delta\rho$/sec	2.0 ~~1.1~~

For those transients classified under the category of reactivity and power distribution anomalies, the uncontrolled CEA withdrawal at low power conditions has been shown to be the most limiting transient for maximum RCS pressure. The initial conditions and NSSS characteristics used for this particular analysis are essentially identical to the above analysis. The core inlet temperature assumed is the minimum value of 520°F. The lowest core inlet temperature is used since this keeps the steam generator safety valves from opening. In addition, no credit is taken for the turbine bypass valves, thereby maximizing the peak RCS pressure reached during the course of the transient. The initial parameters used in this analysis are shown in table 15.4-4.

2. CEA Withdrawal Event from Subcritical Conditions

of $3.809 * 10^{-5}$ MW

An uncontrolled CEA withdrawal event from subcritical conditions was initiated at the power level of 10^{-8}%. The input parameters and initial conditions used to analyze this event were similar to those of the low power CEA withdrawal analysis.

For the subcritical conditions, the maximum reactivity addition rate of 1.9 x 10^{-4} $\Delta\rho$/sec was used. Also, minimum CEA worth at trip of -4.0 %$\Delta\rho$ was used in this analysis. The input parameters used in this analysis are shown in table 15.4-3.

C. Results

The dynamic behavior of important NSSS parameters following a CEA withdrawal from subcritical and low power conditions is presented in Figures 15.4-1 through 15.4-10.

1. CEA Withdrawal from Subcritical Conditions

approximately 58.9 seconds

The uncontrolled CEA withdrawal from subcritical conditions resulted in a reactor trip on high logarithmic power at 75.2 seconds. The minimum DNBR calculated for this event initiated from the conditions of table 15.4-3 was greater than the design limit of 1.31. The peak linear heat generation rate (PLHGR) was calculated to be ~~25.5~~ 55.5 kw/ft which is in excess of the steady state acceptable fuel centerline melt (CTM) limit of 21 kw/ft. However, the fuel centerline temperature was less than 4706°F and, thus, the fuel is not predicted to melt.

The fuel cycle length extensions approved by the NRC for SONGS 2 and 3 required core designs containing erbia (Er_2O_3) integral burnable absorber in place of the traditional boron (B_4C) discrete burnable absorber to control the MTC at the beginning of the cycle and the pin peaking factor throughout the cycle.

Center line fuel melting temperature is a criterion, which is adhered to in the safety analysis during plant transient conditions, when the Peak Linear Heat rate limit set in the Technical Specifications is exceeded. This temperature is also burnup dependent and is thus calculated on a cycle specific bases.

The NRC approval of the methodology for core designs containing erbium burnable absorbers (Reference 6) requested that the Erbia melt temperature limit be decreased linearly with Erbia content such that the limit at zero weight percent be equal to the UO_2 melting temperature limit, and at the highest Erbia weight percent be at least 1 degree Celsius below the lowest melting temperature for which experimental data is available.

For the Cycle 9 core design with Erbia integral burnable absorber rods, the maximum approved Erbia concentration is 2.5 wt% fuel, and the maximum assembly burnup is 60 GWD/MTU. These two factors create a center line fuel melting temperature limit of 4706°F.

Additionally, the peak RCS pressure is less than the design limit of 2750 psia. Table 15.4-1 presents the sequence of events for this event. Figures 15.4-1 through 15.4-5 present the NSSS response for core power, core heat flux, RCS temperatures, RCS pressure and steam generator pressure.

2. CEA Withdrawal from Low Power Conditions

The low power CEAWs were analyzed to maximize the RCS pressure increase and to maximize the potential for the fuel degradation. The initial conditions for the low power CEAW that maximizes peak RCS pressure are listed in table 15.4-4. The CPC low DNBR (VOPT) trip

and Fuel degradation

For fuel degradation, the

Move

is credited to mitigate the consequences of this event. A parametric study on the reactivity addition rate was performed to yield a coincident CPC low DNBR (VOPT) and high pressurizer pressure trip in order to maximize the peak RCS pressure. A high pressurizer pressure trip and CPC low DNBR (VOPT) trip are generated at 151.4 seconds and the scram CEAs begin to drop at 151.7 seconds. The peak RCS pressure is 2640 psia and occurs at 152.9 seconds. The sequence of events is presented in table 15.4-2. Figures 15.4-6 through 15.4-10 present the NSSS response for this event.

15.4.1.1.4 Barrier Performance

A. Mathematical Model

The mathematical model used for evaluation of barrier performance is identical to that described in paragraph 15.4.1.1.3.

B. Input Parameters and Initial Conditions

The input parameters and initial conditions used for evaluation of barrier performance are identical to those described in paragraph 15.4.1.1.3.

C. Results

Figures 15.4-3 and 15.4-8 show the NSSS response for RCS pressure for a CEA withdrawal from subcritical and low power conditions. The peak RCS pressure for a CEA withdrawal from subcritical conditions is less than that of the CEA withdrawal from lower power. The most limiting case of RCS pressure for the CEA withdrawal at low power is 2640 psia which is less than the design limit of 2750 psia.

2655

15.4.1.1.5 Radiological Consequences

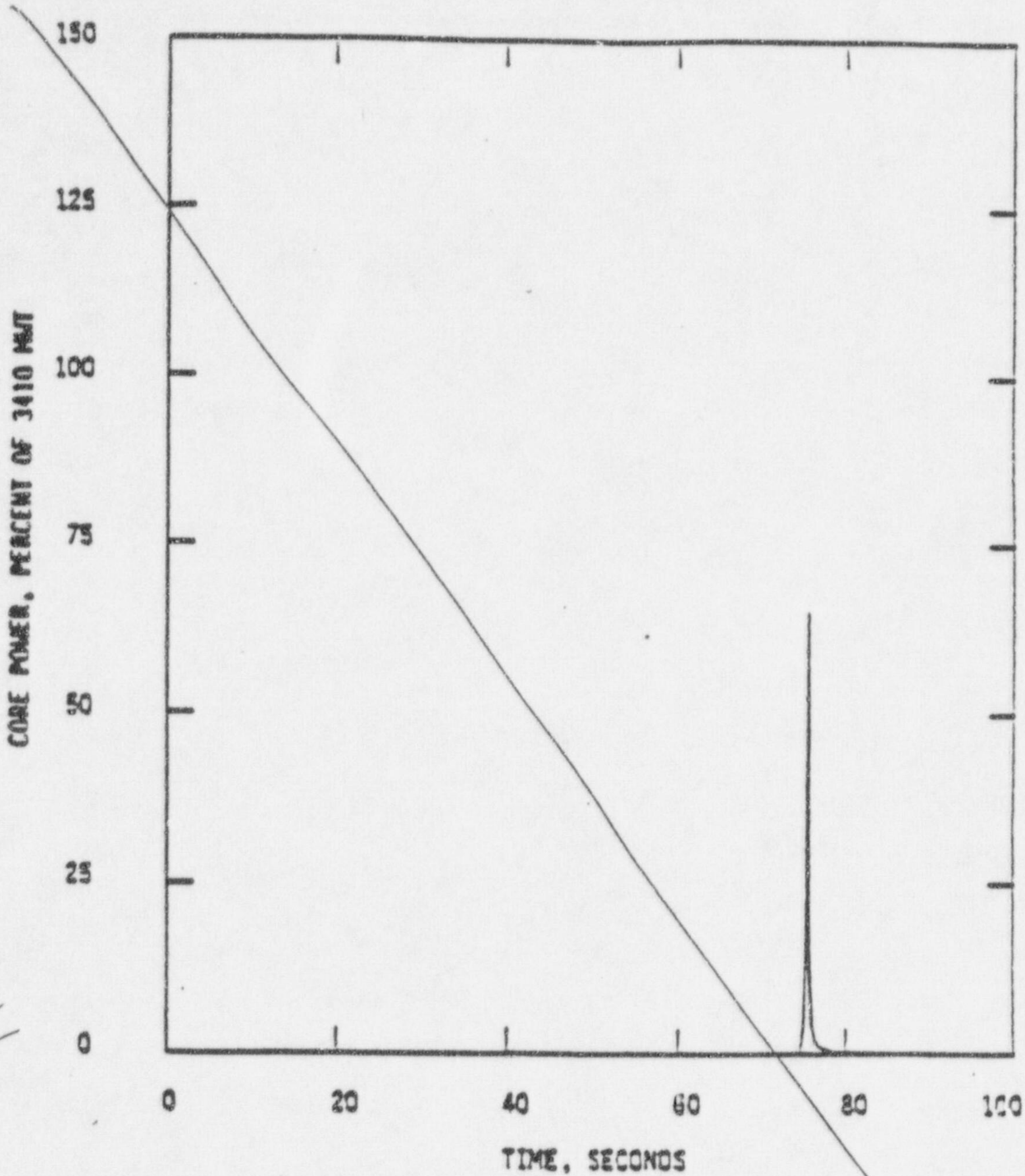
The radiological consequences due to steam releases from the secondary system are less severe than the consequences of the inadvertent opening of the atmospheric dump valve discussed in paragraph 15.1.1.4.

15.4.1.2 <u>Uncontrolled CEA Withdrawal at Power</u>

15.4.1.2.1 Identification of Causes and Frequency Classification

The estimated frequency of a CEA withdrawal at power classifies it as a moderate frequency incident as defined in reference 1 of section 15.0. A CEA withdrawal is assumed to occur as a result of a single failure in the CEDM or CEDMCS.

In accordance with the direction given in Sections 15.0 and 15.0.7, additional information which completes the presentation of this event is provided in Section 15.10.4.1.2.



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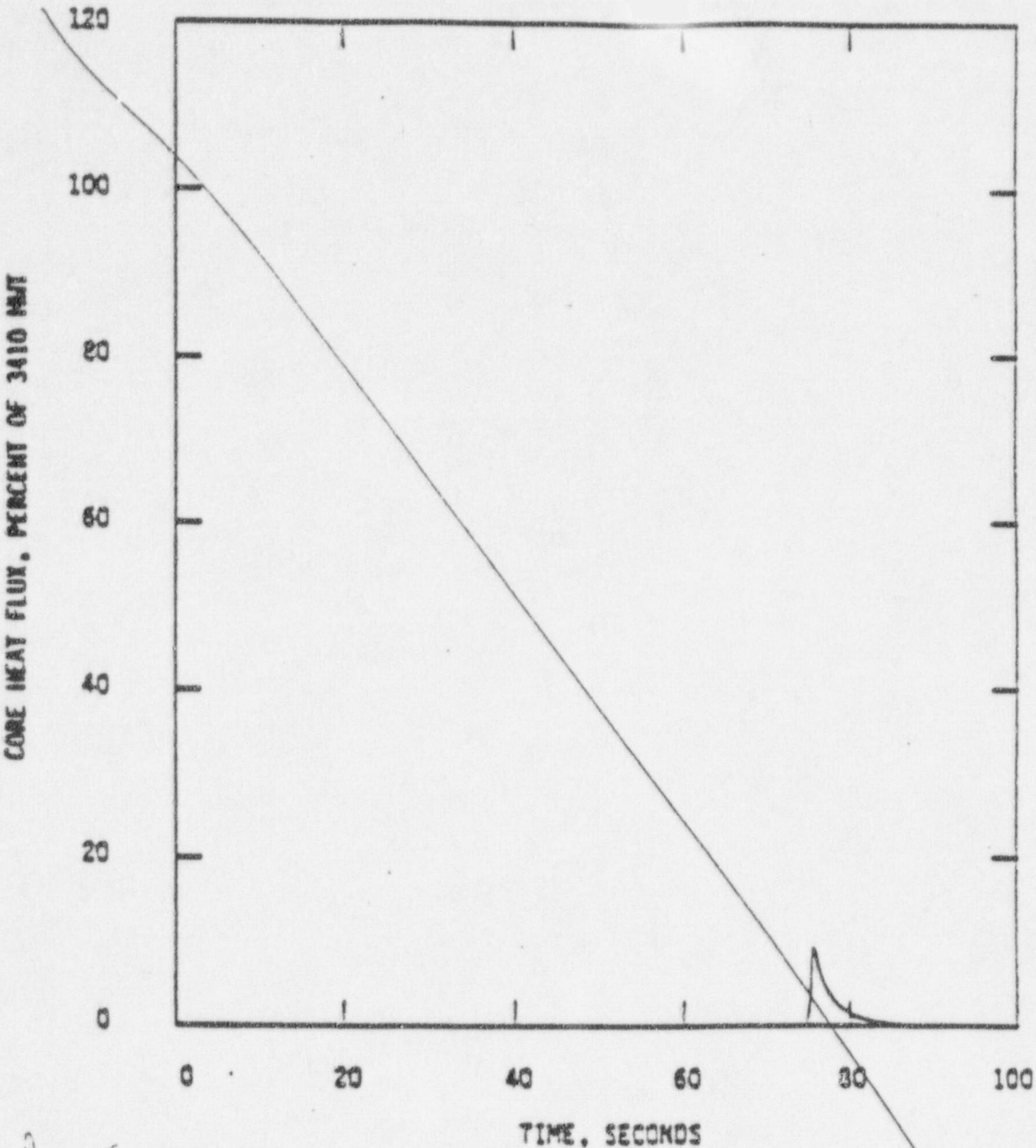
SAN ONOFRE
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL FROM SUBCRITICAL
CORE POWER vs. TIME

Figure 15.4-1



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NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL FROM SUBCRITICAL
CORE HEAT FLUX vs. TIME 3

Figure 15.4-2

2/87 Revision 3

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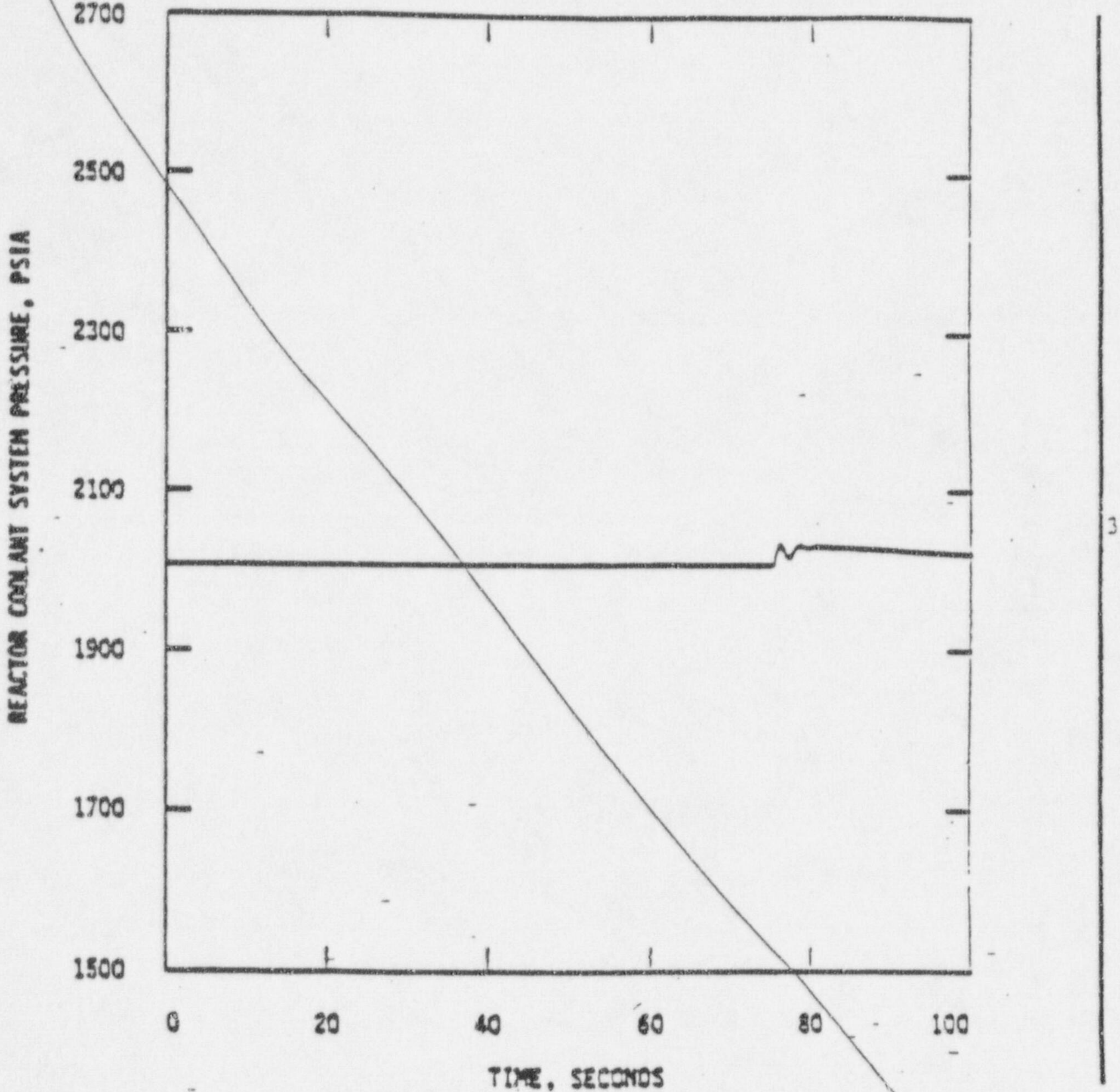

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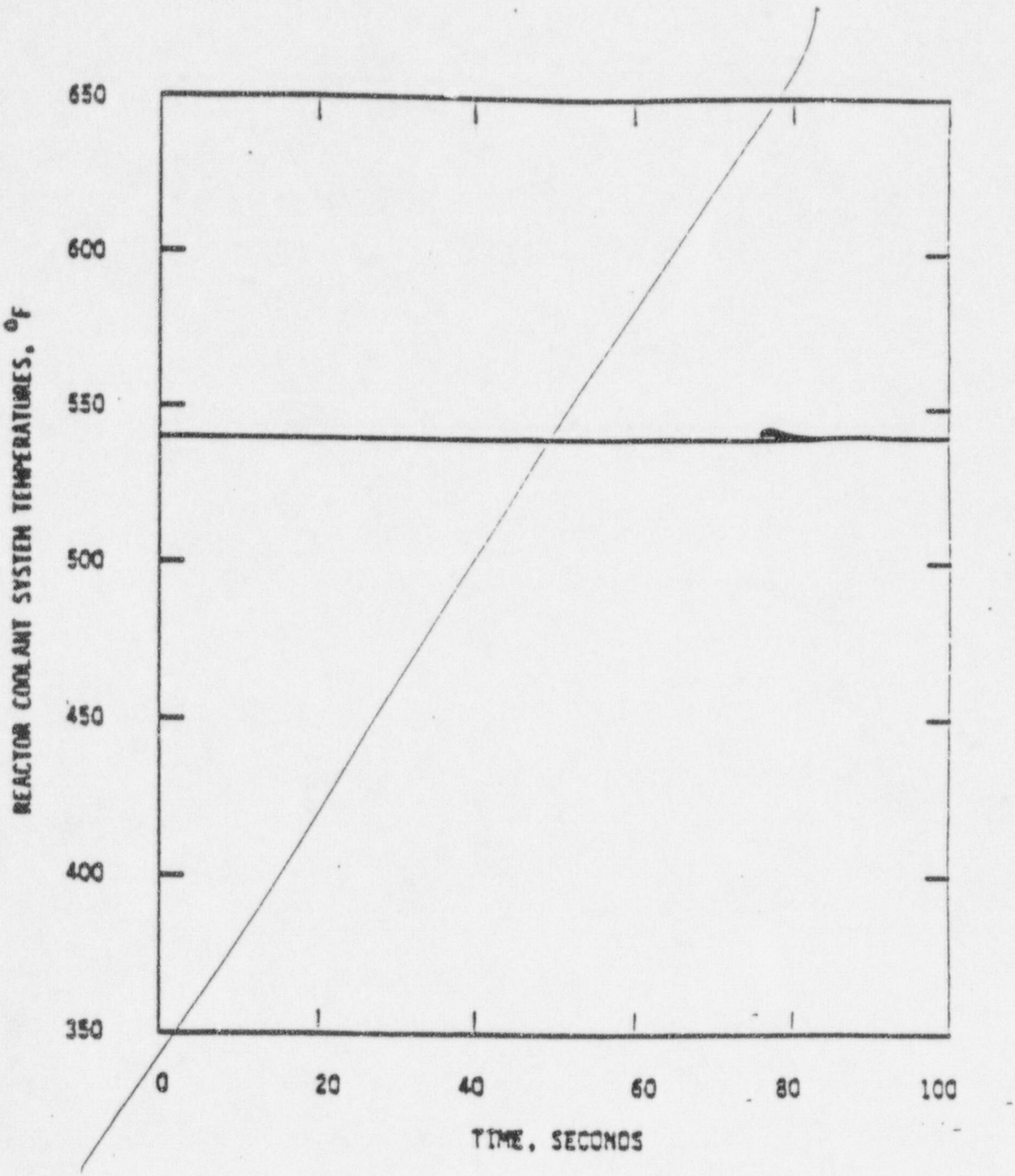
SAN ONOFRE
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL FROM SUBCRITICAL
RCS PRESSURE vs. TIME

Figure 15.4-3

2/87 Revision 3



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NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL FROM SUBCRITICAL
RCS TEMPERATURES vs. TIME

Figure 15.4-4

2/87 Revision 3

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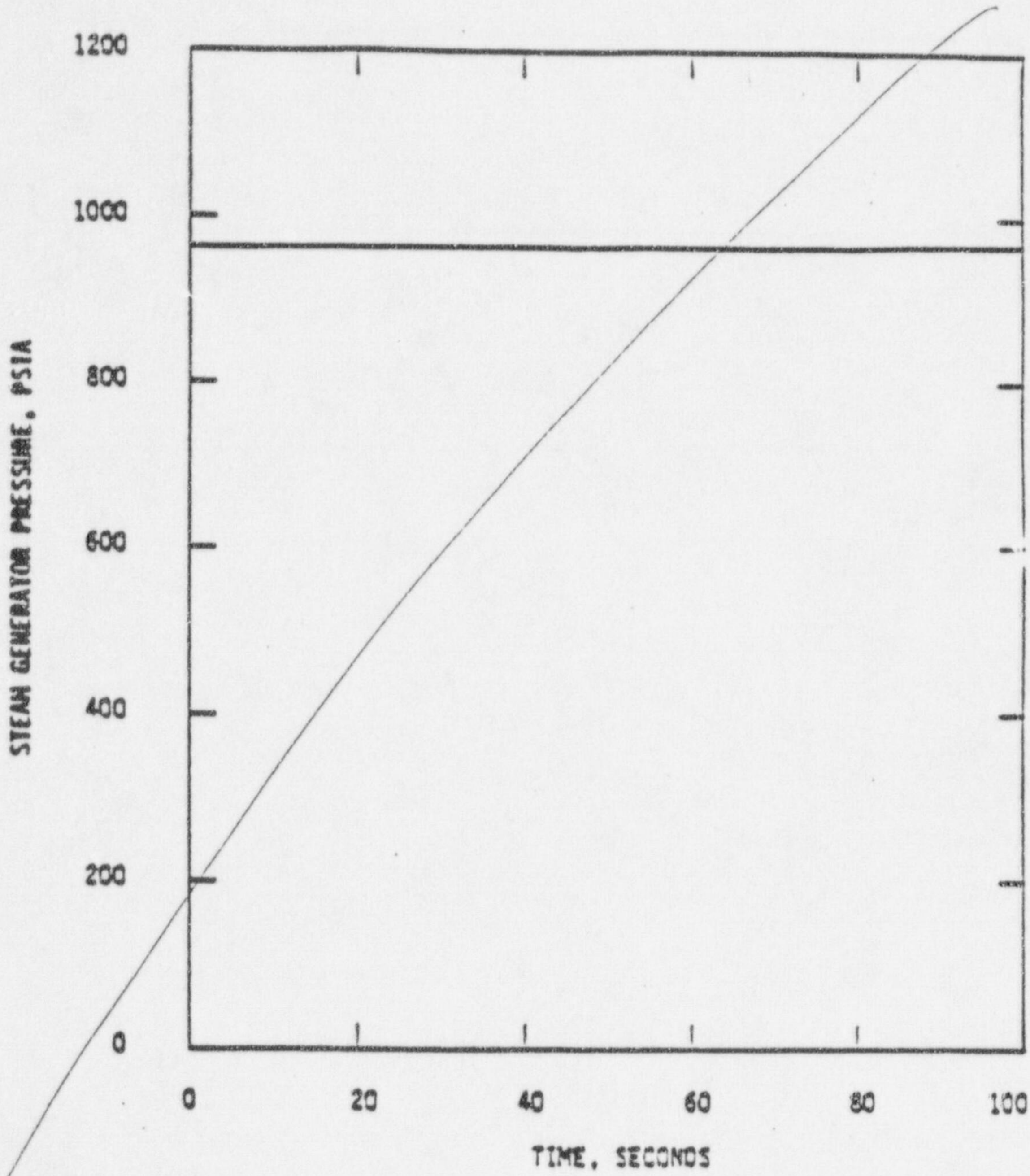

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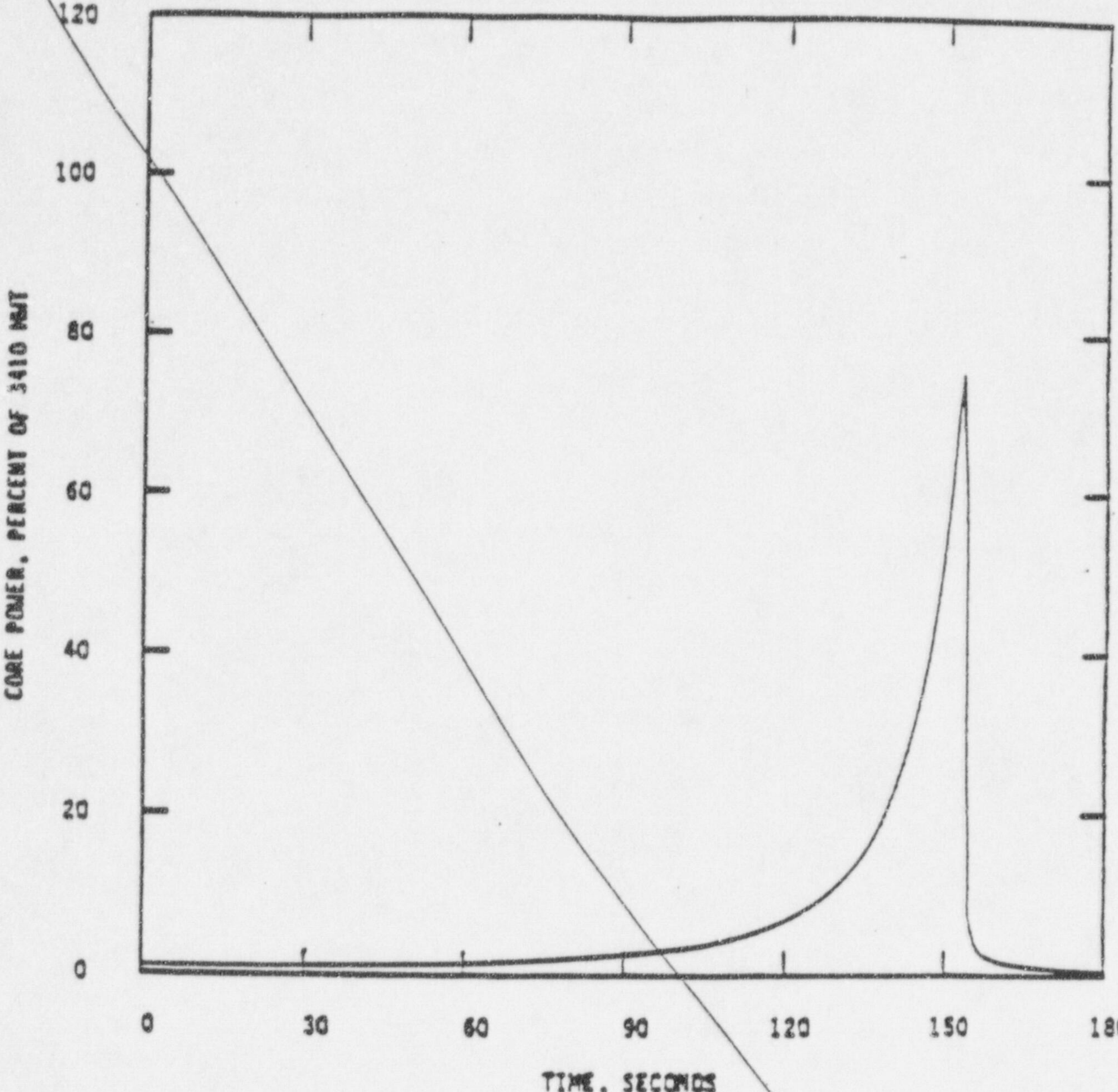
SAN ONOFRE
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL FROM SUBCRTICIAL
STEAM GENERATOR PRESSURE vs. TIME

Figure 15.4-5

2/87 Revision 3

C2-1[illegible]



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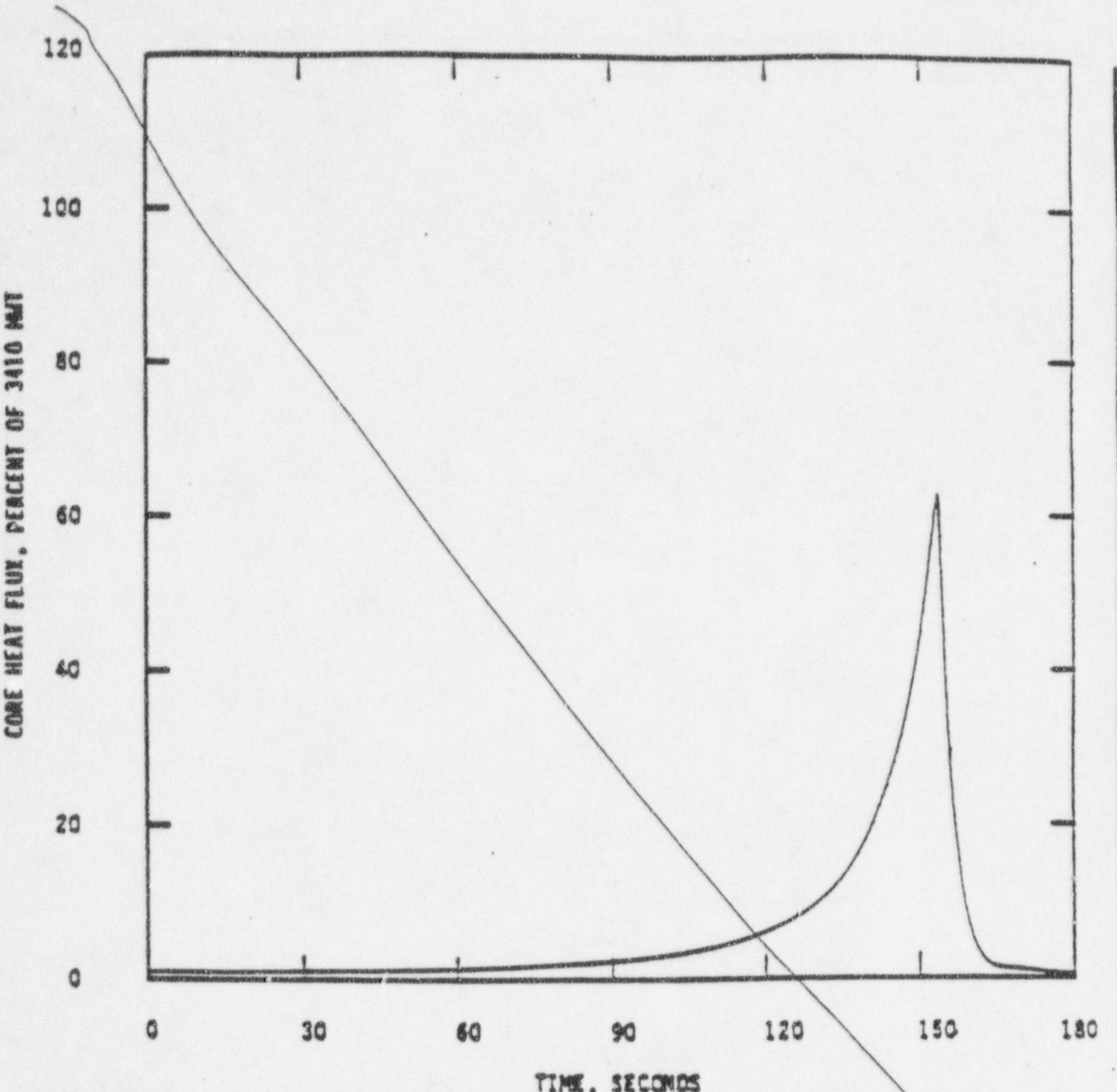
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL AT LOW POWER
CORE POWER vs. TIME

Figure 15.4-5

2/87 Revision 3

C2 5·0



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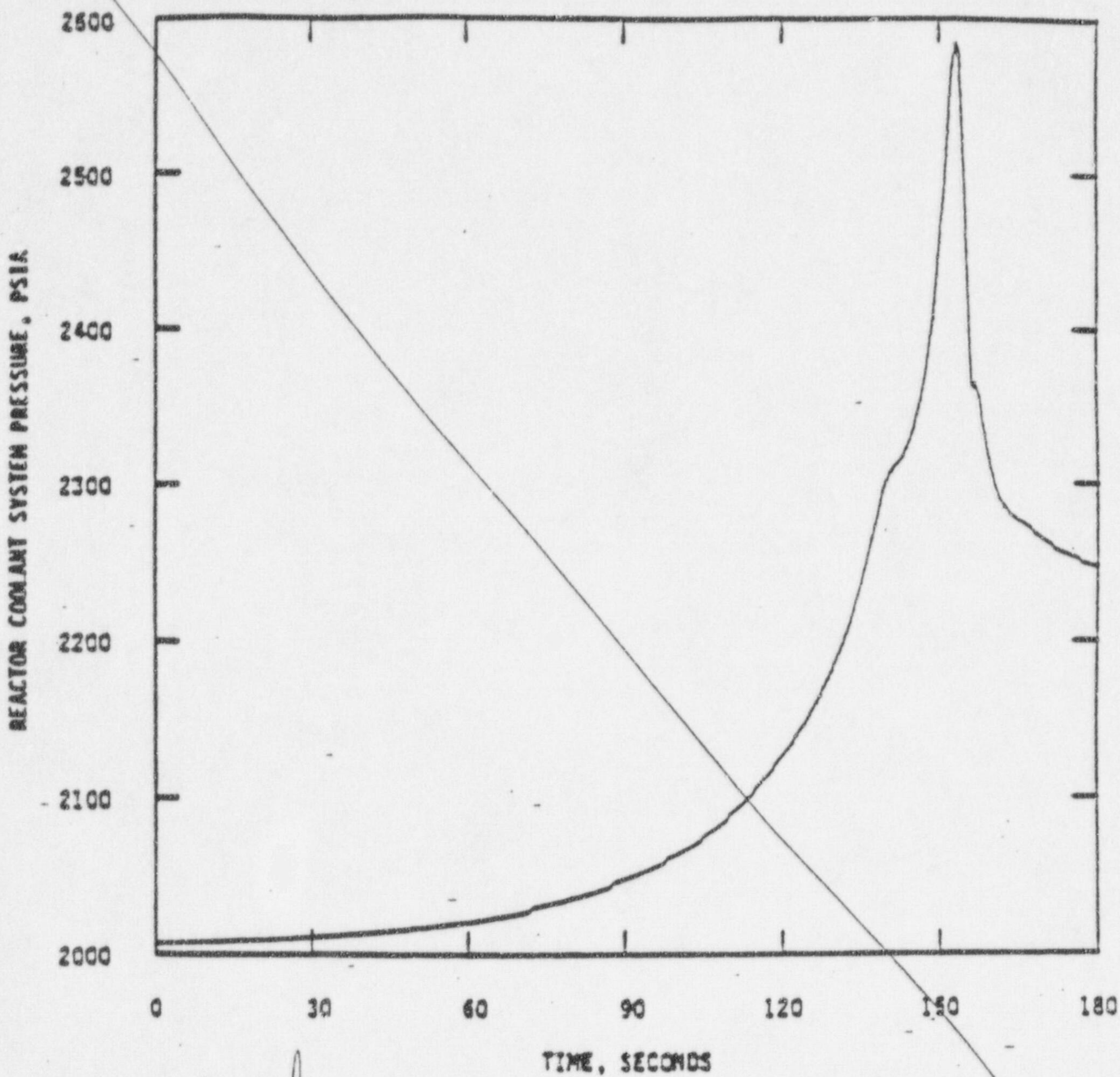
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL AT LOW POWER
CORE HEAT FLUX vs. TIME 3

Figure 15.4-7



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NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL AT LOW POWER
RCS PRESSURE vs. TIME

Figure 15.4-8

2/87 Revision 3

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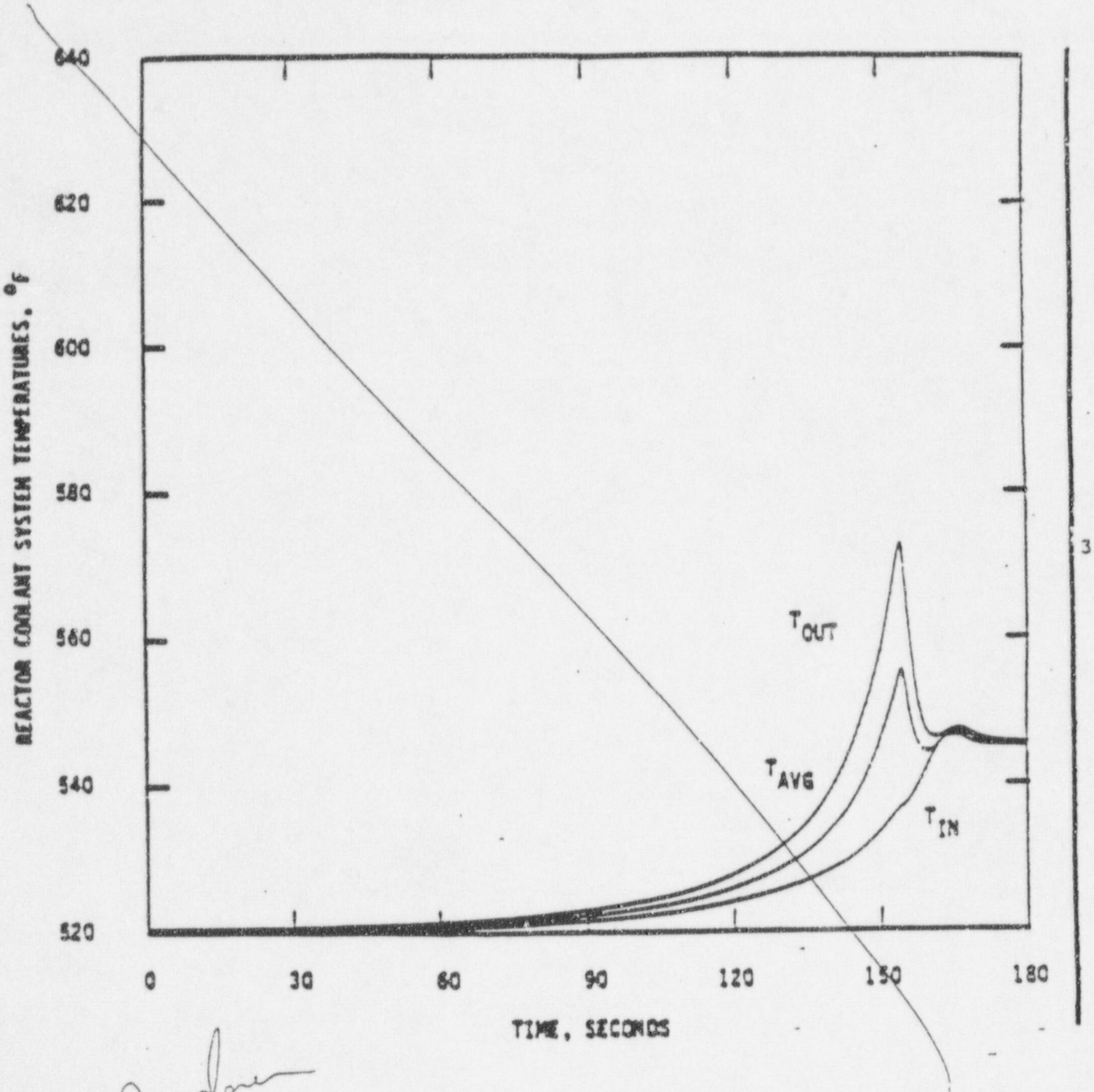

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SAN ONOFRE
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL AT LOW POWER
RCS TEMPERATURES vs. TIME

3

Figure 15.4-9

2/87 Revision 3

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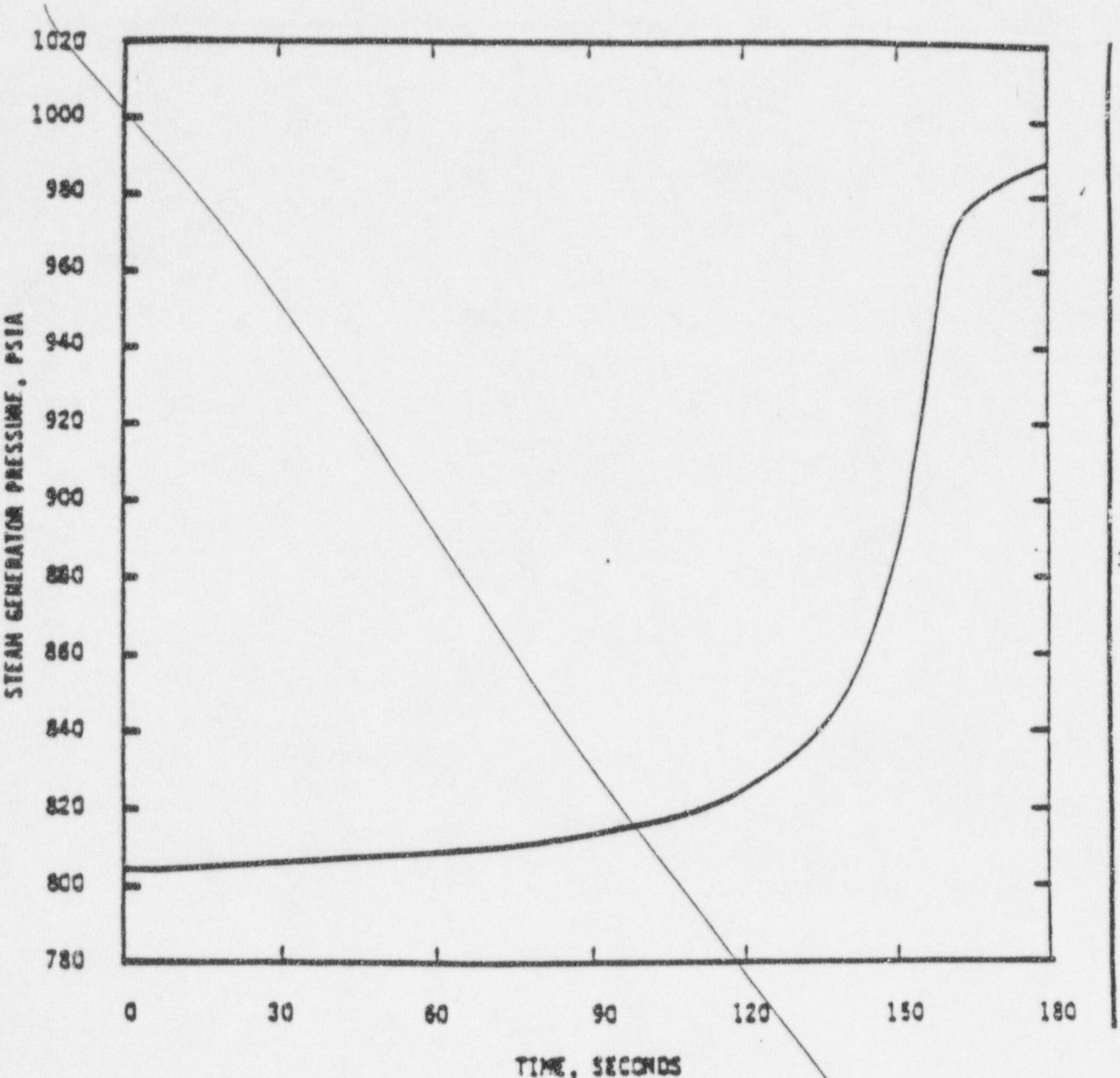

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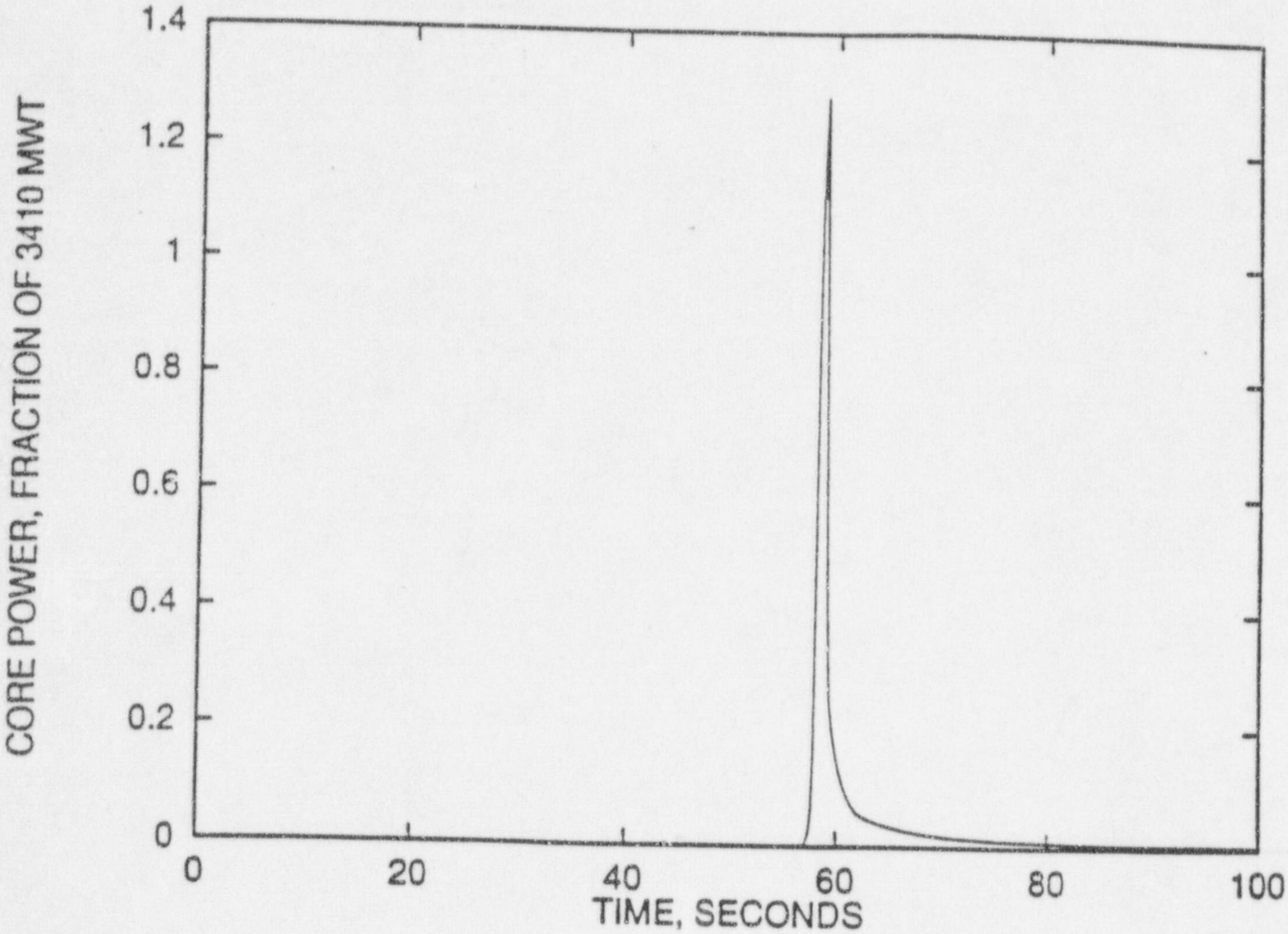
NUCLEAR GENERATING STATION
Units 2 & 3

CEA WITHDRAWAL AT LOW POWER
STEAM GENERATOR PRESSURE vs. TIME 3

Figure 15.4-10

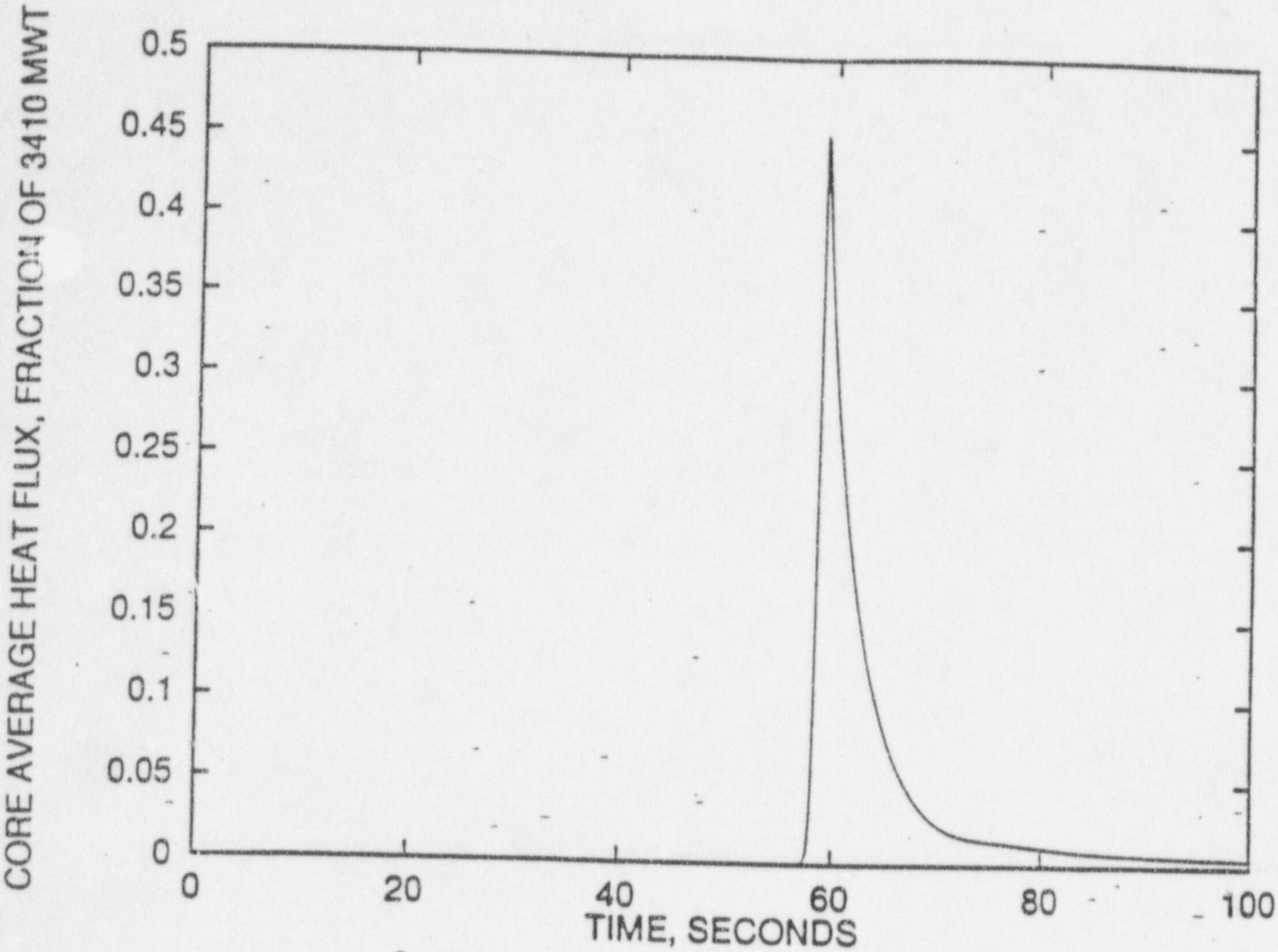
2/87 Revision 3



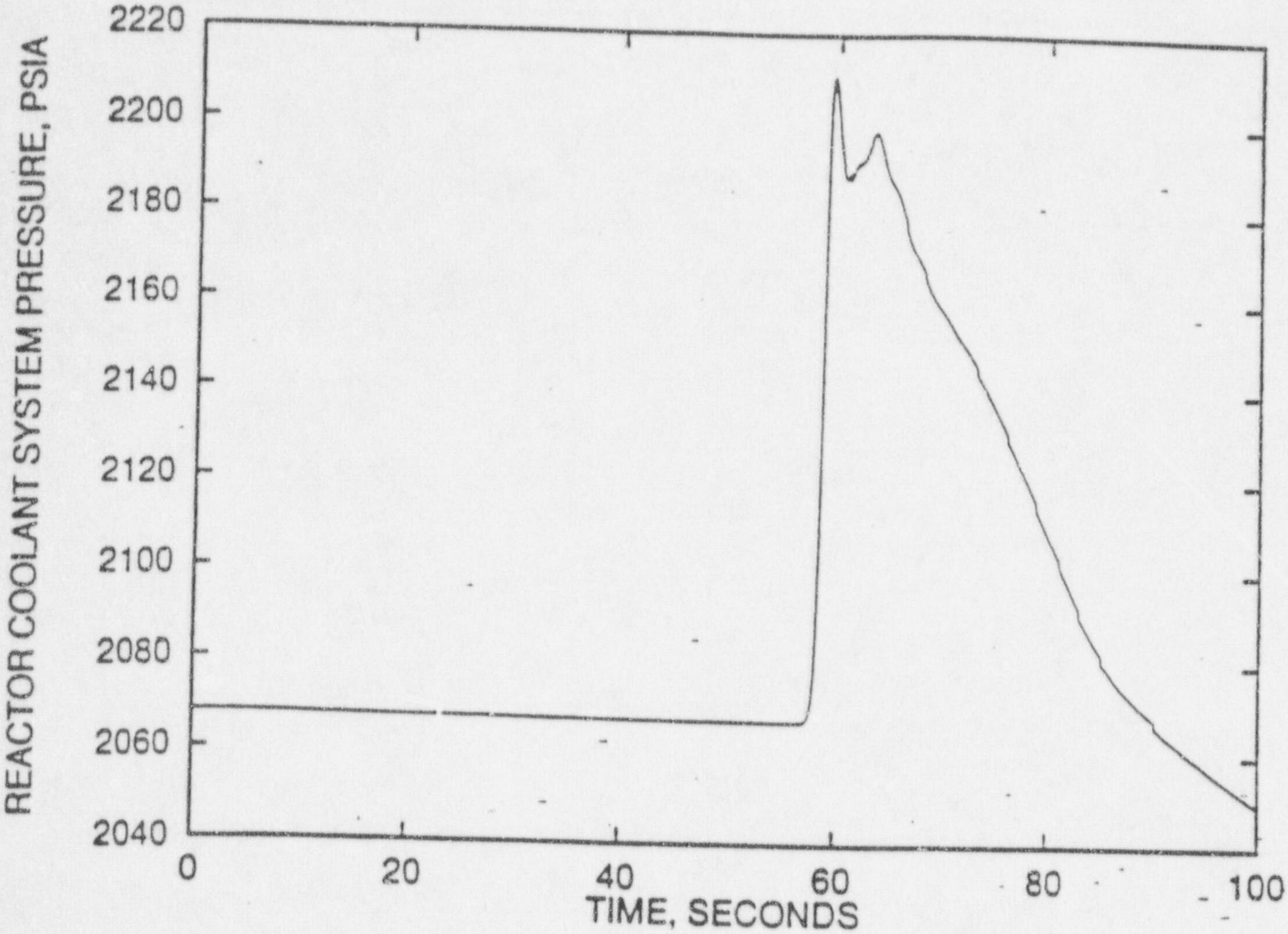
SAN ONOFRE
NUCLEAR GENERATING STATION
UNITS 2 & 3

CEA WITHDRAWAL FROM SUBCRITICAL
POWER FRACTION vs TIME

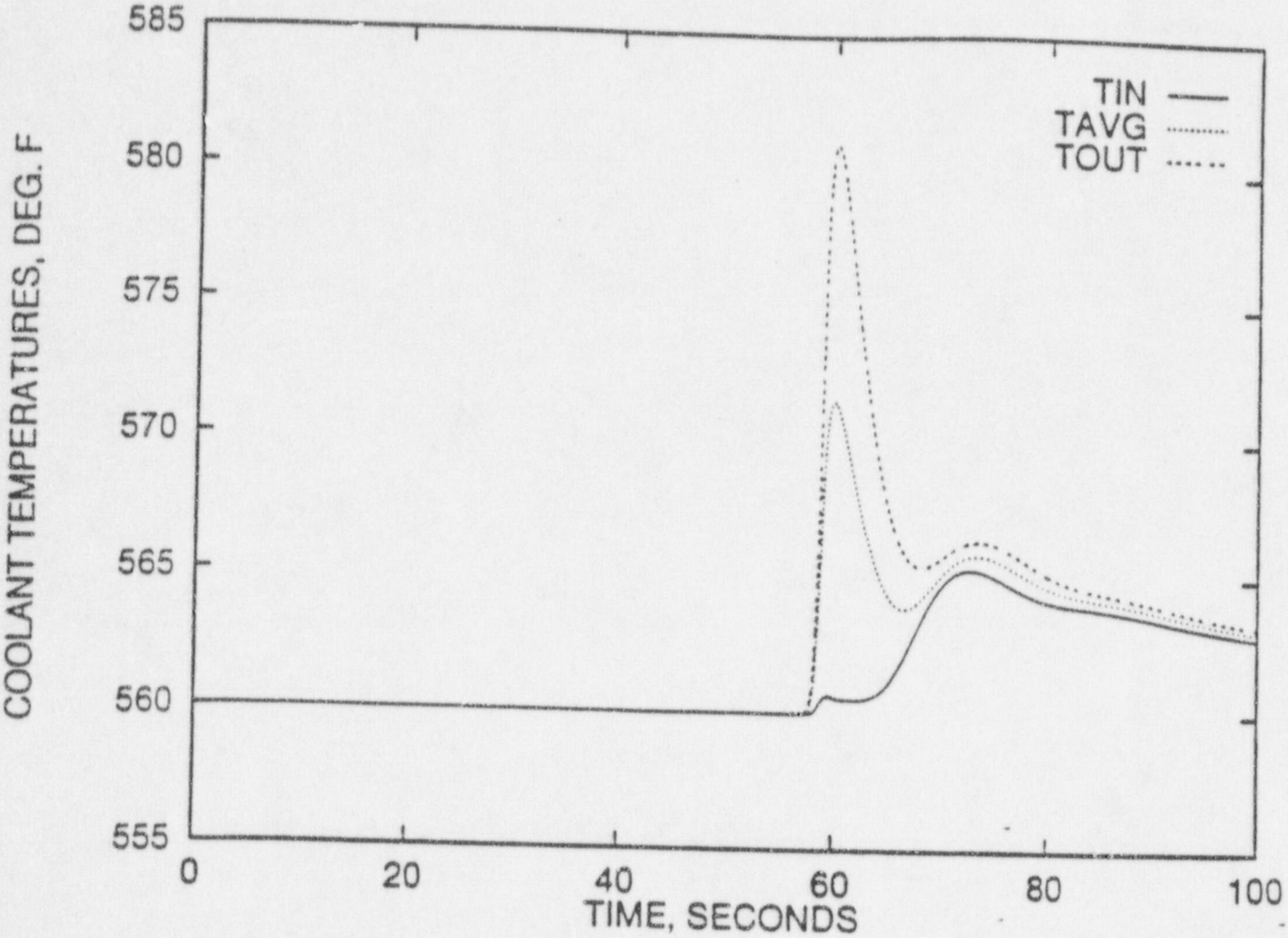
FIGURE 15.4-1



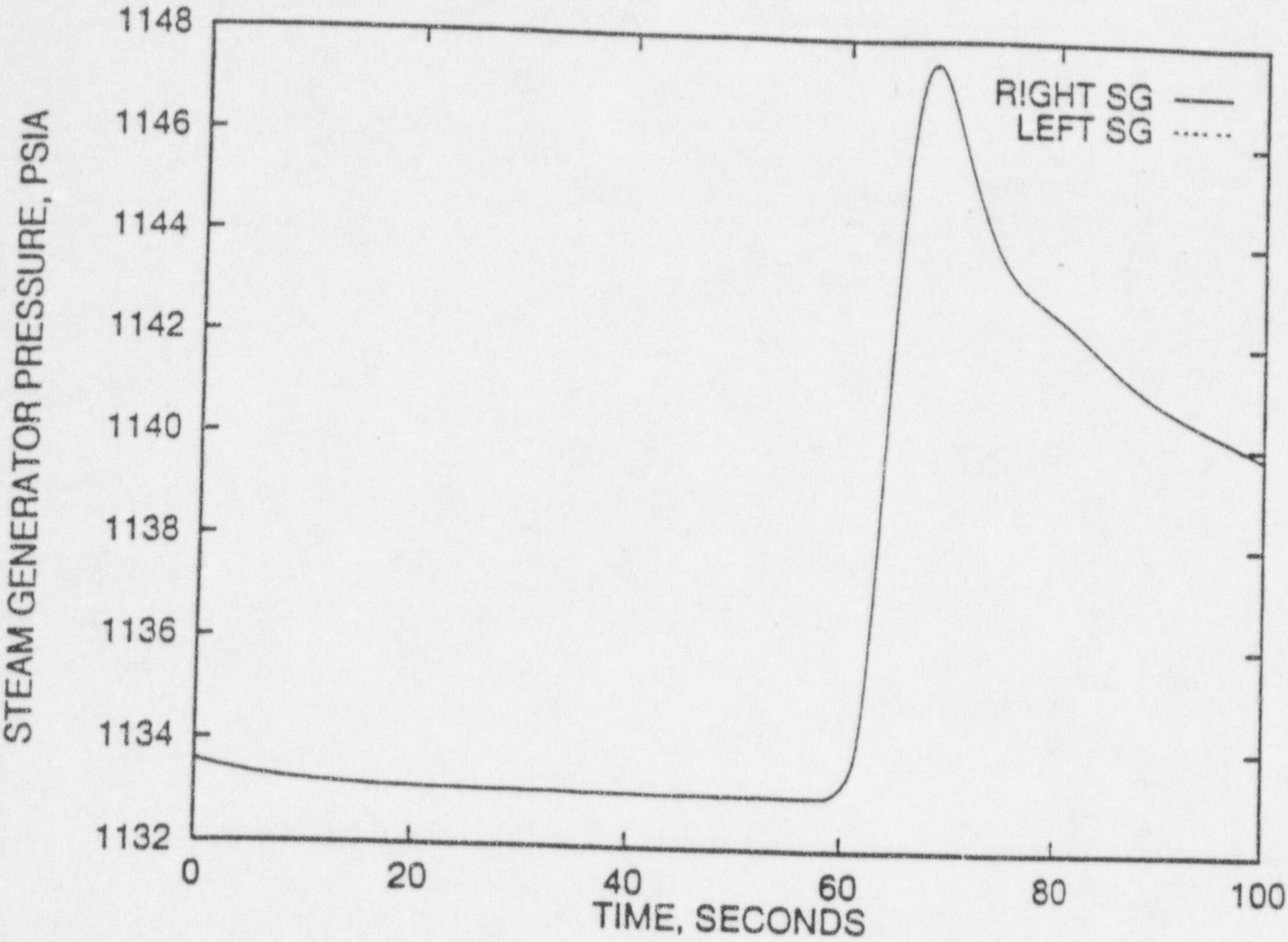
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CEA WITHDRAWAL FROM SUBCRITICAL HEAT FLUX FRACTION vs TIME
FIGURE 15.4-2



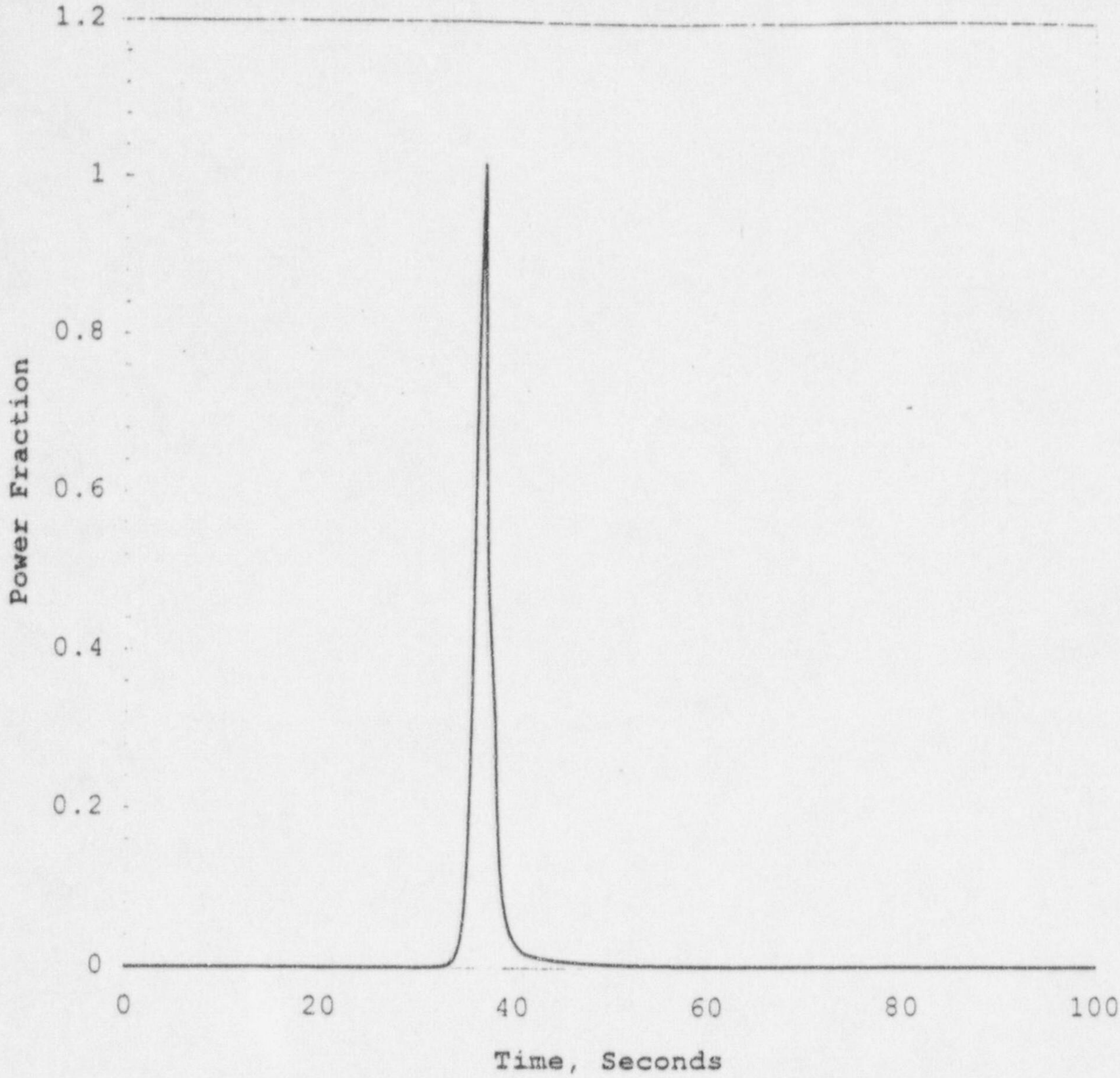
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CEA WITHDRAWAL FROM SUBCRITICAL RCS PRESSURE vs TIME
FIGURE 15.4-3



SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CEA WITHDRAWAL FROM SUBCRITICAL RCS TEMPERATURES vs TIME
FIGURE 15.4-4



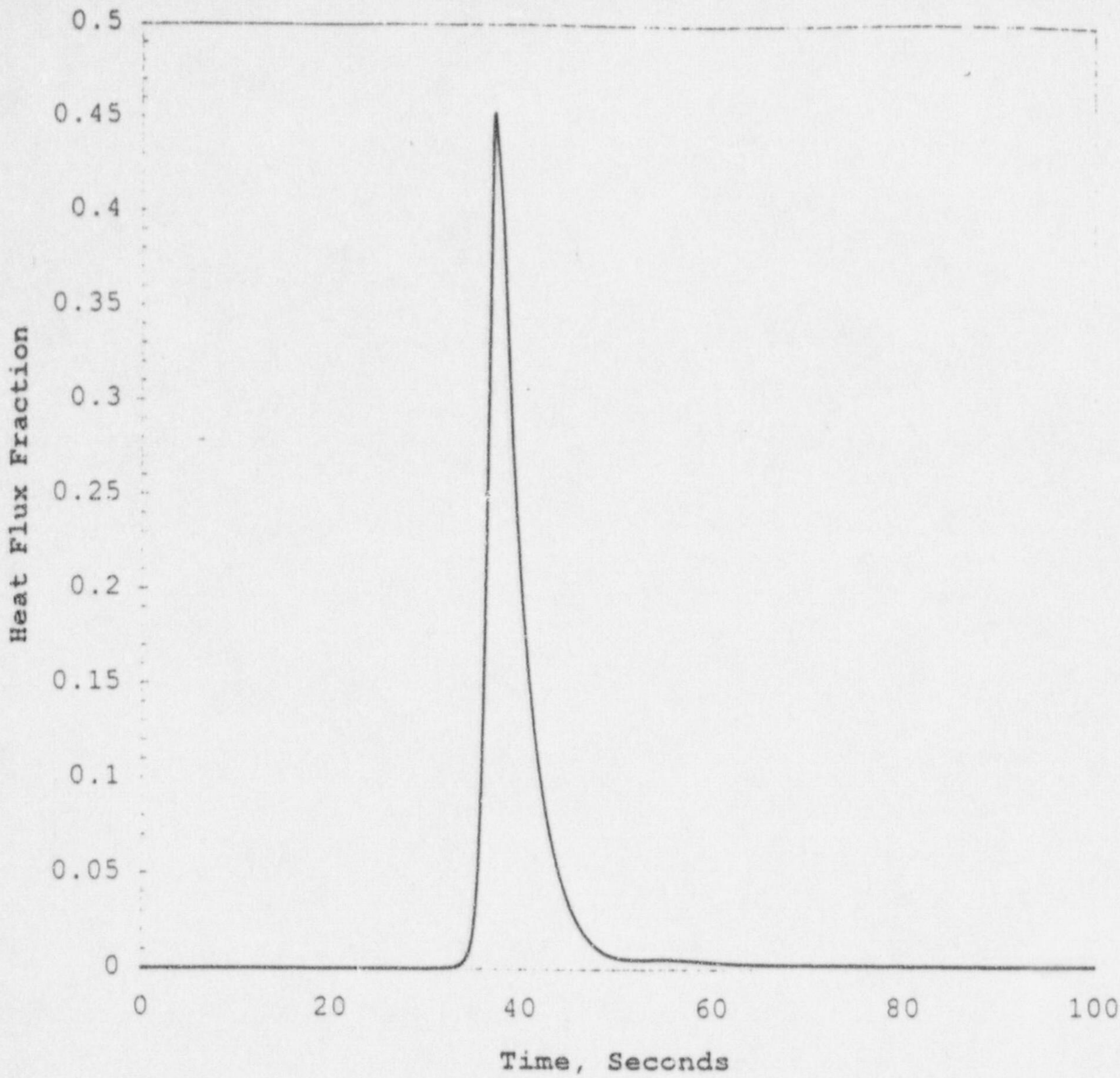
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CEA WITHDRAWAL FROM SUBCRITICAL STEAM GENERATOR PRESSURE vs TIME
FIGURE 15.4-5



SAN ONOFRE
NUCLEAR GENERATING STATION
UNITS 2 & 3

CEA WITHDRAWAL at LOW POWER
POWER FRACTION vs TIME

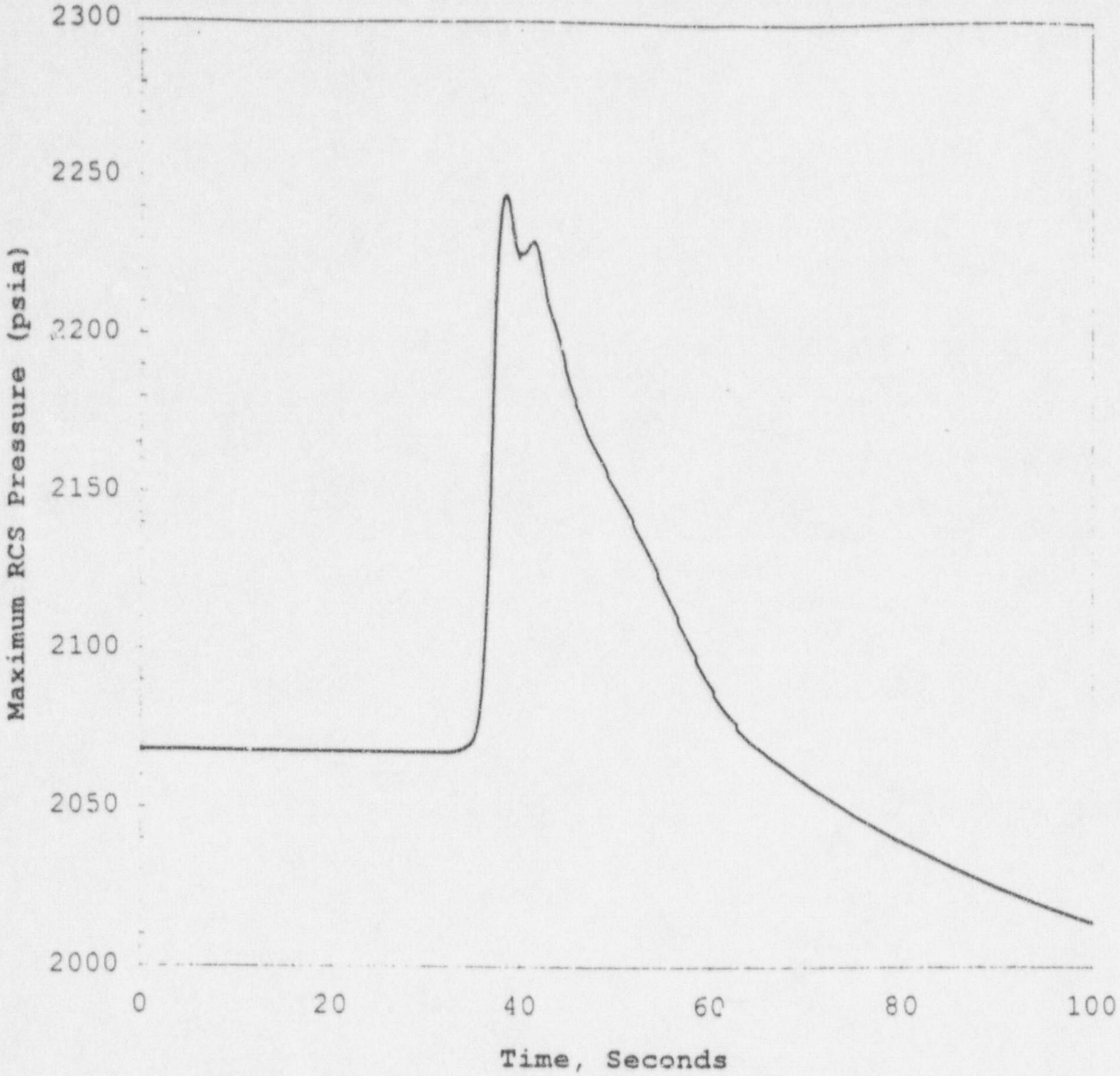
FIGURE 15.4-6



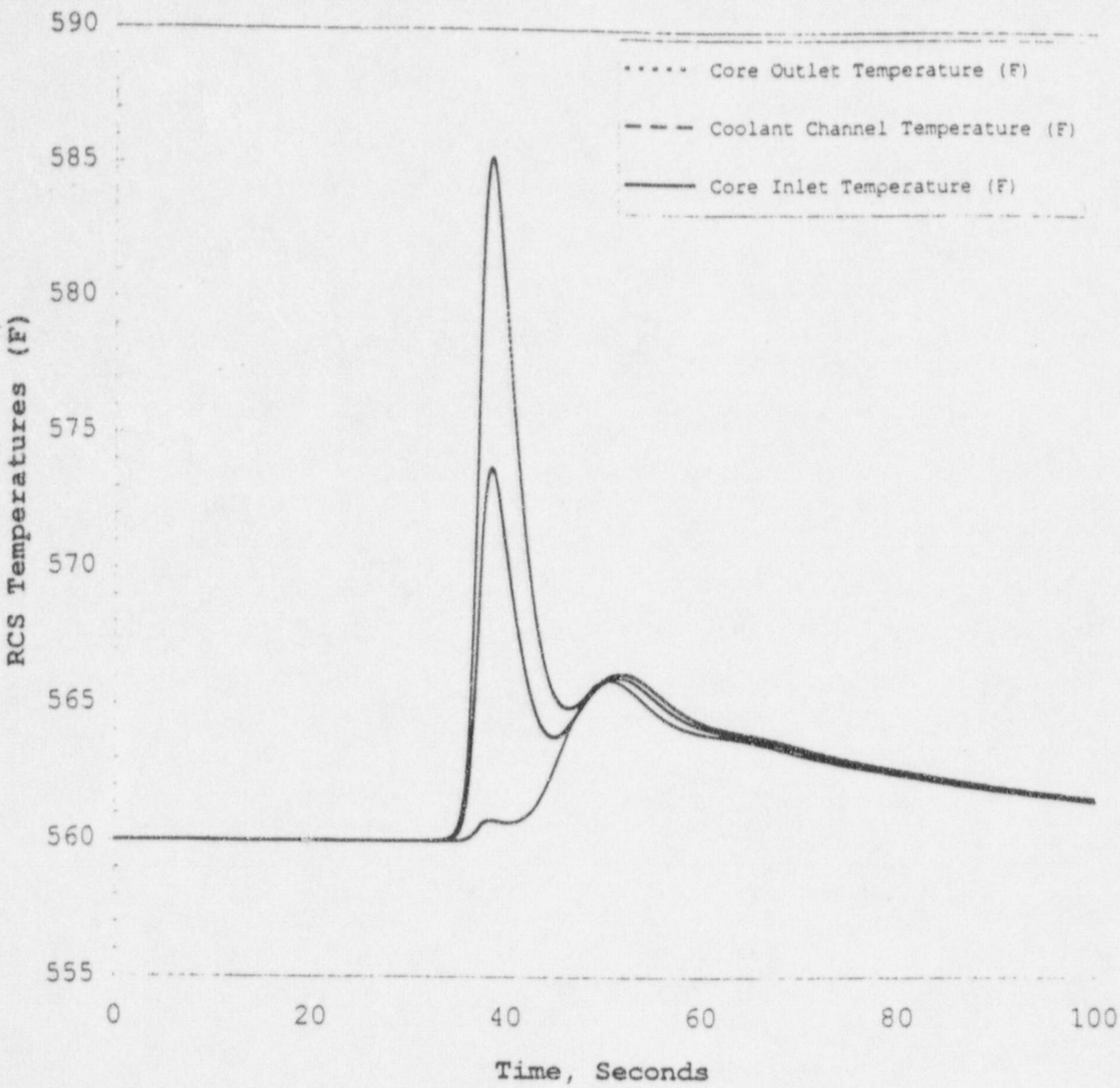
SAN ONOFRE
NUCLEAR GENERATING STATION
UNITS 2 & 3

CEA WITHDRAWAL at LOW POWER
HEAT FLUX FRACTION vs TIME

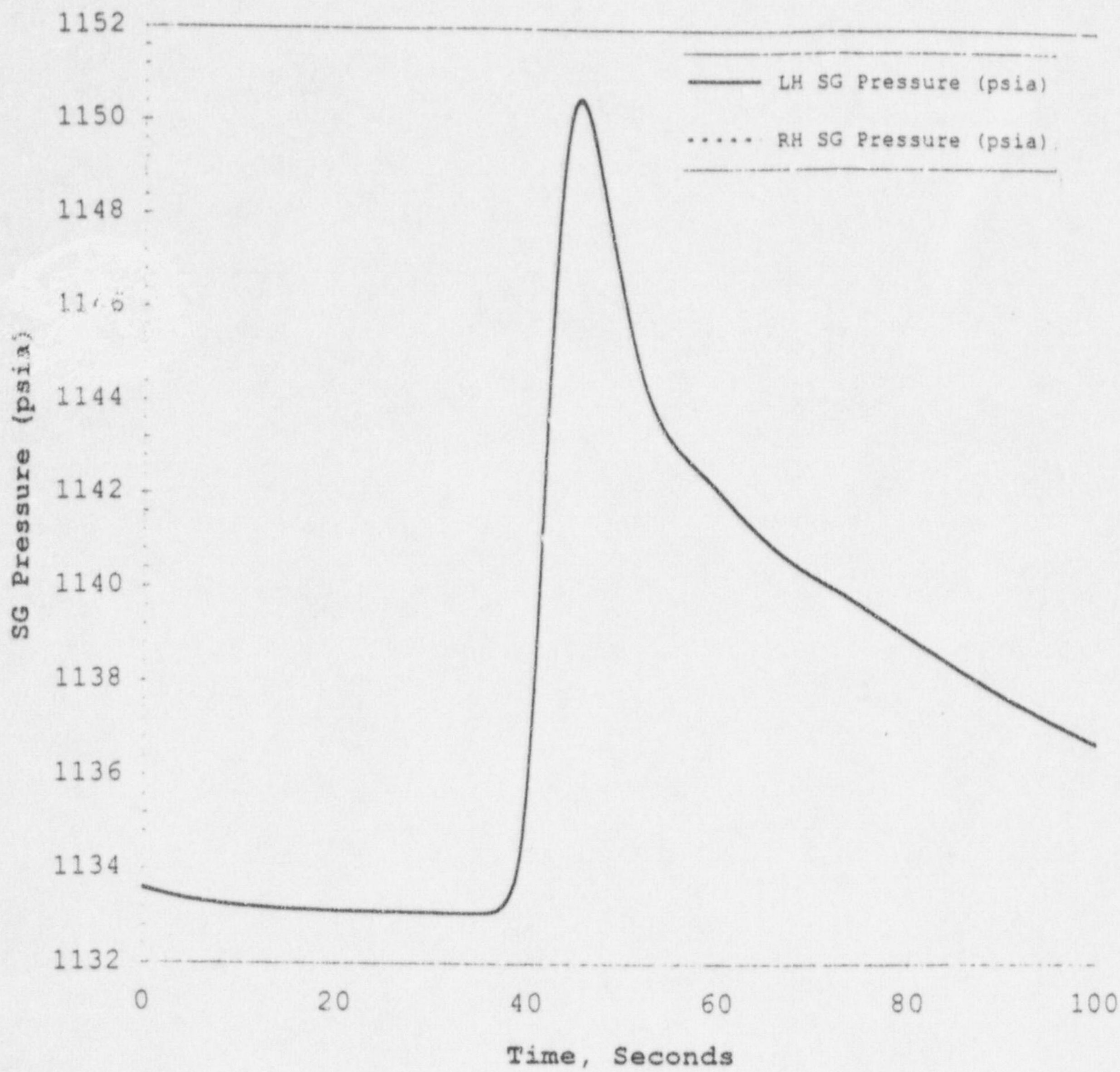
FIGURE 15.4-7



SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CEA WITHDRAWAL at LOW POWER RCS PRESSURE vs TIME
FIGURE 15.4-8



SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CFA WITHDRAWAL at LOW POWER RCS TEMPERATURES vs TIME
FIGURE 15.4-9



SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
CEA WITHDRAWAL at LOW POWER STEAM GENERATOR PRESSURE vs TIME
FIGURE 15.4-10