

PVNGS UNIT 1

**MARKED UP TECHNICAL SPECIFICATIONS
TO SUPPORT NRC GENERIC LETTER 88-16**

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P PDR

1. *Phragmites australis* (Cav.) Trin. ex Steud.
 2. *Scirpus americanus* (L.) Link.
 3. *Eleocharis acicularis* (L.) Rostk Schmidt
 4. *Sagittaria arifolia* (L.) Link.
 5. *Alisma plantaginifolia* (L.) Rostk Schmidt
 6. *Sparganium angustifolium* Michx.
 7. *Najas* sp.
 8. *Chara* sp.
 9. *Utricularia* sp.
 10. *Hydrocotyle* sp.
 11. *Salvinia* sp.
 12. *Wolffia* sp.
 13. *Elodea canadensis* (Mill.) Rostk Schmidt
 14. *Hydrilla verticillata* (L.) Rostk Schmidt
 15. *Valoniopsis spiralis* (L.) Rostk Schmidt
 16. *Myriophyllum spicatum* (L.) Rostk Schmidt
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 170. *Hydrocotyle* sp.
 171. *Salvinia* sp.
 172. *Wolffia* sp.<

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DEFINITIONS

DOSE EQUIVALENT I-131

INSERT 1

1.10 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134 and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites."

\bar{E} - AVERAGE DISINTEGRATION ENERGY

1.11 \bar{E} shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half-lives greater than 15 minutes, making up at least 95% of the total noniodine activity in the coolant.

ENGINEERED SAFETY FEATURES RESPONSE TIME

1.12 The ENGINEERED SAFETY FEATURES RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays where applicable.

FREQUENCY NOTATION

1.13 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

GASEOUS RADWASTE SYSTEM

1.14 A GASEOUS RADWASTE SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

IDENTIFIED LEAKAGE

1.15 IDENTIFIED LEAKAGE shall be:

- a. Leakage into closed systems, other than reactor coolant pump controlled bleed-off flow, such as pump seal or valve packing leaks that are captured and conducted to a sump or collecting tank, or
- b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or
- c. Reactor Coolant System leakage through a steam generator to the secondary system.

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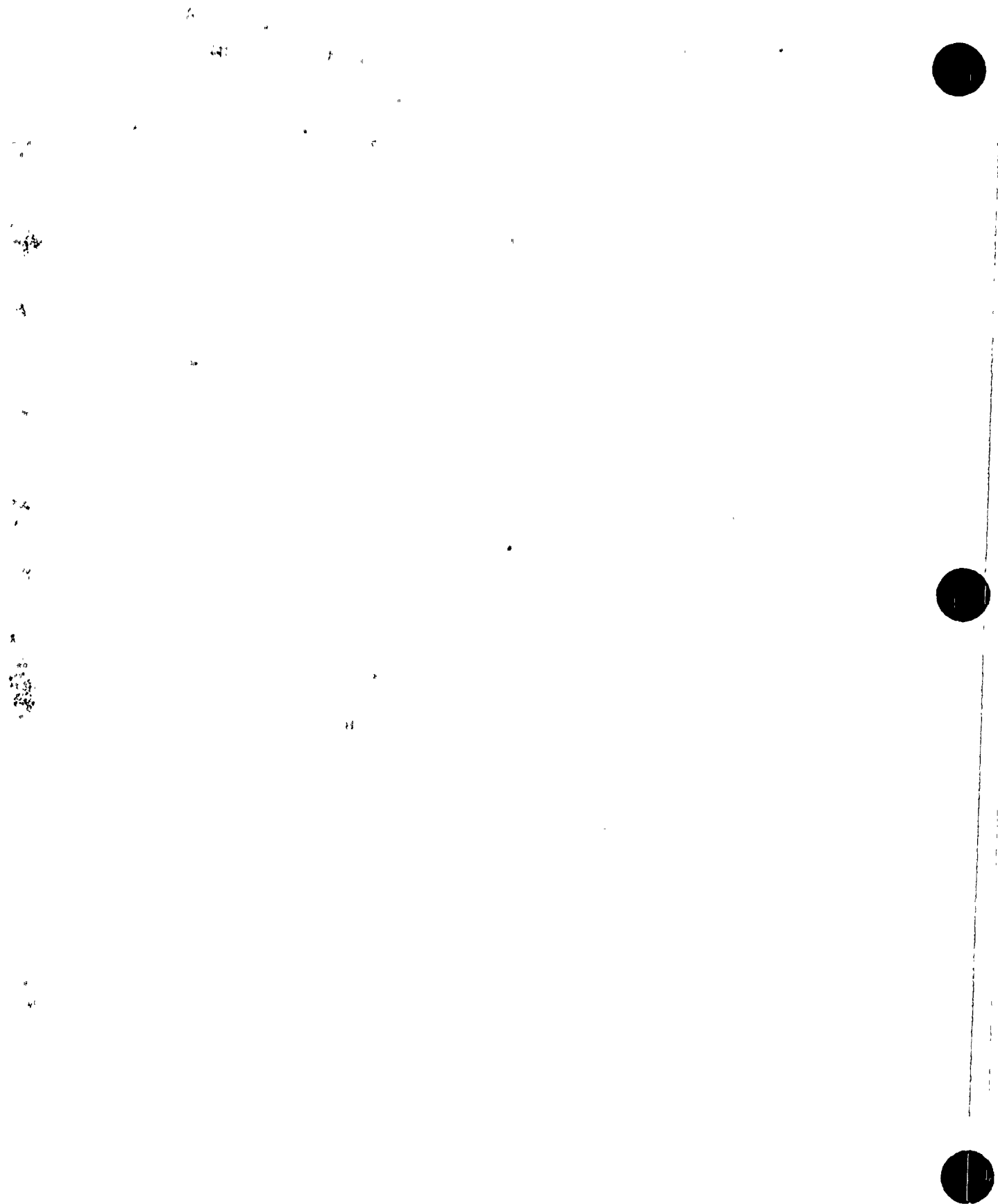
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INSERT 1

CORE OPERATING LIMITS REPORT

1.9a The CORE OPERATING LIMITS REPORT is the unit-specific document that provides core operating limits for the current operating reload cycle. These cycle-specific core operating limits shall be determined for each reload cycle in accordance with Technical Specification 6.9.1. Plant operation within these operating limits is addressed in individual specifications.



REACTIVITY CONTROL SYSTEMS

SHUTDOWN MARGIN - K_{N-1} - ANY CEA WITHDRAWN

LIMITING CONDITION FOR OPERATION

3.1.1.2

specified in the CORE OPERATING LIMITS REPORT

- a. The SHUTDOWN MARGIN shall be greater than or equal to that shown in Figure 3.1-1A, and
- b. For T_{cold} less than or equal to 500°F, K_{N-1} shall be less than 0.99.

APPLICABILITY: MODES 1, 2*, 3*, 4*, and 5* with any full-length CEA fully or partially withdrawn.

ACTION:

specified in the CORE OPERATING LIMITS REPORT

- a. With the SHUTDOWN MARGIN less than that in Figure 3.1-1A, immediately initiate and continue boration at greater than or equal to 26 gpm to the reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored, and
- b. With T_{cold} less than or equal to 500°F and K_{N-1} greater than or equal to 0.99, immediately vary CEA positions and/or initiate and continue boration at greater than or equal to 26 gpm to the reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required K_{N-1} is restored.

SURVEILLANCE REQUIREMENTS

specified in the CORE OPERATING LIMITS REPORT

4.1.1.2.1 With any full-length CEA fully or partially withdrawn, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that in Figure 3.1-1A:

- a. Within 1 hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable as a result of excessive friction or mechanical interference or known to be untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

* See Special Test Exceptions 3.10.1 and 3.10.9



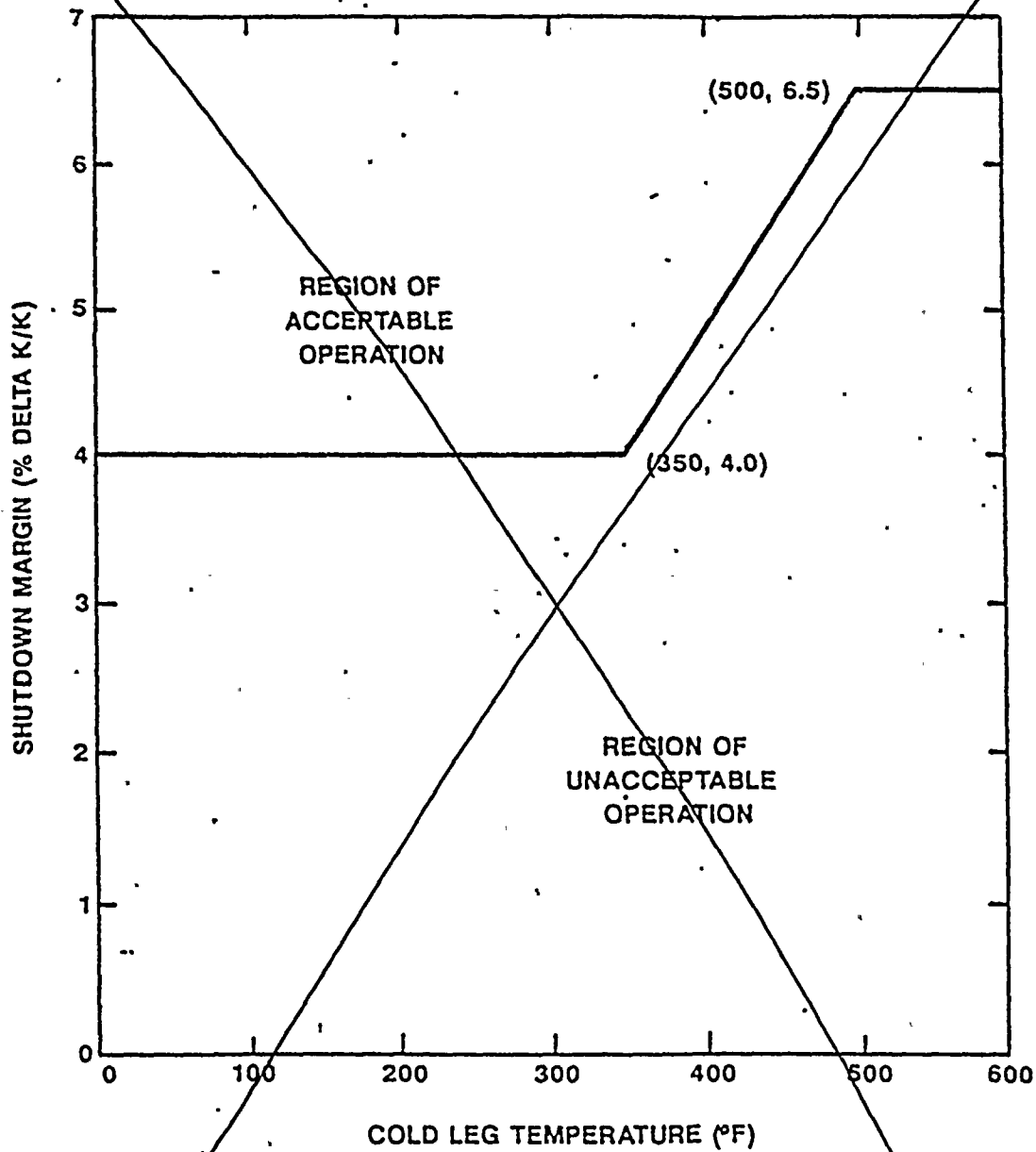
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FIGURE 3.1-1A
SHUTDOWN MARGIN vs. COLD LEG TEMPERATURE

REACTIVITY CONTROL SYSTEMS

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

specified in the CORE OPERATING LIMITS REPORT
 3.1.1.3 The moderator temperature coefficient (MTC) shall be within the area of Acceptable Operation ~~shown on Figure 3.1-1.~~

APPLICABILITY: MODES 1 and 2*#.

ACTION: specified in the CORE OPERATING LIMITS REPORT
 With the moderator temperature coefficient outside the area of Acceptable Operation ~~shown on Figure 3.1-1,~~ be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

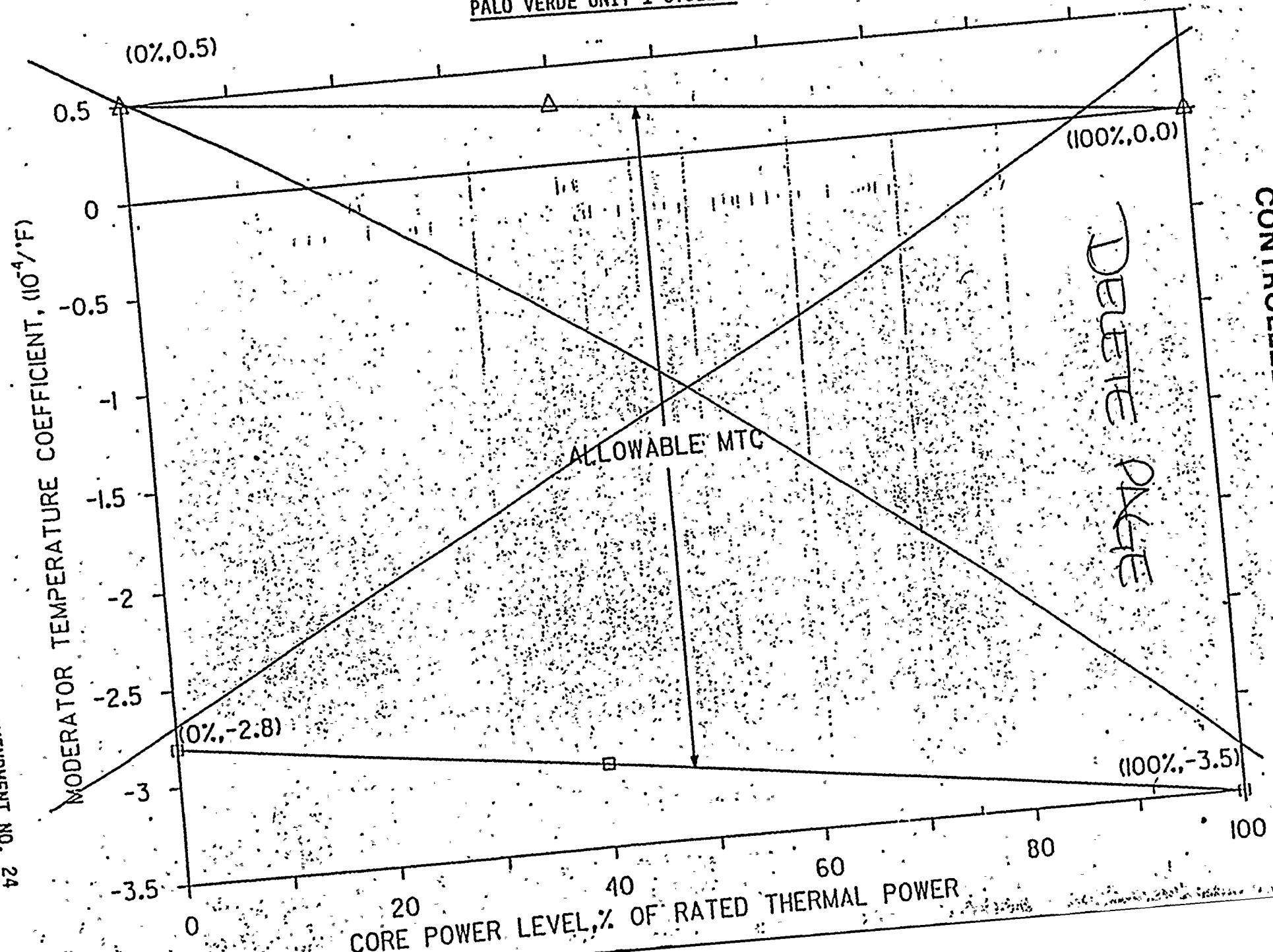
4.1.1.3.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the ~~above limits~~ specified in the CORE OPERATING LIMITS REPORT.
 4.1.1.3.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

- a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.
- b. At any THERMAL POWER, within 7 EFPD after reaching a core average exposure of 40 EFPD burnup into the current cycle.
- c. At any THERMAL POWER, within 7 EFPD after reaching a core average exposure equivalent to two-thirds of the expected current cycle end-of-cycle core average burnup.

*With K_{eff} greater than or equal to 1.0.

#See Special Test Exception 3.10.2.

FIG. 1-1
 ALLOWABLE MTC MODES 1 AND 2
 PALO VERDE UNIT 1 CYCLE 2



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PALO VERDE - UNIT 1

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AMENDMENT NO. 24

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REACTIVITY CONTROL SYSTEMS

MINIMUM TEMPERATURE FOR CRITICALITY

LIMITING CONDITION FOR OPERATION

3.1.1.4 The Reactor Coolant System lowest operating loop temperature (T_{cold}) shall be greater than or equal to 552°F.

APPLICABILITY: MODES 1 and 2#.

ACTION:

With a Reactor Coolant System operating loop temperature (T_{cold}) less than 552°F, restore T_{cold} to within its limit within 15 minutes or be in HOT STANDBY within the next 15 minutes.

SURVEILLANCE REQUIREMENTS

4.1.1.4 The Reactor Coolant System temperature (T_{cold}) shall be determined to be greater than or equal to 552°F:

- a. Within 15 minutes prior to achieving reactor criticality, and
- b. At least once per 30 minutes when the reactor is critical and the Reactor Coolant System T_{cold} is less than 557°F.

#With K_{eff} greater than or equal to 1.0.

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REACTIVITY CONTROL SYSTEMS

3/4.1.2 BORATION SYSTEMS

FLOW PATHS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.1 As a minimum, one of the following boron injection flow paths shall be OPERABLE:

- a. If only the spent fuel pool in Specification 3.1.2.5a. is OPERABLE, a flow path from the spent fuel pool via a gravity feed connection and a charging pump to the Reactor Coolant System.
- b. If only the refueling water tank in Specification 3.1.2.5b. is OPERABLE, a flow path from the refueling water tank via either a charging pump, a high pressure safety injection pump, or a low pressure safety injection pump to the Reactor Coolant System.

APPLICABILITY: MODES 5 and 6.

ACTION:

With none of the above flow paths OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.1 At least one of the above required flow paths shall be demonstrated OPERABLE at least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

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REACTIVITY CONTROL SYSTEMS

FLOW PATHS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.2 At least two of the following three boron injection flow paths shall be OPERABLE:

- a. A gravity feed flow path from either the refueling water tank or the spent fuel pool through CH-536 (RWT Gravity Feed Isolation Valve) and a charging pump to the Reactor Coolant System,
- b. A gravity feed flow path from the refueling water tank through CH-327 (RWT Gravity Feed/Safety Injection System Isolation Valve) and a charging pump to the Reactor Coolant System,
- c. A flow path from either the refueling water tank or the spent fuel pool through CH-164 (Boric Acid Filter Bypass Valve), utilizing gravity feed and a charging pump to the Reactor Coolant System.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one of the above required boron injection flow paths to the Reactor Coolant System OPERABLE, restore at least two boron injection flow paths to the Reactor Coolant System to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore at least two flow paths to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.2.1 At least two of the above required flow paths shall be demonstrated OPERABLE:

- a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.
- b. At least once per 18 months when the Reactor Coolant System is at normal operating pressure by verifying that the flow path required by Specification 3.1.2.2 delivers at least 26 gpm for 1 charging pump and 68 gpm for two charging pumps to the Reactor Coolant System.

4.1.2.2.2 The provisions of Specification 4.0.4 are not applicable for entry into Mode 3 or Mode 4 to perform the surveillance testing of Specification 4.1.2.2.1.b provided the testing is performed within 24 hours after achieving normal operating pressure in the reactor coolant system.

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REACTIVITY CONTROL SYSTEMS

CHARGING PUMPS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.3 At least one charging pump or one high pressure safety injection pump or one low pressure safety injection pump in the boron injection flow path required OPERABLE pursuant to Specification 3.1.2.1 shall be OPERABLE and capable of being powered from an OPERABLE emergency power source.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no charging pump or high pressure safety injection pump or low pressure safety injection pump OPERABLE or capable of being powered from an OPERABLE emergency power source, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.3 No additional Surveillance Requirements other than those required by Specification 4.0.5.

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REACTIVITY CONTROL SYSTEMS

CHARGING PUMPS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.4 At least two charging pumps shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one charging pump OPERABLE, restore at least two charging pumps to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore at least two charging pumps to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.4 No additional Surveillance Requirements other than those required by Specification 4.0.5.

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REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.5 As a minimum, one of the following borated water sources shall be OPERABLE:

- a. The spent fuel pool with:
 1. A minimum borated water volume of 33,500 gallons and
 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 3. A solution temperature between 60°F and 180°F.
- b. The refueling water tank with:
 1. A minimum contained borated water volume of 33,500 gallons and
 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 3. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 5* and 6*.

ACTION:

With no borated water sources OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one borated water source is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

4.1.2.5 The above required borated water sources shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 1. Verifying the boron concentration of the water, and _____
 2. Verifying the contained borated water volume of the refueling water tank or the spent fuel pool.
- b. At least once per 24 hours by verifying the refueling water tank temperature when it is the source of borated water and the outside air temperature is outside the 60°F to 120°F range.
- c. At least once per 24 hours by verifying the spent fuel pool temperature when it is the source of borated water and irradiated fuel is present in the pool.

*See Special Test Exception 3.10.7.

PALO VERDE - UNIT 1

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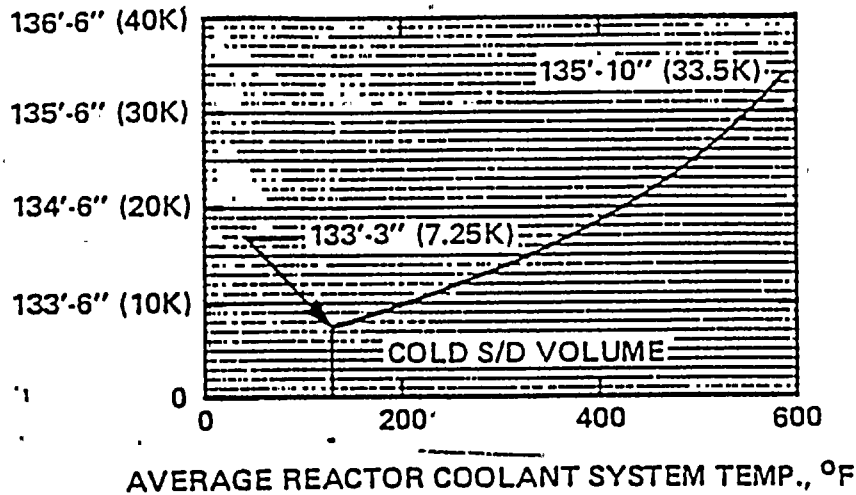
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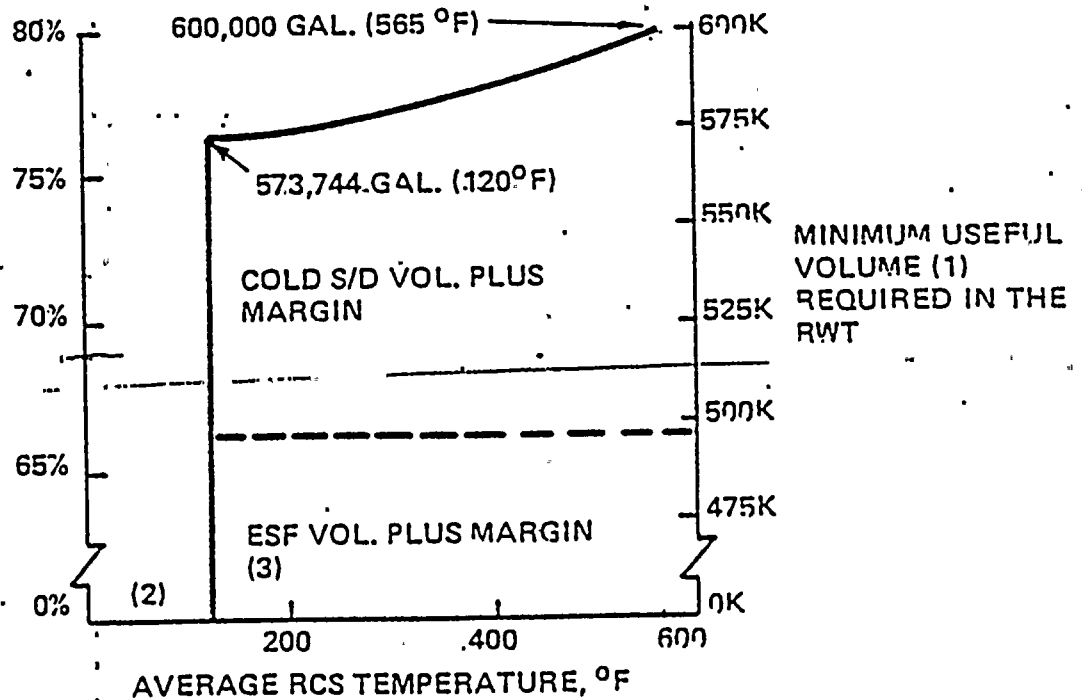
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RWT LEVEL
INSTRUMENT
READING (1)



- (1) THE TANK LEVEL AND VOLUME SHOWN ARE THE USEFUL LEVEL AND VOLUME ABOVE THAT IN THE TANK WHICH IS REQUIRED FOR VORTEX CONSIDERATIONS
- (2) DURING MODE 5 AND 6 ONE OF THESE BORATED SOURCES SHALL CONTAIN A MINIMUM OF 33,500 GALLONS
- (3) THIS VOLUME IS NOT REQUIRED DURING MODE 6

FIGURE 3.1-X1

MINIMUM BORATED WATER VOLUMES

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.6 Each of the following borated water sources shall be OPERABLE:

- a. The spent fuel pool with:
 1. A minimum borated water volume as specified in Figure ~~3.1-2~~ ^{3.1-1} and
 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 3. A solution temperature between 60°F and 180°F.
- b. The refueling water tank with:
 1. A minimum contained borated water volume as specified in Figure ~~3.1-2~~ ^{3.1-1}, and
 2. A boron concentration of between 4000 and 4400 ppm of boron, and
 3. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 1, 2,* 3,* and 4*.

ACTION:

- a. With the above required spent fuel pool inoperable, restore the pool to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the above required spent fuel pool to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.
- b. With the refueling water tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.6 Each of the above required borated water sources shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 1. Verifying the boron concentration in the water, and
 2. Verifying the contained borated water volume of the water source.
- b. At least once per 24 hours by verifying the refueling water tank temperature when the outside air temperature is outside the 60°F to 120°F range.
- c. At least once per 24 hours by verifying the spent fuel pool temperature when irradiated fuel is present in the pool.

* See Special Test Exception 3.10.7.

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REACTIVITY CONTROL SYSTEMS

BORON DILUTION ALARMS

LIMITING CONDITION FOR OPERATION

3.1.2.7 Both startup channel high neutron flux alarms shall be OPERABLE.

APPLICABILITY: MODES 3*, 4, 5, and 6.

ACTION:

specified in the CORE OPERATING LIMITS REPORT

- a. With one startup channel high neutron flux alarm inoperable:
 1. Determine the RCS boron concentration when entering MODE 3, 4, 5, or 6 or at the time the alarm is determined to be inoperable. From that time, the RCS boron concentration shall be determined at the applicable monitoring frequency ~~in Tables 3.1-1 through 3.1-5~~ by either boronmeter or RCS sampling**.
- b. With both startup channel high neutron flux alarms inoperable:
 1. Determine the RCS boron concentration by either boronmeter and RCS sampling** or by independent collection and analysis of two RCS samples when entering Mode 3, 4, or 5 or at the time both alarms are determined to be inoperable. From that time, the RCS boron concentration shall be determined at the applicable monitoring frequency ~~in Tables 3.1-1 through 3.1-5~~, as applicable, by either boronmeter and RCS sampling** or by collection and analysis of two independent RCS samples. If redundant determination of RCS boron concentration cannot be accomplished immediately, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until the method for determining and confirming RCS boron concentration is restored.
 2. When in MODE 5 with the RCS level below the centerline of the hotleg or MODE 6, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one startup channel high neutron flux alarm is restored to OPERABLE status.
- c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.2.7 Each startup channel high neutron flux alarm shall be demonstrated OPERABLE by performance of:

* Within 1 hour after the neutron flux is within the startup range following a reactor shutdown.

**With one or more reactor coolant pumps (RCP) operating the sample should be obtained from the hot leg. With no RCP operating, the sample should be obtained from the discharge line of the low pressure safety injection (LPSI) pump operating in the shutdown cooling mode.

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REACTIVITY CONTROL SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

a. A CHANNEL CHECK:

1. At least once per 12 hours.
2. When initially setting setpoints at the following times:
 - a) One hour after a reactor trip.
 - b) After a controlled reactor shutdown: Within 1 hour after the neutron flux is within the startup range in MODE 3.

b. A CHANNEL FUNCTIONAL TEST every 31 days of cumulative operation during shutdown.

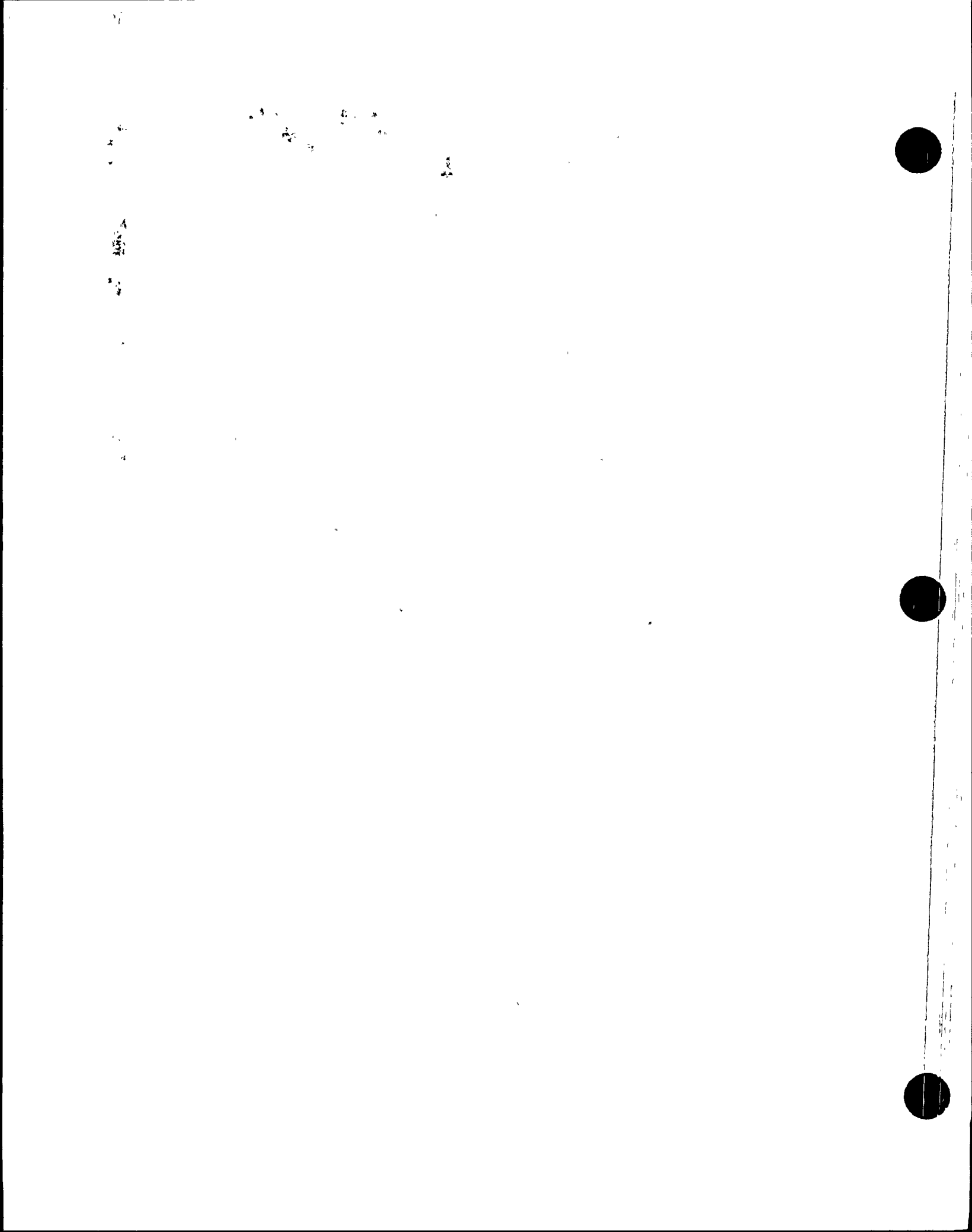


TABLE 3.1-1

~~REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $k_{eff} > 0.98$~~

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	1 hour	ONA	ONA
4 not on SCS	12 hours	1 hour	ONA	ONA
5 not on SCS	8 hours	1 hour	ONA	ONA
4 & 5 on SCS	ONA	ONA	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation not allowed

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TABLE 3.1-2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
 DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT
 OPERATIONAL MODES FOR $0.98 > K_{eff} > 0.97$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	2.0 hours	0.5 hours	ONA
4 not on SCS	12 hours	2.5 hours	1 hour	0.5 hours
5 not on SCS	8 hours	2.5 hours	1 hour	0.5 hours
4 & 5 on SCS	8 hours	0.5 hours	ONA	ONA

Notes: SCS = Shutdown Cooling System
 ONA = Operation not allowed

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TABLE 3.1-3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $0.97 > K_{eff} > 0.96$

OPERATIONAL MODE	<u>Number of Operating Charging Pumps</u>			
	0	1	2	3
3	12 hours	3.5 hours	1.5 hours	0.5 hours
4 not on SCS	12 hours	3.5 hours	1.5 hours	1 hour
5 not on SCS	8 hours	3.5 hours	1.5 hours	1 hour
4 & 5 on SCS	8 hours	1 hour	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
 ONA = Operation not allowed

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TABLE 3.1-4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $0.96 > K_{eff} > 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	5 hours	2 hours	1 hour
4 not on SCS	12 hours	5 hours	2 hours	1 hour
5 not on SCS	8 hours	5 hours	2 hours	1 hour
4 & 5 on SCS	8 hours	2 hours	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation not allowed

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TABLE 3.1-5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $k_{eff} < 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	6 hours	2.5 hours	1.5 hours
4 not on SCS	12 hours	6 hours	3 hours	1.5 hours
5 not on SCS	8 hours	6 hours	3 hours	1.5 hours
4 & 5 on SCS	8 hours	2 hours	1 hour	0.5 hours
6	24 hours	8 hours	4 hours	2 hours

Note: SCS = Shutdown Cooling System

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REACTIVITY CONTROL SYSTEMS3/4.1.3 MOVABLE CONTROL ASSEMBLIESCEA POSITIONLIMITING CONDITION FOR OPERATION

3.1.3.1 All full-length (shutdown and regulating) CEAs, and all part-length CEAs which are inserted in the core, shall be OPERABLE with each CEA of a given group positioned within 6.6 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

- a. With one or more full-length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is satisfied within 1 hour and be in at least HOT STANDBY within 6 hours.
- b. With more than one full-length or part-length CEA inoperable or misaligned from any other CEA in its group by more than 19 inches (indicated position), be in at least HOT STANDBY within 6 hours.
- c. With one or more full-length or part-length CEAs misaligned from any other CEAs in its group by more than 6.6 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with Figure 3.1-2A and that within 1 hour the misaligned CEA(s) is either: the limits specified in the CORE OPERATING LIMITS REPORT
 1. Restored to OPERABLE status within its above specified alignment requirements, or
 2. Declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is satisfied. After declaring the CEA(s) inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specifications 3.1.3.6 and 3.1.3.7 provided:
 - a) Within 1 hour the remainder of the CEAs in the group with the inoperable CEA(s) shall be aligned to within 6.6 inches of the inoperable CEA(s) while maintaining the allowable CEA sequence and insertion limits and the THERMAL POWER level restrictions of Specifications 3.1.3.6 and 3.1.3.7 during subsequent operation.

*See Special Test Exceptions 3.10.2 and 3.10.4.

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REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is determined at least once per 12 hours.

Otherwise, be in at least HOT STANDBY within 6 hours.

- d. With one full-length CEA inoperable due to causes other than addressed by ACTION a., above, but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.
- e. With one part-length CEA inoperable and inserted in the core, operation may continue provided the alignment of the inoperable part length CEA is maintained within 6.6 inches (indicated position) of all other part-length CEAs in its group and the CEA is maintained pursuant to the requirements of Specification 3.1.3.7.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full-length and part-length CEA shall be determined to be within 6.6 inches (indicated position) of all other CEAs in its group at least once per 12 hours except during time intervals when one CEAC is inoperable or when both CEACs are inoperable, then verify the individual CEA positions at least once per 4 hours.

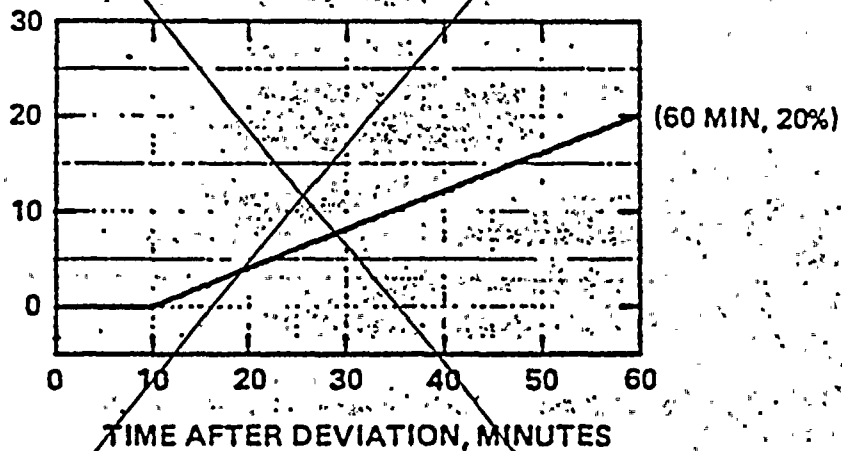
4.1.3.1.2 Each full-length CEA not fully inserted and each part-length CEA which is inserted in the core shall be determined to be OPERABLE by movement of at least 5 inches in any one direction at least once per 31 days.

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MINIMUM REQUIRED POWER REDUCTION
(% OF RATED THERMAL POWER)



*WHEN CORE POWER IS REDUCED TO 55% OF RATED THERMAL POWER PER THIS LIMIT CURVE, FURTHER REDUCTION IS NOT REQUIRED

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FIGURE 3.1-2A

CORE POWER LIMIT AFTER CEA DEVIATION*

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REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2 At least two of the following three CEA position indicator channels shall be OPERABLE for each CEA:

- a. CEA Reed Switch Position Transmitter (RSPT 1) with the capability of determining the absolute CEA positions within 5.2 inches,
- b. CEA Reed Switch Position Transmitter (RSPT 2) with the capability of determining the absolute CEA positions within 5.2 inches, and
- c. The CEA pulse counting position indicator channel.

APPLICABILITY: MODES 1 and 2.

ACTION:

With a maximum of one CEA per CEA group having only one of the above required CEA position indicator channels OPERABLE, within 6 hours either:

- a. Restore the inoperable position indicator channel to OPERABLE status, or
- b. Be in at least HOT STANDBY, or
- c. Position the CEA group(s) with the inoperable position indicator(s) at its fully withdrawn position while maintaining the requirements of Specifications 3.1.3.1, 3.1.3.5, 3.1.3.6 and 3.1.3.7. Operation may then continue provided the CEA group(s) with the inoperable position indicator(s) is maintained fully withdrawn, except during surveillance testing pursuant to the requirements of Specification 4.1.3.1.2, and each CEA in the group(s) is verified fully withdrawn at least once per 12 hours thereafter by its "Full Out" limit*.

SURVEILLANCE REQUIREMENTS

4.1.3.2 Each of the above required position indicator channels shall be determined to be OPERABLE by verifying that for the same CEA, the position indicator channels agree within 5.2 inches of each other at least once per 12 hours.

*CEAs are fully withdrawn (Full Out) when withdrawn to at least 144.75 inches.

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REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.3.3 At least one CEA Reed Switch Position Transmitter indicator channel shall be OPERABLE for each shutdown, regulating or part-length CEA not fully inserted.

APPLICABILITY: MODES 3*, 4*, and 5*.

ACTION:

With less than the above required position indicator channel(s) OPERABLE, immediately open the reactor trip breakers.

SURVEILLANCE REQUIREMENTS

4.1.3.3 The above required CEA Reed Switch Position Transmitter indicator channel(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

* With the reactor trip breakers in the closed position.

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REACTIVITY CONTROL SYSTEMS

CEA DROP TIME

LIMITING CONDITION FOR OPERATION

3.1.3.4 The individual full-length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be less than or equal to 4 seconds from when the electrical power is interrupted to the CEA drive mechanism until the CEA reaches its 90% insertion position with:

- a. T_{cold} greater than or equal to 552°F, and
- b. All reactor coolant pumps operating.

APPLICABILITY: MODES 1 and 2.

ACTION:

- a. With the drop time of any full-length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to MODE 1 or 2.

SURVEILLANCE REQUIREMENTS

4.1.3.4 The CEA drop time of full-length CEAs shall be demonstrated through measurement prior to reactor criticality:

- a. For all CEAs following each removal and reinstallation of the reactor vessel head,
- b. For specifically affected individual CEAs following any maintenance on or modification to the CEA drive system which could affect the drop time of those specific CEAs, and
- c. At least once per 18 months.



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REACTIVITY CONTROL SYSTEMS

SHUTDOWN CEA INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown CEAs shall be withdrawn to at least 144.75 inches.

APPLICABILITY: MODES 1 and 2*#.

ACTION:

With a maximum of one shutdown CEA withdrawn to less than 144.75 inches, except for surveillance testing pursuant to Specification 4.1.3.1.2, within 1 hour either:

- a. Withdraw the CEA to at least 144.75 inches, or
- b. Declare the CEA inoperable and comply with Specification 3.1.3.1.

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown CEA shall be determined to be withdrawn to at least 144.75 inches:

- a. Within 15 minutes prior to withdrawal of any CEAs in regulating groups during an approach to reactor criticality, and
- b. At least once per 12 hours thereafter except during time intervals when both CEAC's are inoperable, then verify the individual CEA positions at least once per 4 hours.

* See Special Test Exception 3.10.2.

#With K_{eff} greater than or equal to 1.

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REGULATING CEA INSERTION LIMITSLIMITING CONDITION FOR OPERATION

3.1.3.6 The regulating CEA groups shall be maintained within the following limits:

a. One or more CEAC's OPERABLE

Specified in the CORE OPERATING LIMITS REPORT

1. The regulating CEA groups shall be limited to the withdrawal sequence, and to the insertion limits~~##~~ shown on Figure 3.1-3 when the COLSS is in service or shown on Figure 3.1-4 when the COLSS is not in service. The CEA insertion between the Long Term Steady State Insertion Limits and the Transient Insertion Limits is restricted to:

- a) Less than or equal to 5 Effective Full Power Days per 30 Effective Full Power Day interval, and
- b) Less than or equal to 14 Effective Full Power Days per 18 Effective Full Power Months.

2. CEA insertion between the Short Term Steady State Insertion Limits and the Transient Insertion Limits shall be restricted to ≤ 4 hours per 24 hour interval.

b. Both CEAC's INOPERABLE (with or without COLSS in service)

Regulating CEA group 5 may be inserted no further than 127.5 inches withdrawn which is the Transient Insertion Limit when both CEAC's are inoperable.

Regulating CEA groups which are excluded by these insertion limits must be maintained fully withdrawn > 144.75 inches, which is the Transient Insertion Limit except for surveillance testing pursuant to Specification 4.1.3.1.2.

APPLICABILITY: MODES 1* and 2*#.

ACTION:

- a. With the regulating CEA groups inserted beyond the Transient Insertion Limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, within 2 hours either:

*See Special Test Exceptions 3.10.2 and 3.10.4.

#With K_{eff} greater than or equal to 1.

##A reactor power cutback will cause either (Case 1) Regulating Group 5 or Regulating Group 4 and 5 to be dropped with no sequential insertion of additional Regulating Groups (Groups 1, 2, 3, and 4) or (Case 2) Regulating Group 5 or Regulating Group 4 and 5 to be dropped with all or part of the remaining Regulating Groups (Groups 1, 2, 3, and 4) being sequentially inserted. In either case, the Transient Insertion Limit and the withdrawal sequence of Figure 3.1-3 or Figure 3.1-4 can be exceeded for up to 2 hours.

Specified in the CORE OPERATING LIMITS REPORT

REGULATING CEA INSERTION LIMITSLIMITING CONDITION FOR OPERATION (Continued)ACTION: (Continued)

1. Restore the regulating CEA groups to within the limits, or
2. Reduce THERMAL POWER as follows:
 - a) One or more CEAC's OPERABLE
 - 1) Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the CEA group position ~~using Figures 2.1-3 or 2.1-4.~~ or specified in the CORE OPERATING LIMITS REPORT
 - 2) Be in at least HOT STANDBY within 6 hours.
 - b) Both CEAC's INOPERABLE

Be in at least HOT STANDBY within 6 hours.
- b. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Transient Insertion Limits for intervals greater than 5 EFPD per 30 EFPD interval or greater than 14 EFPD per 18 Effective Full Power Months, either;
 1. Restore the regulating groups to within the Long Term Steady State Insertion Limits within 2 hours, or
 2. Be in at least HOT STANDBY within 6 hours.
- c. With the regulating CEA groups inserted between the Short Term Steady State Insertion Limits and the Transient Insertion Limits for intervals > 4 hours per 24 hour interval, operation may proceed provided any subsequent increase in THERMAL POWER is restricted to $\leq 5\%$ of RATED THERMAL POWER per hour.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The position of each regulating CEA group shall be determined to be within the Transient Insertion Limits at least once per 12 hours except during time intervals when the PDIL Auctioneer Alarm Circuit is inoperable, or both CEAC's are inoperable, then verify the CEA group positions at least once per 4 hours. The accumulated times during which the regulating CEA groups are inserted beyond the Long Term Steady State Insertion Limits but within the Transient Insertion Limits shall be determined at least once per 24 hours.

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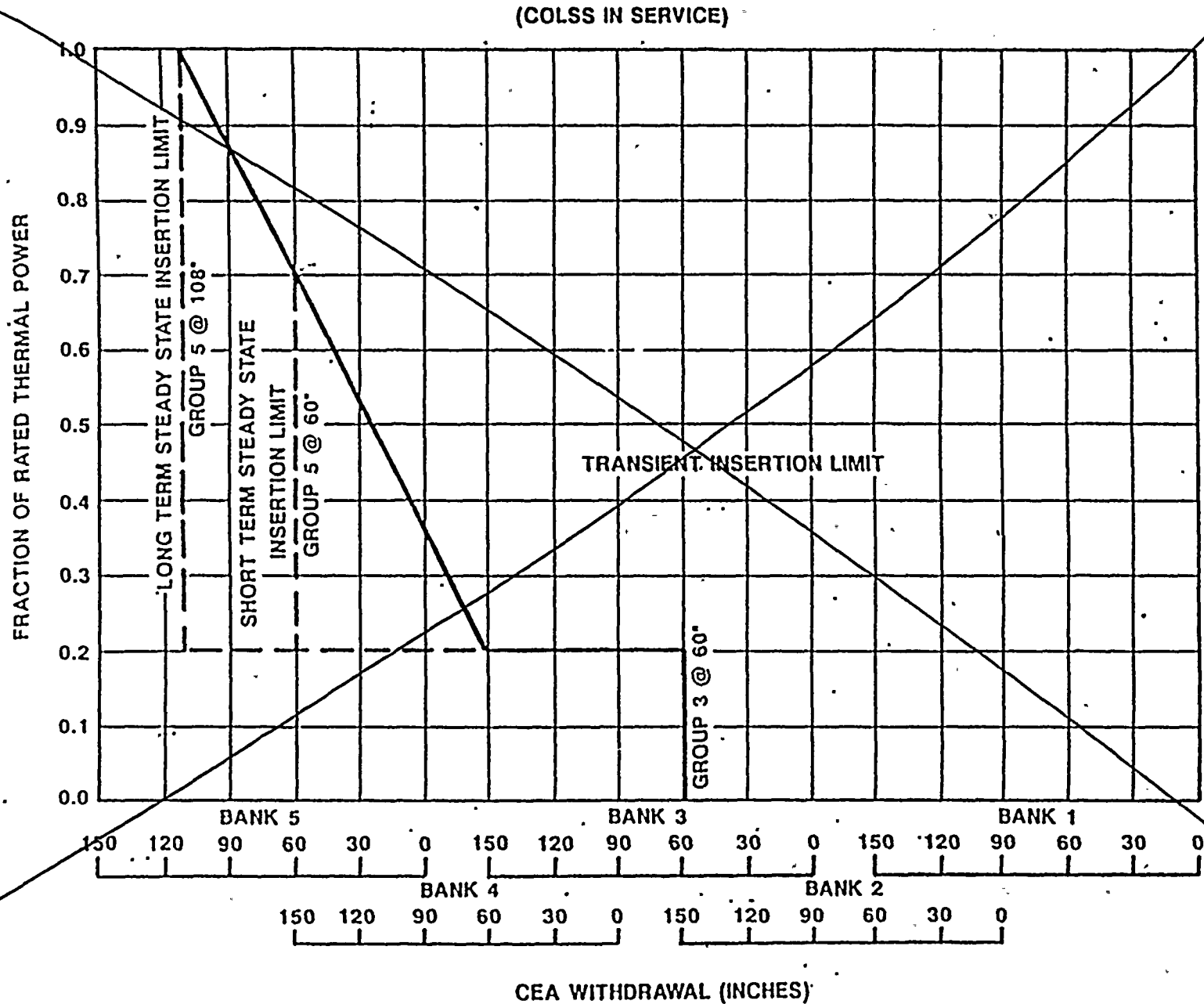
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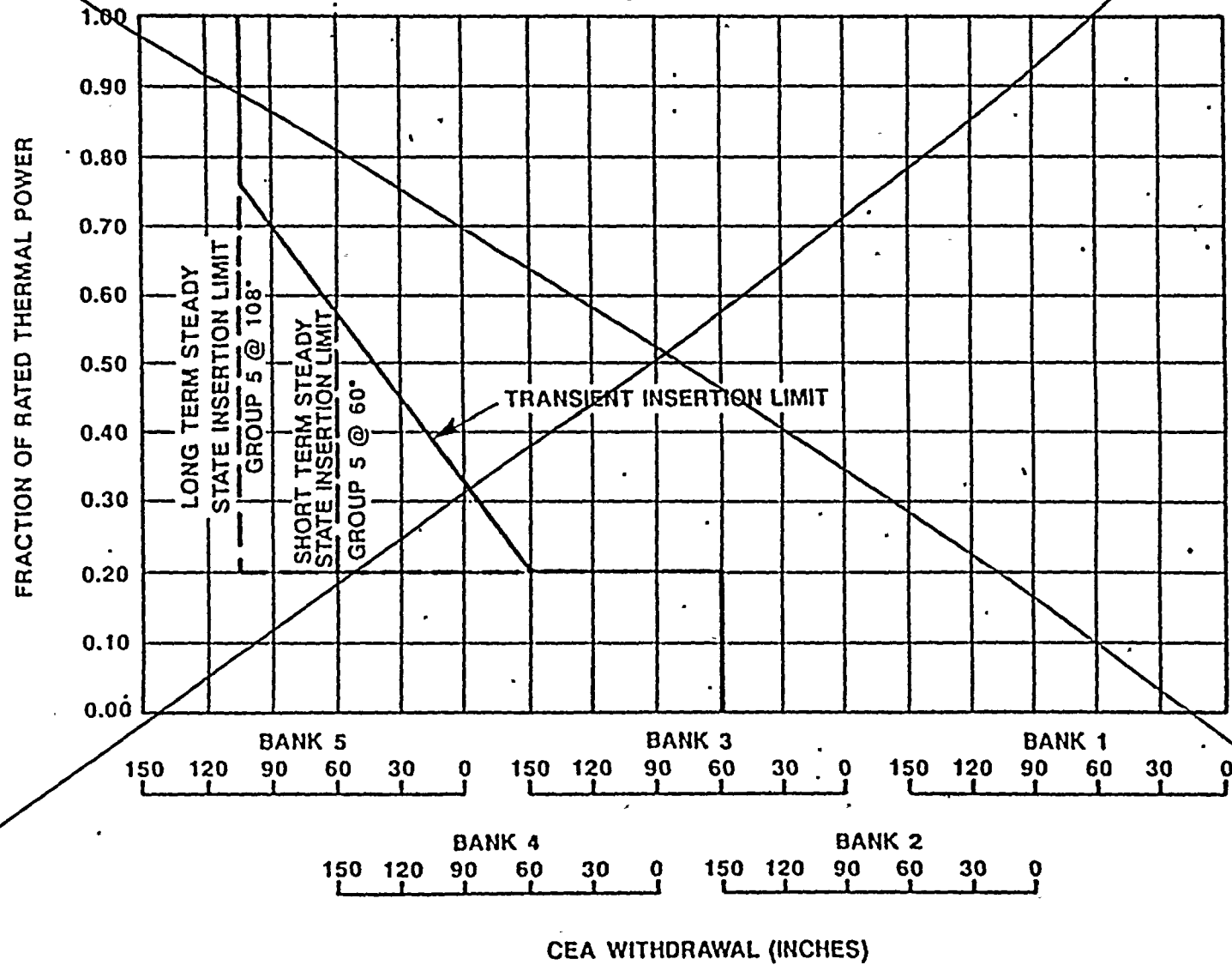
FIGURE 3.1-3

CEA INSERTION LIMITS vs. THERMAL POWER
(COLSS IN SERVICE)



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FIGURE 3.1-4
CEA INSERTION LIMITS vs. THERMAL POWER
(COLSS OUT OF SERVICE)



FOR INFORMATION ONLY

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REACTIVITY CONTROL SYSTEMSPART LENGTH CEA INSERTION LIMITSLIMITING CONDITION FOR OPERATION

3.1.3.7 The part length CEA groups shall be maintained within the following limits with COLSS in service or out of service:

- a. ~~One or more CEACs OPERABLE~~
specified in the CORE OPERATING LIMITS REPORT
 The part length CEA groups shall be limited to the insertion limits shown on Figure 3.1-5 with PLCEA insertion between the Long Term Steady State Insertion Limit and the Transient Insertion Limit restricted to:

1. ≤ 7 EFPD per 30 EFPD interval, and
2. ≤ 14 EFPD per calendar year.

- b. Both CEACs INOPERABLE

The part length CEA groups must be maintained fully withdrawn (> 144.75 inches) which is the Transient Insertion Limit when both CEACs are inoperable.

APPLICABILITY: MODES 1* and 2*

ACTION:

- a. With the part length CEA groups inserted beyond the Transient Insertion Limit, except for surveillance testing pursuant to Specification 4.1.3.1.2, within two hours, either:
1. Restore the part length CEA groups to within the limits, or
 2. Reduce THERMAL POWER as follows:
 - a) One or more CEACs OPERABLE
 - 1) Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the PLCEA group position ~~using Figure 3.1-5~~, or specified in the CORE OPERATING LIMITS REPORT
 - 2) Be in at least HOT STANDBY within 6 hours.
 - b) Both CEACs INOPERABLE

Be in at least HOT STANDBY within 6 hours.

*See Special Test Exceptions 3.10.2 and 3.10.4.

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FOR INFORMATION ONLY

REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- b. With the part length CEA groups inserted between the Long Term Steady State Insertion Limit and the Transient Insertion Limit for intervals > 7 EFPD per 30 EFPD interval or > 14 EFPD per calendar year, either:
 - 1. Restore the part length groups within the Long Term Steady State Insertion Limit within two hours, or
 - 2. Be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.7 The positions of the part length CEA groups shall be determined to be within the Transient Insertion Limit at least once per 12 hours except during time intervals when both CEACs are inoperable, then verify the part length CEA group positions at least once per 4 hours.



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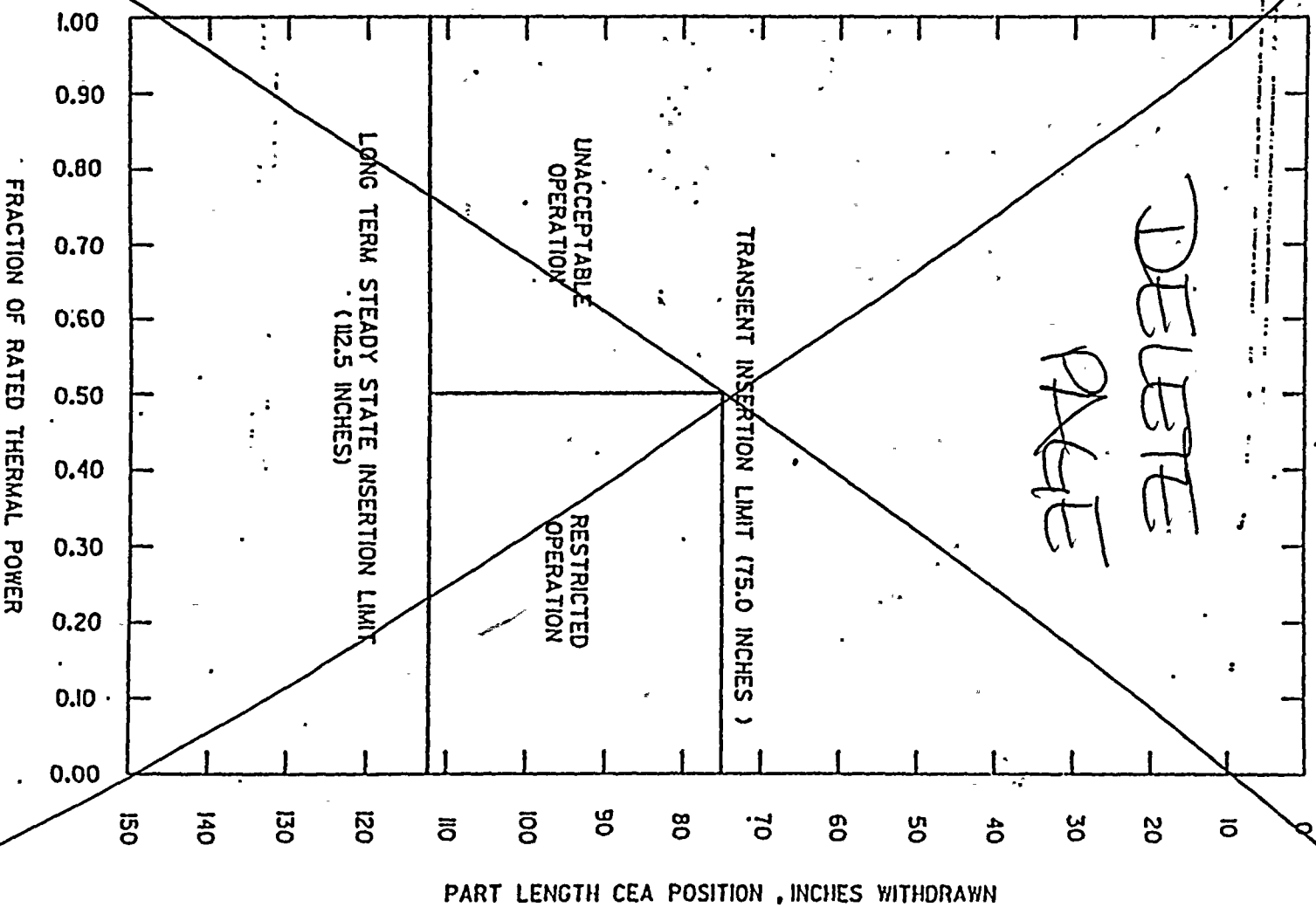


FIGURE 3.1-5

PART LENGTH CEA INSERTION LIMIT VS THERMAL POWER

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3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

specified in the CORE OPERATING LIMITS REPORT

3.2.1 The linear heat rate limit ~~of 13.5 kW/ft~~ shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to the COLSS calculated power operating limit based on linear heat rate (when COLSS is in service); or
- b. Maintaining peak linear heat rate within its limit using any operable CPC channel (when COLSS is out of service).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With the linear heat rate limit not being maintained as indicated by:

1. COLSS calculated core power exceeding the COLSS calculated core power operating limit based on linear heat rate; or
2. Peak linear heat rate outside its limit using any operable CPC channel (when COLSS is out of service);

within 15 minutes initiate corrective action to reduce the linear heat rate to within the limits and either:

- a. Restore the linear heat rate to within its limits within 1 hour, or
- b. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limit when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within its limit.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on linear heat rate.

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POWER DISTRIBUTION LIMITS

3/4.2.3 AZIMUTHAL POWER TILT - T_q

LIMITING CONDITION FOR OPERATION

3.2.3 The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the following limits:

- a. The AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs), and specified in the CORE OPERATING LIMITS REPORT
- b.1. The limit ~~in Figure 3.2-1A~~ with COLSS in service, or
- b.2. $T_q \leq 0.10$ with COLSS out of service.

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs, within 2 hours: either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value. specified in the CORE OPERATING LIMITS REPORT
- b. With the measured AZIMUTHAL POWER TILT determined to exceed the limit ~~in Figure 3.2-1A~~ with COLSS in service or 0.10 with COLSS out of service:
 - 1. Due to misalignment of either a part-length or full-length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1 and 4.2.4) is detecting the CEA misalignment.
 - 2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and verify that the Variable Overpower Trip Setpoint has been reduced as appropriate within the next 4 hours.
 - 3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

*See Special Test Exception 3.10.2.



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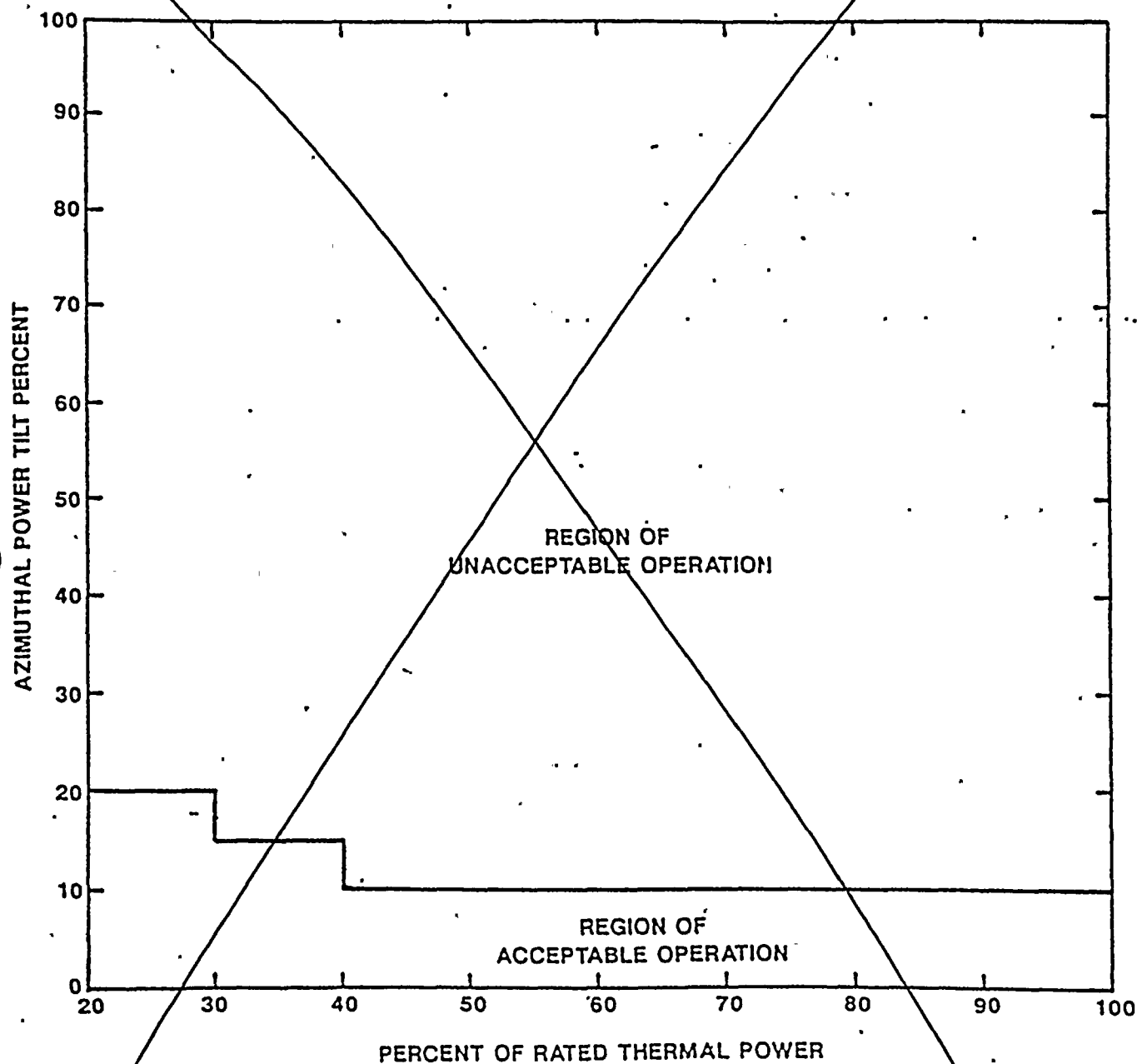


FIGURE 3.2-1A
AZIMUTHAL POWER TILT LIMIT vs. THERMAL POWER
(COLSS IN SERVICE)

POWER DISTRIBUTION LIMITS

3/4.2.4 DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by one of the following methods:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
specified in the CORE OPERATING LIMITS REPORT
- b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance shown in Figure 3.2-1 (when COLSS is in service and neither CEAC is operable); or
specified in the CORE OPERATING LIMITS REPORT
- c. Operating within the region of acceptable operation of Figure 3.2-2 using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
specified in the CORE OPERATING LIMITS REPORT
- d. Operating within the region of acceptable operation of Figure 3.2-2A using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With the DNBR not being maintained:

1. As indicated by COLSS calculated core power exceeding the appropriate COLSS calculated power operating limit; or
2. With COLSS out of service, operation outside the region of acceptable operation of Figure 3.2-2 or 3.2-2A, as applicable;

within 15 minutes initiate corrective action to increase the DNBR to within the limits and either:

- a. Restore the DNBR to within its limits within 1 hour, or
- b. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit shown on Figure 3.2-2 or Figure 3.2-2A.

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

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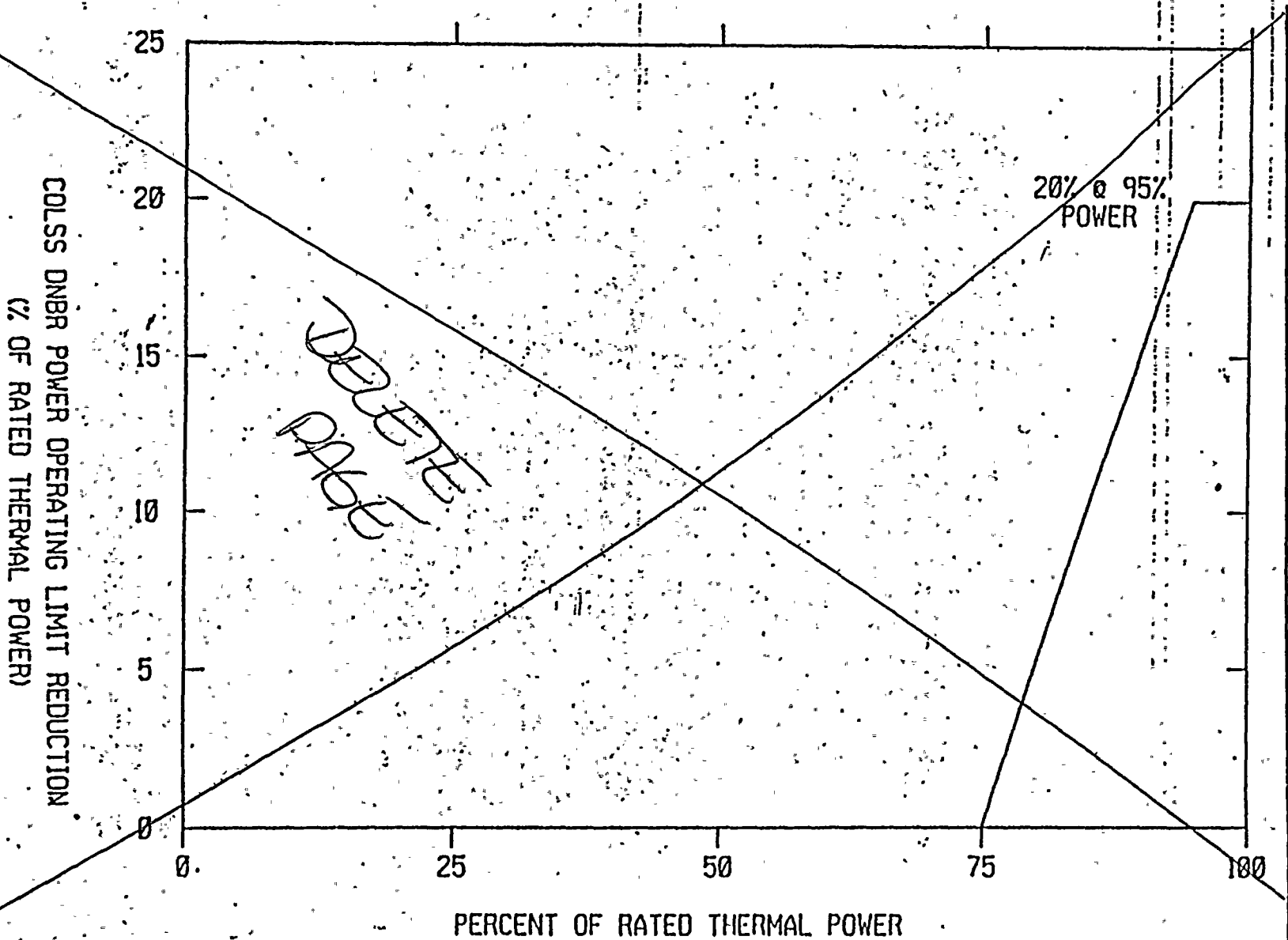


FIGURE 3.2-1

COLSS DNBR POWER OPERATING LIMIT
ALLOWANCE FOR BOTH CEACS INOPERABLE

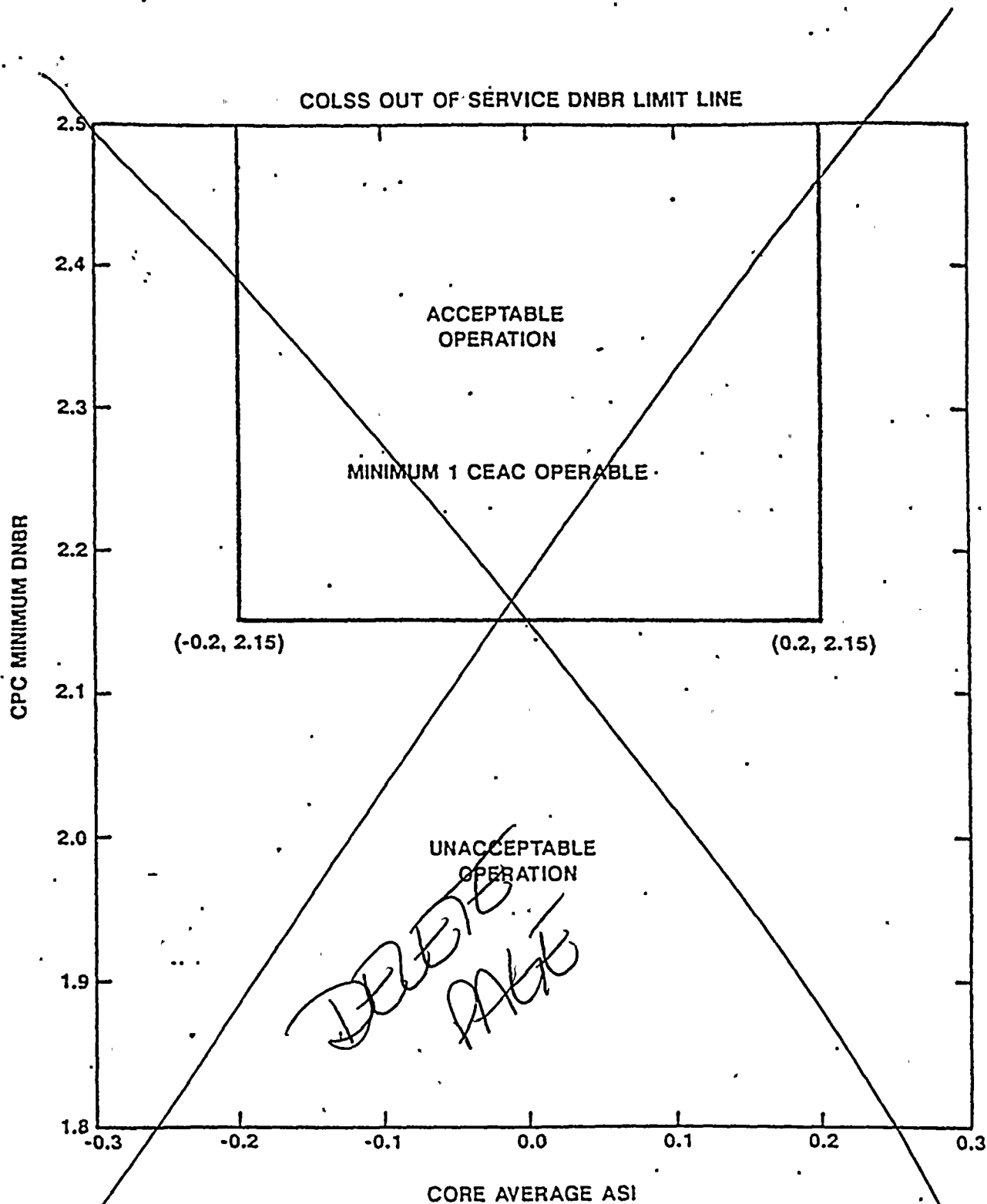


FIGURE 3.2-2
DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEAC'S OPERABLE)



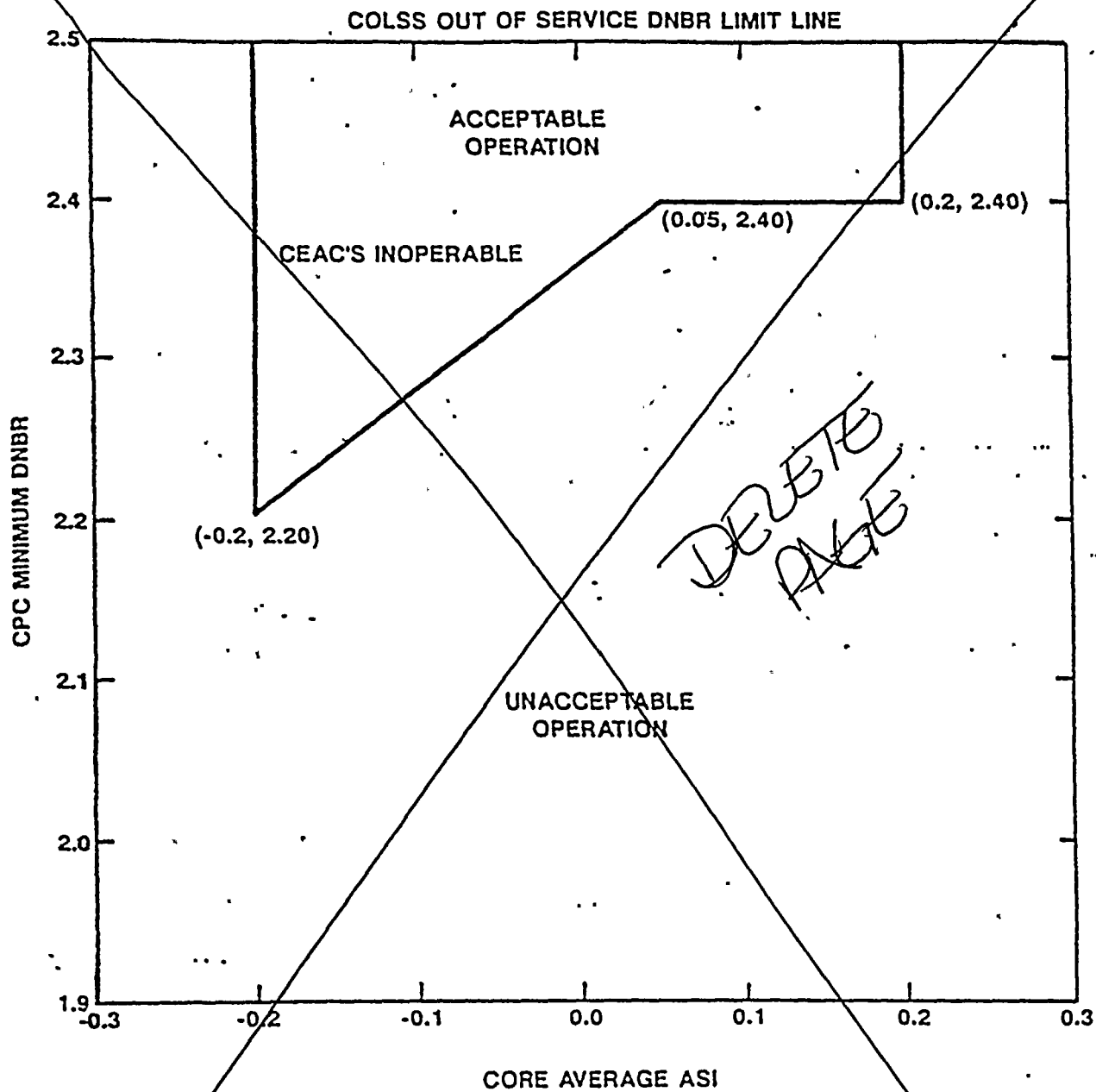


FIGURE 3.2-2a
DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEAC'S INOPERABLE)

POWER DISTRIBUTION LIMITS

3/4.2.5 RCS FLOW RATE

LIMITING CONDITION FOR OPERATION

3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to 155.8×10^6 lbm/hr.

APPLICABILITY: MODE 1.

ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5...The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to its limit at least once per 12 hours.

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CONTROLLED BY USER

POWER DISTRIBUTION LIMITS

3/4.2.6 REACTOR COOLANT COLD LEG TEMPERATURE

LIMITING CONDITION FOR OPERATION

3.2.6 The reactor coolant cold leg temperature (T_c) shall be within the Area of Acceptable Operation shown in Figure ~~3.2-3~~.

3.2-1.

APPLICABILITY: MODE 1* and 2*#.

ACTION:

With the reactor coolant cold leg temperature exceeding its limit, restore the temperature to within its limit within 2 hours or be in HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.6 The reactor coolant cold leg temperature shall be determined to be within its limit at least once per 12 hours.

*See Special Test Exception 3.10.4.

#With K_{eff} greater than or equal to 1

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FIGURE 3.2-X 1

REACTOR COOLANT COLD LEG TEMPERATURE vs CORE POWER LEVEL

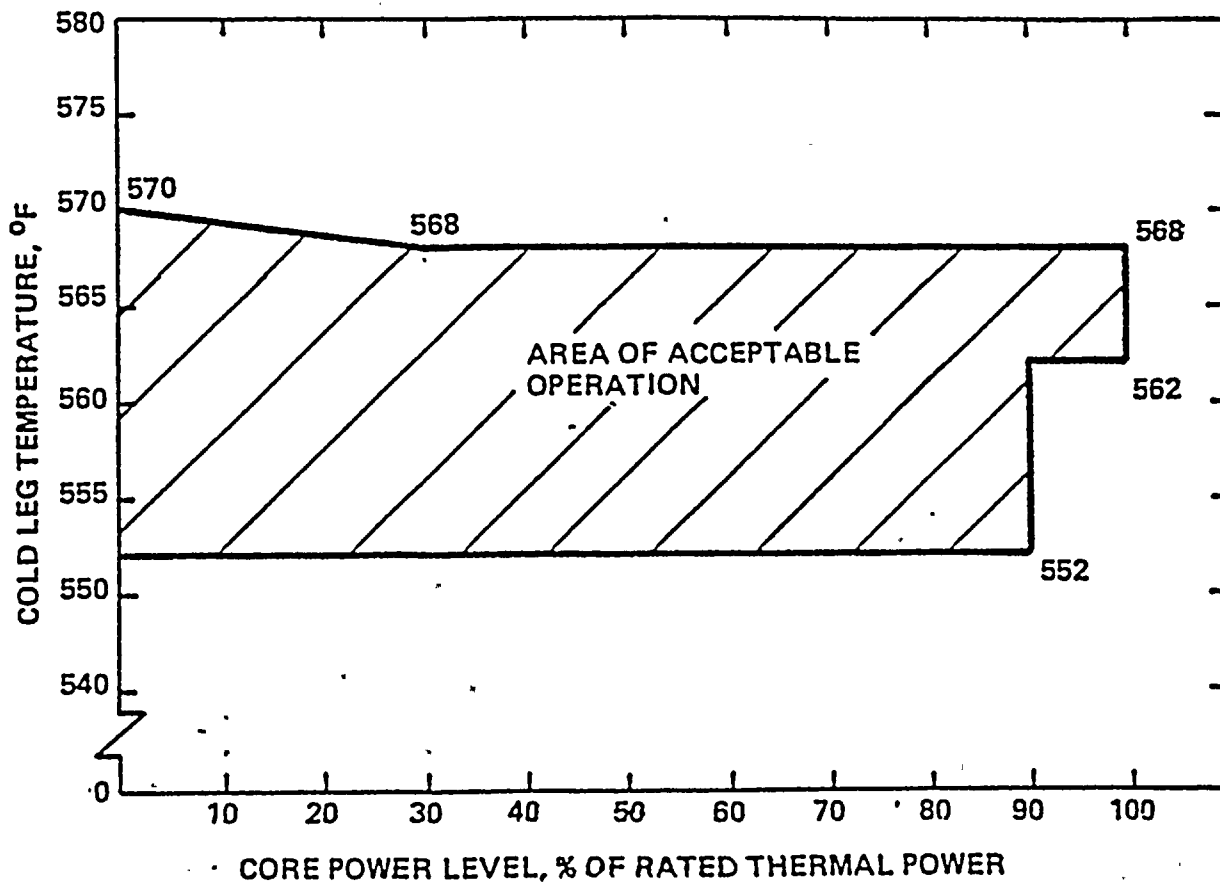


FIGURE 3.2-X 1

REACTOR COOLANT COLD LEG TEMPERATURE VS CORE POWER LEVEL

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POWER DISTRIBUTION LIMITS

3/4.2.7 AXIAL SHAPE INDEX

LIMITING CONDITION FOR OPERATION

3.2.7 The core average AXIAL SHAPE INDEX (ASI) shall be maintained within the following limits:

specified in the CORE OPERATING LIMITS REPORT

~~a. COLSS OPERABLE~~
~~-0.28 ≤ ASI ≤ 0.28~~

~~b. COLSS OUT OF SERVICE (CPC)~~
~~-0.20 ≤ ASI ≤ +0.20~~

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

specified in the CORE OPERATING LIMITS REPORT

With the core average AXIAL SHAPE INDEX outside ^{the} its above limits, restore the core average ASI to within its limit within 2 hours or reduce THERMAL POWER to less than 20% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.7 The core average AXIAL SHAPE INDEX shall be determined to be within its limit at least once per 12 hours using the COLSS or any OPERABLE Core Protection Calculator channel.

* See Special Test Exception 3.10.2.

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FOR INFORMATION ONLY

POWER DISTRIBUTION LIMITS

3/4.2.8 PRESSURIZER PRESSURE

LIMITING CONDITION FOR OPERATION

3.2.8 The pressurizer pressure shall be maintained between 2025 psia and 2300 psia.

APPLICABILITY: MODES 1 and 2.

ACTION:

With the pressurizer pressure outside its above limits, restore the pressure to within its limit within 2 hours or be in at least HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.8 The pressurizer pressure shall be determined to be within its limit at least once per 12 hours.

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EMERGENCY CORE COOLING SYSTEMS

3/4.5.4 REFUELING WATER TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water tank (RWT) shall be OPERABLE with:

- a. A minimum borated water volume as specified in Figure ^{3.1-1}~~3.1-2~~ of Specification 3.1-2.5, and
- b. A boron concentration between 4000 and 4400 ppm of boron, and
- c. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the refueling water tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWT shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1. Verifying the contained borated water volume in the tank, and
 - 2. Verifying the boron concentration of the water.
- b. At least once per 24 hours by verifying the RWT temperature when the (outside) air temperature is outside the 60°F to 120°F range.

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REACTIVITY CONTROL SYSTEMSBASESMOVABLE CONTROL ASSEMBLIES (Continued)

and load maneuvering. Analyses are performed based on the expected mode of operation of the NSSS (base load maneuvering, etc.) and from these analyses CEA insertions are determined and a consistent set of radial peaking factors defined. The Long Term Steady State and Short Term Insertion Limits are determined based upon the assumed mode of operation used in the analyses and provide a means of preserving the assumptions on CEA insertions used. The limits specified serve to limit the behavior of the radial peaking factors within the bounds determined from analysis. The actions specified serve to limit the extent of radial xenon redistribution effects to those accommodated in the analyses. The Long and Short Term Insertion Limits of Specifications 3.1.3.6 and 3.1.3.7 are specified for the plant which has been designed for primarily base loaded operation but which has the ability to accommodate a limited amount of load maneuvering.

The Transient Insertion Limits of Specifications 3.1.3.6 and 3.1.3.7 and the Shutdown CEA Insertion Limits of Specification 3.1.3.5 ensure that (1) the minimum SHUTDOWN MARGIN is maintained, and (2) the potential effects of a CEA ejection accident are limited to acceptable levels. Long-term operation at the Transient Insertion Limits is not permitted since such operation could have effects on the core power distribution which could invalidate assumptions used to determine the behavior of the radial peaking factors.

The PVNGS CPC and COLSS systems are responsible for the safety and monitoring functions, respectively, of the reactor core. COLSS monitors the DNB Power Operating Limit (POL) and various operating parameters to help the operator maintain plant operation within the limiting conditions for operation (LCO). Operating within the LCO guarantees that in the event of an Anticipated Operational Occurrence (AOO), the CPCs will provide a reactor trip in time to prevent unacceptable fuel damage. (specified in the CORE OPERATING LIMITS REPORT)

The COLSS reserves the Required Overpower Margin (ROPM) to account for the Loss of Flow (LOF) and CEA misoperation transients. When the COLSS is Out of Service (COOS), the monitoring function is performed via the CPC calculation of DNBR in conjunction with Technical Specification COOS Limit Lines (~~Figures 3.2-2 and 3.2-2A~~) which restrict the reactor power sufficiently to preserve the ROM.

The reduction of the CEA deviation penalties in accordance with the CEAC (Control Element Assembly Calculator) sensitivity reduction program has been performed. This task involved setting many of the inward single CEA deviation penalty factors to 1.0. An inward CEA deviation event in effect would not be accompanied by the application of the CEA deviation penalty in either the CPC DNB and LHR (Linear Heat Rate) calculations for those CEAs with the reduced penalty factors. The protection for an inward CEA deviation event is thus accounted for separately.



REACTIVITY CONTROL SYSTEMS

BASES

MOVABLE CONTROL ASSEMBLIES (Continued)

in the CORE OPERATING LIMITS REPORT

If an inward CEA deviation event occurs, the current CPC algorithm applies two penalty factors to each of the DNB and LHR calculations. The first, a static penalty factor, is applied upon detection of the event. The second, a xenon redistribution penalty, is applied linearly as a function of time after the CEA drop. The expected margin degradation for the inward CEA deviation event for which the penalty factor has been reduced is accounted for in two ways. The ROM reserved in COLSS is used to account for some of the margin degradation. Further, a power reduction in accordance with the curve in Figure 3.1-2A is required. In addition, the part length CEA maneuvering is restricted in accordance with Figure 3.1-5 to justify reduction of the PLR deviation penalty factors.

limits specified in the CORE OPERATING LIMITS REPORT

The technical specification permits plant operation if both CEACs are considered inoperable for safety purposes after this period.

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3/4.2...POWER DISTRIBUTION LIMITSBASES3/4.2.1 LINEAR HEAT RATE

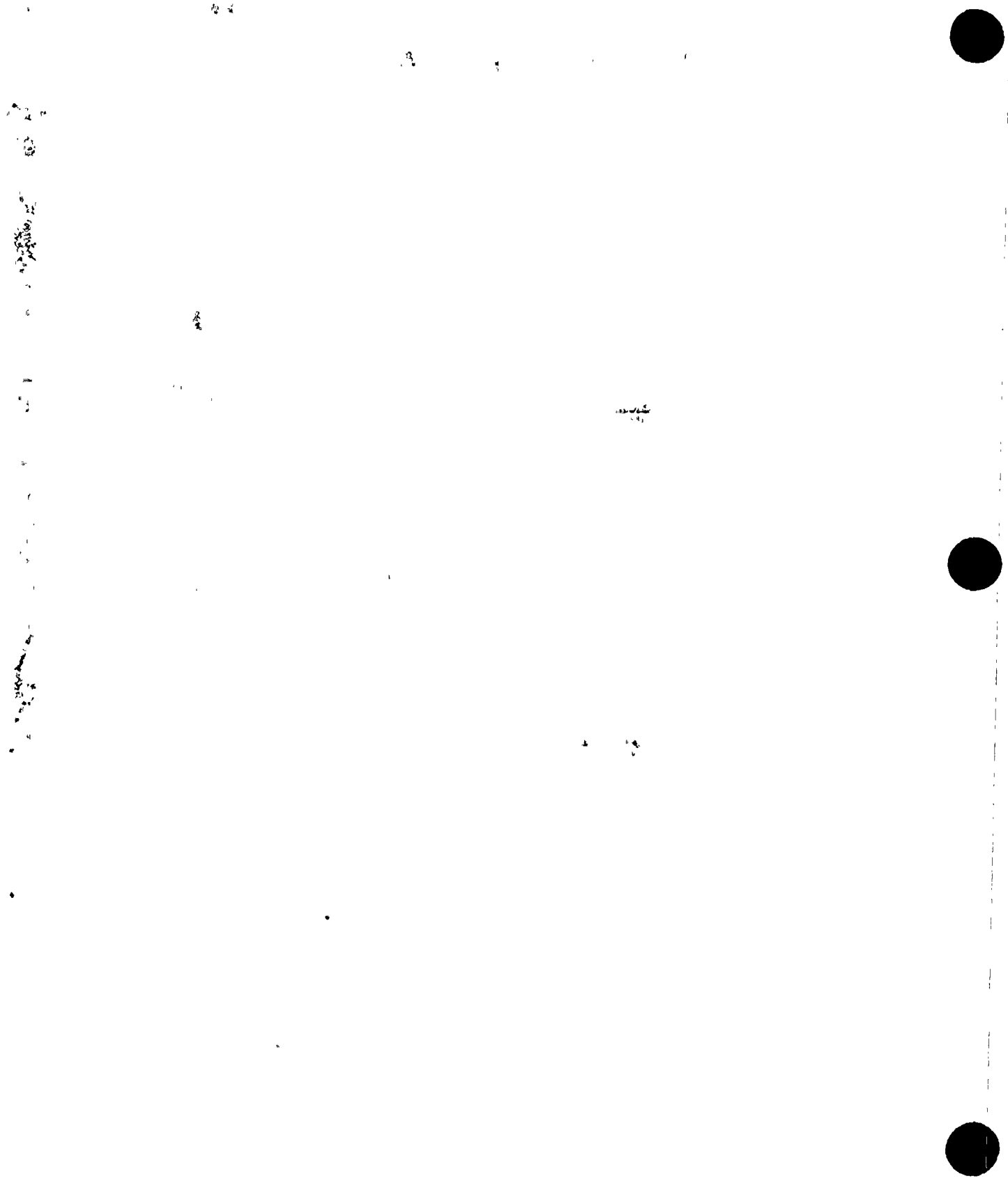
The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limits ~~of 13.5 kW/ft~~ are not exceeded.

specified in the CORE OPERATING LIMITS REPORT

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the maximum linear heat rate calculated by COLSS is conservative with respect to the actual maximum linear heat rate existing in the core. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB, and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the linear heat rate limit can be maintained by utilizing any operable CPC channel. The above listed uncertainty and penalty factors plus those associated with the CPC startup test acceptance criteria are also included in the CPCs.



POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic surveillance requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provides assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

specified in the CORE OPERATING LIMITS REPORT

3/4.2.3 AZIMUTHAL POWER TILT - T_q

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than the limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

The AZIMUTHAL POWER TILT is equal to $(P_{\text{tilt}}/P_{\text{untilt}}) - 1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_q g \cos(\theta - \theta_0)$$

where:

T_q is the peak fractional tilt amplitude at the core periphery

g is the radial normalizing factor

θ is the azimuthal core location

θ_0 is the azimuthal core location of maximum tilt

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POWER DISTRIBUTION LIMITSBASESAZIMUTHAL POWER TILT - T_q (Continued)

$P_{\text{tilt}}/P_{\text{untilt}}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions and which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on DNBR includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the core power limits calculated by COLSS (based on the minimum DNBR limit) are conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement. specified in the CORE OPERATING LIMITS REPORT

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits of Figures 3.2-2 and 3.2-2A can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

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ADMINISTRATIVE CONTROLSSEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (Continued)

The Semiannual Radioactive Effluent Release Report to be submitted 60 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1, October 1977.

The Semiannual Radioactive Effluent Release Reports shall include the following information for each class of solid waste (as defined by 10 CFR Part 61) shipped offsite during the report period:

- a. Container volume,
- b. Total curie quantity (specify whether determined by measurement or estimate),
- c. Principal radionuclides (specify whether determined by measurement or estimate),
- d. Source of waste and processing employed (e.g., dewatered spent resin compacted dry waste, evaporator bottoms),
- e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and
- f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Semiannual Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Semiannual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM and to the OFFSITE DOSE CALCULATION MANUAL, as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

SPECIAL REPORTSINSERT 2

6.9.2 Special reports shall be submitted to the Regional Administrator of the Regional Office of the NRC within the time period specified for each report.

6.9.3 Violations of the requirements of the fire protection program described in the Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be reported in accordance with 10 CFR 50.73.



INSERT 2

CORE OPERATING LIMITS REPORT

6.9.1.9 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, and are as follows:

"C-E Method for Control Element Assembly Ejection Analysis," CENPD-190-A, January, 1976;

"The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April, 1983;

"INCA/CECOR Power Peaking Uncertainty," CENPD-153-P, Revision 1-P-A, May, 1980;

"Safety Evaluation Report Related to the Final Design of the Standard Nuclear Steam Supply Reference Systems CESSAR System 80, Docket No. STN 50-470," NUREG-0852 (November 1981), Supplements No. 1 (March 1983), No. 2 (September 1983), No. 3 (December 1987);

"Modified Statistical Combination of Uncertainties," CEN-356(V)-P-A, Revision 01-P-A, May, 1988.

The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermalhydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements thereto, shall be provided upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

PVNGS UNIT 2

**MARKED UP TECHNICAL SPECIFICATIONS
TO SUPPORT NRC GENERIC LETTER 88-16**



FOR INFORMATION ONLY

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DEFINITIONS

SERT 1

DOSE EQUIVALENT I-131

1.10 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134 and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites."

\bar{E} - AVERAGE DISINTEGRATION ENERGY

1.11 \bar{E} shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half-lives greater than 15 minutes, making up at least 95% of the total noniodine activity in the coolant.

ENGINEERED SAFETY FEATURES RESPONSE TIME

1.12 The ENGINEERED SAFETY FEATURES RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays where applicable.

FREQUENCY NOTATION

1.13 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

GASEOUS RADWASTE SYSTEM

1.14 A GASEOUS RADWASTE SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

IDENTIFIED LEAKAGE

1.15 IDENTIFIED LEAKAGE shall be:

- a. Leakage into closed systems, other than reactor coolant pump controlled bleed-off flow, such as pump seal or valve packing leaks that are captured and conducted to a sump or collecting tank, or
- b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or
- c. Reactor Coolant System leakage through a steam generator to the secondary system.



INSERT 1

CORE OPERATING LIMITS REPORT

1.9a The CORE OPERATING LIMITS REPORT is the unit-specific document that provides core operating limits for the current operating reload cycle. These cycle-specific core operating limits shall be determined for each reload cycle in accordance with Technical Specification 6.9.1. Plant operation within these operating limits is addressed in individual specifications.

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REACTIVITY CONTROL SYSTEMS

SHUTDOWN MARGIN - K_{N-1} - ANY CEA WITHDRAWN

LIMITING CONDITION FOR OPERATION

3.1.1.2

specified in the CORE OPERATING LIMITS REPORT

a. The SHUTDOWN MARGIN shall be greater than or equal to that shown in ~~Figure 3.1.1A~~, and

b. For T_{cold} less than or equal to 500°F, K_{N-1} shall be less than 0.99.

APPLICABILITY: MODES 1, 2*, 3*, 4*, and 5* with any full-length CEA fully or partially withdrawn.

ACTION:

specified in the CORE OPERATING LIMITS REPORT

a. With the SHUTDOWN MARGIN less than that ~~in Figure 3.1.1A~~, immediately initiate and continue boration at greater than or equal to 26 gpm to the reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored, and

b. With T_{cold} less than or equal to 500°F and K_{N-1} greater than or equal to 0.99, immediately vary CEA positions and/or initiate and continue boration at greater than or equal to 26 gpm to the reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required K_{N-1} is restored.

SURVEILLANCE REQUIREMENTS

specified in the CORE OPERATING LIMITS REPORT

4.1.1.2.1 With any full-length CEA fully or partially withdrawn, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that ~~in Figure 3.1.1A~~.

a. Within 1 hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable as a result of excessive friction or mechanical interference or known to be untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

* See Special Test Exceptions 3.10.1 and 3.10.9.

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2. The second part of the document is a list of names and addresses of the members of the committee.

3. The third part of the document is a list of names and addresses of the members of the committee.

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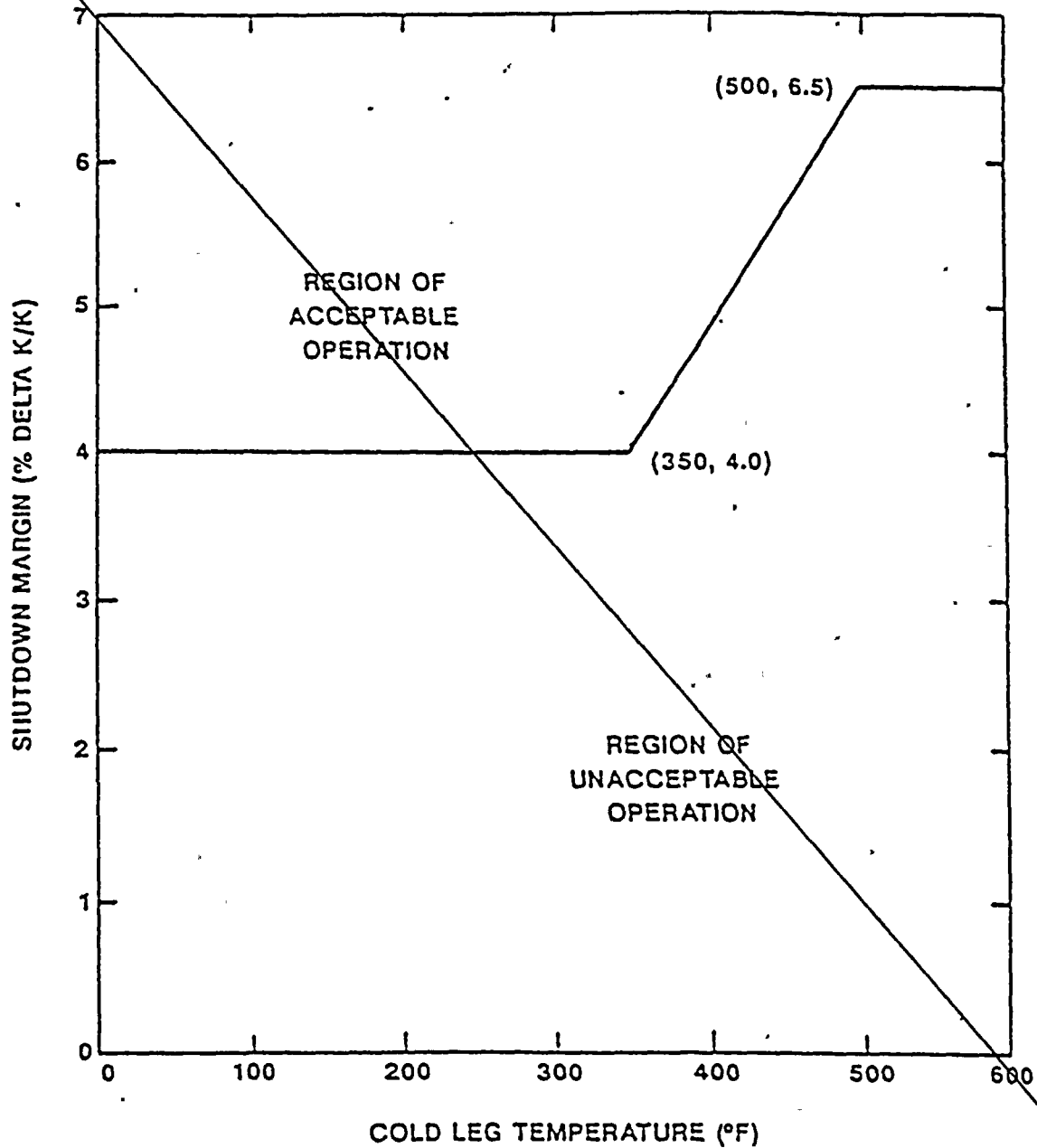


FIGURE 3.1-1A
SHUTDOWN MARGIN vs. COLD LEG TEMPERATURE

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MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

specified in the CORE OPERATING LIMITS REPORT.

3.1.1.3 The moderator temperature coefficient (MTC) shall be within the area of Acceptable Operation ~~shown on Figure 3.1.1.~~

APPLICABILITY: MODES 1 and 2*#.

ACTION: *specified in the CORE OPERATING LIMITS REPORT*

With the moderator temperature coefficient outside the area of Acceptable Operation ~~shown on Figure 3.1.1,~~ be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.1.3.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the ~~above limits,~~ *specified in the CORE OPERATING LIMITS REPORT.*

4.1.1.3.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

- a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.
- b. At any THERMAL POWER, within 7 EFPD after reaching a core average exposure of 40 EFPD burnup into the current cycle.
- c. At any THERMAL POWER, within 7 EFPD after reaching a core average exposure equivalent to two-thirds of the expected current cycle end-of-cycle core average burnup.

*When Keff greater than or equal to 1.0.

#See Special Test Exception 3.10.2.

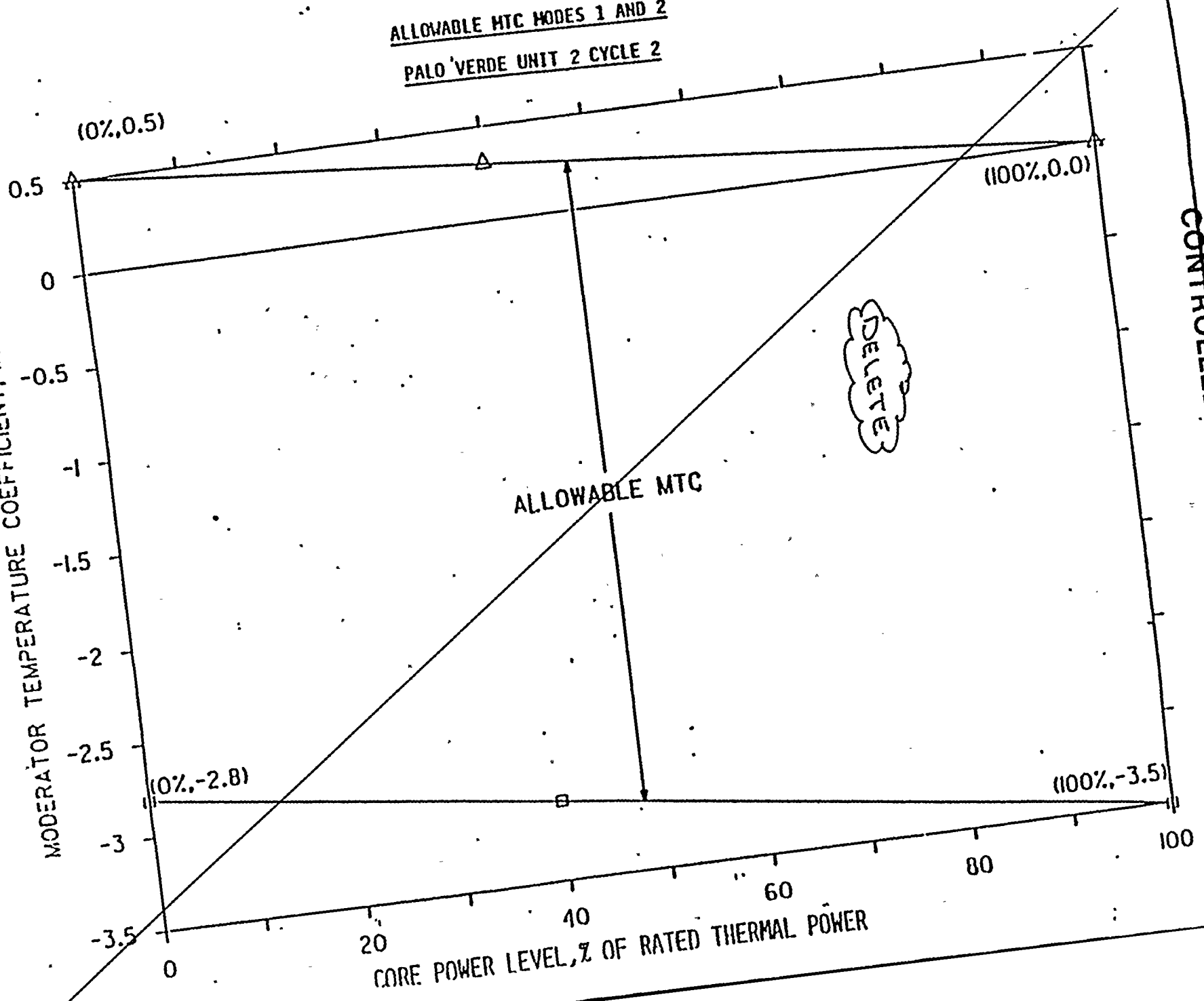
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3. The third part of the document is a list of names and addresses of the members of the committee.

FIG. 3.1-1

ALLOWABLE MTC MODES 1 AND 2
PALO VERDE UNIT 2 CYCLE 2



PALO VERDE - UNIT 2

3/4 1-5

AMENDMENT NO. 19

and

and

and

and

and

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MINIMUM TEMPERATURE FOR CRITICALITY

LIMITING CONDITION FOR OPERATION

3.1.1.4 The Reactor Coolant System lowest operating loop temperature (T_{cold}) shall be greater than or equal to 552°F.

APPLICABILITY: MODES 1 and 2#.

ACTION:

With a Reactor Coolant System operating loop temperature (T_{cold}) less than 552°F, restore T_{cold} to within its limit within 15 minutes or be in HOT STANDBY within the next 15 minutes.

SURVEILLANCE REQUIREMENTS

- c 4.1.1.4 The Reactor Coolant System temperature (T_{cold}) shall be determined to be greater than or equal to 552°F:
- Within 15 minutes prior to achieving reactor criticality, and
 - At least once per 30 minutes when the reactor is critical and the Reactor Coolant System T_{cold} is less than 557°F.

#With K_{eff} greater than or equal to 1.0.



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3/4.1.2 BORATION SYSTEMS

FLOW PATHS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.1 As a minimum, one of the following boron injection flow paths shall be OPERABLE:

- a. If only the spent fuel pool in Specification 3.1.2.5a. is OPERABLE, a flow path from the spent fuel pool via a gravity feed connection and a charging pump to the Reactor Coolant System.
- b. If only the refueling water tank in Specification 3.1.2.5b. is OPERABLE, a flow path from the refueling water tank via either a charging pump, a high pressure safety injection pump, or a low pressure safety injection pump to the Reactor Coolant System.

APPLICABILITY: MODES 5 and 6.

ACTION:

With none of the above flow paths OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.1 At least one of the above required flow paths shall be demonstrated OPERABLE at least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.



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REACTIVITY CONTROL SYSTEMS

FLOW PATHS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.2 At least two of the following three boron injection flow paths shall be OPERABLE:

- a. A gravity feed flow path from either the refueling water tank or the spent fuel pool through CH-536 (RWT Gravity Feed Isolation Valve) and a charging pump to the Reactor Coolant System,
- b. A gravity feed flow path from the refueling water tank through CH-327 (RWT Gravity Feed/Safety Injection System Isolation Valve) and a charging pump to the Reactor Coolant System,
- c. A flow path from either the refueling water tank or the spent fuel pool through CH-164 (Boric Acid Filter Bypass Valve), utilizing gravity feed and a charging pump to the Reactor Coolant System.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one of the above required boron injection flow paths to the Reactor Coolant System OPERABLE, restore at least two boron injection flow paths to the Reactor Coolant System to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore at least two flow paths to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.2.1 At least two of the above required flow paths shall be demonstrated OPERABLE:

- a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.
- b. At least once per 18 months when the Reactor Coolant System is at normal operating pressure by verifying that the flow path required by Specification 3.1.2.2 delivers at least 26 gpm for 1 charging pump and 68 gpm for two charging pumps to the Reactor Coolant System.

4.1.2.2.2 The provisions of Specification 4.0.4 are not applicable for entry into Mode 3 or Mode 4 to perform the surveillance testing of Specification 4.1.2.2.1.b provided the testing is performed within 24 hours after achieving normal operating pressure in the reactor coolant system.



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REACTIVITY CONTROL SYSTEMS

CHARGING PUMPS - SHUTDOWN

~~LIMITING CONDITION FOR OPERATION~~

3.1.2.3 At least one charging pump or one high pressure safety injection pump or one low pressure safety injection pump in the boron injection flow path required OPERABLE pursuant to Specification 3.1.2.1 shall be OPERABLE and capable of being powered from an OPERABLE emergency power source.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no charging pump or high pressure safety injection pump or low pressure safety injection pump OPERABLE or capable of being powered from an OPERABLE emergency power source, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.3 No additional Surveillance Requirements other than those required by Specification 4.0.5.



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REACTIVITY CONTROL SYSTEMS

CHARGING PUMPS... OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.4 At least two charging pumps shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one charging pump OPERABLE, restore at least two charging pumps to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore at least two charging pumps to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.4 No additional Surveillance Requirements other than those required by Specification 4.0.5.



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BORATED WATER SOURCES - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.5 As a minimum, one of the following borated water sources shall be OPERABLE:

- a. The spent fuel pool with:
 1. A minimum borated water volume of 33,500 gallons and
 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 3. A solution temperature between 60°F and 180°F.
- b. The refueling water tank with:
 1. A minimum contained borated water volume of 33,500 gallons and
 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 3. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 5* and 6*.

ACTION:

With no borated water sources OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one borated water source is restored to OPERABLE status.

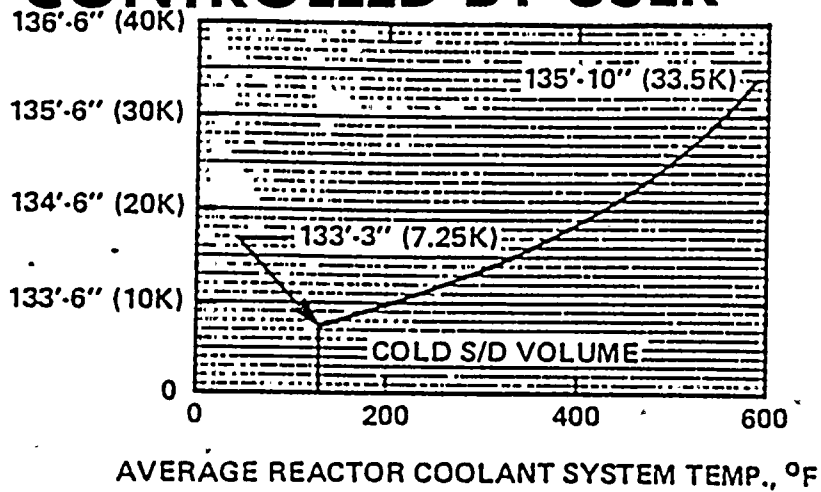
SURVEILLANCE REQUIREMENTS

- 4.1.2.5 The above required borated water sources shall be demonstrated OPERABLE:
- a. At least once per 7 days by:
 1. Verifying the boron concentration of the water, and
 2. Verifying the contained borated water volume of the refueling water tank or the spent fuel pool.
 - b. At least once per 24 hours by verifying the refueling water tank temperature when it is the source of borated water and the outside air temperature is outside the 60°F to 120°F range.
 - c. At least once per 24 hours by verifying the spent fuel pool temperature when it is the source of borated water and irradiated fuel is present in the pool.

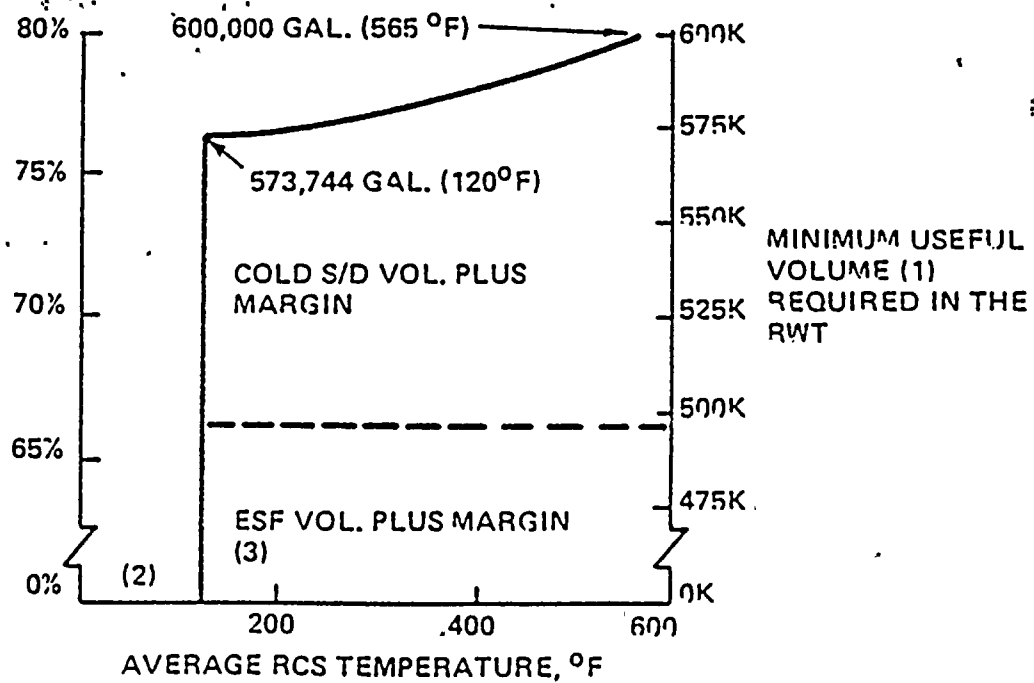
*See Special Test Exception 3.10.7.



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RWT LEVEL
INSTRUMENT
READING (1)



- (1) THE TANK LEVEL AND VOLUME SHOWN ARE THE USEFUL LEVEL AND VOLUME ABOVE THAT IN THE TANK WHICH IS REQUIRED FOR VORTEX CONSIDERATIONS
- (2) DURING MODE 5 AND 6 ONE OF THESE BORATED SOURCES SHALL CONTAIN A MINIMUM OF 33,500 GALLONS
- (3) THIS VOLUME IS NOT REQUIRED DURING MODE 6

FIGURE 3.1-2
MINIMUM BORATED WATER VOLUMES



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.. REACTIVITY CONTROL SYSTEMS

.. BORATED WATER SOURCES - OPERATING

.. LIMITING CONDITION FOR OPERATION

3.1.2.6 Each of the following borated water sources shall be OPERABLE:

- a. The spent fuel pool with:
 - 1. A minimum borated water volume as specified in Figure 3.1-2, and
 - 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 - 3. A solution temperature between 60°F and 180°F.
- b. The refueling water tank with:
 - 1. A minimum contained borated water volume as specified in Figure 3.1-2, and
 - 2. A boron concentration of between 4000 and 4400 ppm of boron, and
 - 3. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 1, 2,* 3,* and 4*.

ACTION:

- a. With the above required spent fuel pool inoperable, restore the pool to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the above required spent fuel pool to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.
- b. With the refueling water tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.6 Each of the above required borated water sources shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1. Verifying the boron concentration in the water, and
 - 2. Verifying the contained borated water volume of the water source.
- b. At least once per 24 hours by verifying the refueling water tank temperature when the outside air temperature is outside the 60°F to 120°F range.
- c. At least once per 24 hours by verifying the spent fuel pool temperature when irradiated fuel is present in the pool.

* See Special Test Exception 3.10.7.



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BORON DILUTION ALARMS

LIMITING CONDITION FOR OPERATION

3.1.2.7 Both startup channel high neutron flux alarms shall be OPERABLE.

APPLICABILITY: MODES 3*, 4, 5, and 6.

ACTION: -

- Specified in the CORE OPERATING LIMITS REPORT*
- a. With one startup channel high neutron flux alarm inoperable:
 1. Determine the RCS boron concentration when entering MODE 3, 4, 5, or 6 or at the time the alarm is determined to be inoperable. From that time, the RCS boron concentration shall be determined at the applicable monitoring frequency, ~~in Tables 3.1-1 through 3.1-5~~ by either boronmeter or RCS sampling**.
 - b. With both startup channel high neutron flux alarms inoperable:
 1. Determine the RCS boron concentration by either boronmeter and RCS sampling** or by independent collection and analysis of two RCS samples when entering Mode 3, 4, or 5 or at the time both alarms are determined to be inoperable. From that time, the RCS boron concentration shall be determined at the applicable monitoring frequency, ~~in Tables 3.1-1 through 3.1-5~~, as applicable, by either boronmeter and RCS sampling** or by collection and analysis of two independent RCS samples. If redundant determination of RCS boron concentration cannot be accomplished immediately, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until the method for determining and confirming RCS boron concentration is restored.
 2. When in MODE 5 with the RCS level below the centerline of the hotleg or MODE 6, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one startup channel high neutron flux alarm is restored to OPERABLE status.
 - c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.1.2.7 Each startup channel high neutron flux alarm shall be demonstrated OPERABLE by performance of:

*Within 1 hour after the neutron flux is within the startup range following a reactor shutdown.

**With one or more reactor coolant pumps (RCP) operating the sample should be obtained from the hot leg. With no RCP operating, the sample should be obtained from the discharge line of the low pressure safety injection (LPSI) pump operating in the shutdown cooling mode.

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SURVEILLANCE REQUIREMENTS (Continued)

a. A CHANNEL CHECK:

1. At least once per 12 hours.

2. When initially setting setpoints at the following times:

a) One hour after a reactor trip.

b) After a controlled reactor shutdown: Within 1 hour after the neutron flux is within the startup range in MODE 3.

b. A CHANNEL FUNCTIONAL TEST every 31 days of cumulative operation during shutdown.



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TABLE 3.1-1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $K_{eff} > 0.98$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	1 hour	ONA	ONA
4 not on SCS	12 hours	1 hour	ONA	ONA
5 not on SCS	8 hours	1 hour	ONA	ONA
4 & 5 on SCS	ONA	ONA	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation not allowed

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TABLE 3.1-2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT
OPERATIONAL MODES FOR $0.98 > K_{eff} > 0.97$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	2.0 hours	0.5 hours	ONA
4 not on SCS	12 hours	2.5 hours	1 hour	0.5 hours
5 not on SCS	8 hours	2.5 hours	1 hour	0.5 hours
4 & 5 on SCS	8 hours	0.5 hours	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation not allowed

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TABLE 3.1-3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $0.97 > K_{eff} > 0.96$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	3.5 hours	1.5 hours	0.5 hour
4 not on SCS	12 hours	3.5 hours	1.5 hours	1 hour
5 not on SCS	8 hours	3.5 hours	1.5 hours	1 hour
4 & 5 on SCS	8 hours	1 hour	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
 ONA = Operation not allowed

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REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $0.96 \geq K_{eff} > 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	5 hours	2 hours	1 hour
4 not on SCS	12 hours	5 hours	2 hours	1 hour
5 not on SCS	8 hours	5 hours	2 hours	1 hour
4 & 5 on SCS	8 hours	2 hours	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation not allowed

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1 2 3 4 5 6 7 8 9 10

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TABLE 3.1-5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $K_{eff} \leq 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	6 hours	2.5 hours	1.5 hours
4 not on SCS	12 hours	6 hours	3 hours	1.5 hours
5 not on SCS	8 hours	6 hours	3 hours	1.5 hours
4 & 5 on SCS	8 hours	2 hours	1 hour	0.5 hours
6	24 hours	8 hours	4 hours	2 hours

Note: SCS = Shutdown Cooling System

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REACTIVITY CONTROL SYSTEMS

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 All full-length (shutdown and regulating) CEAs, and all part-length CEAs which are inserted in the core, shall be OPERABLE with each CEA of a given group positioned within 6.6 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

- a. With one or more full-length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is satisfied within 1 hour and be in at least HOT STANDBY within 6 hours.
- b. With more than one full-length or part-length CEA inoperable or misaligned from any other CEA in its group by more than 19 inches (indicated position), be in at least HOT STANDBY within 6 hours.
- c. With one or more full-length or part-length CEAs misaligned from any other CEAs in its group by more than 6.6 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with Figure 3.1-2A and that within 1 hour the misaligned CEA(s) is either:
 - 1. Restored to OPERABLE status within its above specified alignment requirements, or
 - 2. Declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is satisfied. After declaring the CEA(s) inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specifications 3.1.3.6 and 3.1.3.7 provided:
 - a) Within 1 hour the remainder of the CEAs in the group with the inoperable CEA(s) shall be aligned to within 6.6 inches of the inoperable CEA(s) while maintaining the allowable CEA sequence and insertion limits and the THERMAL POWER level restrictions of Specifications 3.1.3.6 and 3.1.3.7 during subsequent operation.

*See Special Test Exceptions 3.10.2 and 3.10.4.



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REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is determined at least once per 12 hours.

Otherwise, be in at least HOT STANDBY within 6 hours.

- d. With one full-length CEA inoperable due to causes other than addressed by ACTION a., above, but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.
- e. With one part-length CEA inoperable and inserted in the core, operation may continue provided the alignment of the inoperable part length CEA is maintained within 6.6 inches (indicated position) of all other part-length CEAs in its group and the CEA is maintained pursuant to the requirements of Specification 3.1.3.7.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full-length and part-length CEA shall be determined to be within 6.6 inches (indicated position) of all other CEAs in its group at least once per 12 hours except during time intervals when one CEAC is inoperable or when both CEACs are inoperable, then verify the individual CEA positions at least once per 4 hours.

4.1.3.1.2 Each full-length CEA not fully inserted and each part-length CEA which is inserted in the core shall be determined to be OPERABLE by movement of at least 5 inches in any one direction at least once per 31 days.



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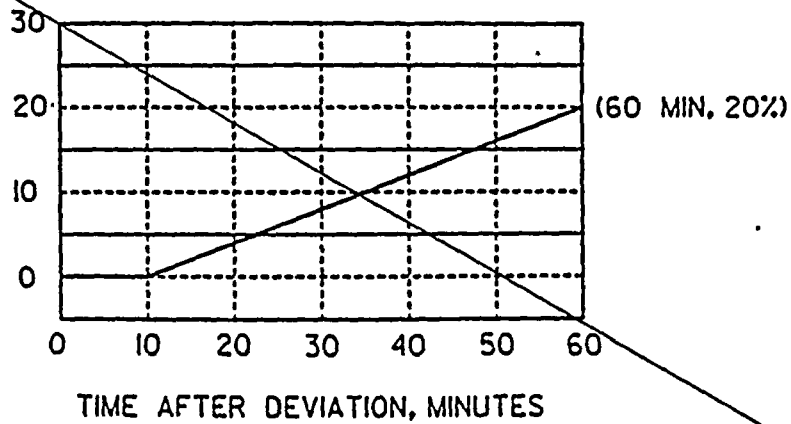
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MINIMUM REQUIRED POWER REDUCTION
(% OF RATED THERMAL POWER)



• WHEN CORE POWER IS REDUCED TO 55% OF RATED THERMAL POWER PER THIS LIMIT CURVE, FURTHER REDUCTION IS NOT REQUIRED

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FIGURE 3.1-2A

CORE POWER LIMIT AFTER CEA DEVIATION*

100

100

100

100

100.00

100

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REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2 At least two of the following three CEA position indicator channels shall be OPERABLE for each CEA:

- a. CEA Reed Switch Position Transmitter (RSPT 1) with the capability of determining the absolute CEA positions within 5.2 inches,
- b. CEA Reed Switch Position Transmitter (RSPT 2) with the capability of determining the absolute CEA positions within 5.2 inches, and
- c. The CEA pulse counting position indicator channel.

APPLICABILITY: MODES 1 and 2.

ACTION:

With a maximum of one CEA per CEA group having only one of the above required CEA position indicator channels OPERABLE, within 6 hours either:

- a. Restore the inoperable position indicator channel to OPERABLE status, or
- b. Be in at least HOT STANDBY, or
- c. Position the CEA group(s) with the inoperable position indicator(s) at its fully withdrawn position while maintaining the requirements of Specifications 3.1.3.1, 3.1.3.5, 3.1.3.6 and 3.1.3.7. Operation may then continue provided the CEA group(s) with the inoperable position indicator(s) is maintained fully withdrawn, except during surveillance testing pursuant to the requirements of Specification 4.1.3.1.2, and each CEA in the group(s) is verified fully withdrawn at least once per 12 hours thereafter by its "Full Out" limit.*

SURVEILLANCE REQUIREMENTS

4.1.3.2 Each of the above required position indicator channels shall be determined to be OPERABLE by verifying that for the same CEA, the position indicator channels agree within 5.2 inches of each other at least once per 12 hours.

*CEAs are fully withdrawn (Full Out) when withdrawn to at least 144.75 inches.



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REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.3.3 At least one CEA Reed Switch Position Transmitter indicator channel shall be OPERABLE for each shutdown, regulating or part-length CEA not fully inserted.

APPLICABILITY: MODES 3*, 4*, and 5*.

ACTION:

With less than the above required position indicator channel(s) OPERABLE, immediately open the reactor trip breakers.

SURVEILLANCE REQUIREMENTS

4.1.3.3 The above required CEA Reed Switch Position Transmitter indicator channel(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

* With the reactor trip breakers in the closed position.

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CEA DROP TIME

LIMITING CONDITION FOR OPERATION

3.1.3.4 The individual full-length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be less than or equal to 4 seconds from when the electrical power is interrupted to the CEA drive mechanism until the CEA reaches its 90% insertion position with:

- a. T_{cold} greater than or equal to 552°F, and
- b. All reactor coolant pumps operating.

APPLICABILITY: MODES 1 and 2.

ACTION:

- a. With the drop time of any full-length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to MODE 1 or 2.

SURVEILLANCE REQUIREMENTS

4.1.3.4 The CEA drop time of full-length CEAs shall be demonstrated through measurement prior to reactor criticality:

- a. For all CEAs following each removal and reinstallation of the reactor vessel head,
- b. For specifically affected individual CEAs following any maintenance on or modification to the CEA drive system which could affect the drop time of those specific CEAs, and
- c. At least once per 18 months.



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REACTIVITY CONTROL SYSTEMS

SHUTDOWN CEA INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown CEAs shall be withdrawn to at least 144.75 inches.

APPLICABILITY: MODES 1 and 2*#.

ACTION:

With a maximum of one shutdown CEA withdrawn to less than 144.75 inches, except for surveillance testing pursuant to Specification 4.1.3.1.2, within 1 hour either:

- a. Withdraw the CEA to at least 144.75 inches, or
- b. Declare the CEA inoperable and comply with Specification 3.1.3.1.

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown CEA shall be determined to be withdrawn to at least 144.75 inches:

- a. Within 15 minutes prior to withdrawal of any CEAs in regulating groups during an approach to reactor criticality, and
- b. At least once per 12 hours thereafter except during time intervals when both CEAC's are inoperable, then verify the individual CEA positions at least once per 4 hours.

* See Special Test Exception 3.10.2.

#With K_{eff} greater than or equal to 1.



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REGULATING CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.6 The regulating CEA groups shall be maintained within the following limits: *specified in the CORE OPERATING LIMITS REPORT*

a. One or more CEAC's OPERABLE

1. The regulating CEA groups shall be limited to the withdrawal sequence, and to the insertion limits ~~### shown on Figure 3.1-3~~ when the COLSS is in service or ~~shown on Figure 3.1-4~~ when the COLSS is not in service. The CEA Insertion between the Long Term Steady State insertion Limits and the Transient Insertion Limits is restricted to:
 - a) Less than or equal to 5 Effective Full Power Days per 30 Effective Full Power Day interval, and
 - b) Less than or equal to 14 Effective Full Power Days per 18 Effective Full Power Months.
2. CEA insertion between the Short Term Steady State Insertion Limits and the Transient Insertion Limits shall be restricted to ≤ 4 hours per 24 hour interval.

b. Both CEAC's INOPERABLE (With or without COLSS in service)

Regulating CEA group 5 may be inserted no further than 127.5 inches withdrawn which is the Transient Insertion Limit when both CEAC's are inoperable.

Regulating CEA groups which are excluded by these insertion limits must be maintained fully withdrawn ≥ 144.75 inches, which is the Transient Insertion Limit except for surveillance testing pursuant to Specification 4.1.3.1.2.

APPLICABILITY: MODES 1* and 2*#.

ACTION:

- a. With the regulating CEA groups inserted beyond the Transient Insertion Limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, within 2 hour either:

1. Restore the regulating CEA groups to within the limits, or

*See Special Test Exceptions 3.10.2 and 3.10.4.

#With K_{eff} greater than or equal to 1.

##A reactor power cutback will cause either (Case 1) Regulating Group 5 or Regulating Group 4 and 5 to be dropped with no sequential insertion of additional Regulating Groups (Groups 1, 2, 3, and 4) or (Case 2) Regulating Group 5 or Regulating Group 4 and 5 to be dropped with all or part of the remaining Regulating Groups (Groups 1, 2, 3, and 4) being sequentially inserted. In either case, the Transient Insertion Limit and the withdrawal sequence ~~of Figure 3.1-3 or Figure 3.1-4~~ can be exceeded for up to 2 hours.

specified in the CORE OPERATING LIMITS REPORT

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REGULATING CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

2. Reduce THERMAL POWER as follows:

a) One or more CEAC's OPERABLE

- 1) Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the CEA group position using Figures 3.1-3 or 3.1-4, or specified in the CORE OPERATING LIMITS REPORT
- 2) Be in at least HOT STANDBY within 6 hours.

b) Both CEAC's INOPERABLE

Be in at least HOT STANDBY within 6 hours.

b. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Transient Insertion Limits for intervals greater than 5 EFPD per 30 EFPD interval or greater than 14 EFPD per 18 Effective full Power Months, either:

1. Restore the regulating groups to within the Long Term Steady State Insertion Limits within 2 hours, or
2. Be in at least HOT STANDBY within 6 hours.

c. With the regulating CEA groups inserted between the Short Term Steady State Insertion Limits and the Transient Insertion Limits for intervals > 4 hours per 24 hour interval, operation may proceed provided any subsequent increase in THERMAL POWER is restricted to $\leq 5\%$ of RATED THERMAL POWER per hour.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The position of each regulating CEA group shall be determined to be within the Transient Insertion Limits at least once per 12 hours except during time intervals when the PDIL Auctioneer Alarm Circuit is inoperable, or both CEAC's are inoperable, then verify the CEA group positions at least once per 4 hours. The accumulated times during which the regulating CEA groups are inserted beyond the Long Term Steady State Insertion Limits but within the Transient Insertion Limits shall be determined at least once per 24 hours.

1. *Pharmaceutical industry* – The pharmaceutical industry is a major contributor to the economy of the United States. It is a highly competitive industry with a high level of innovation. The industry is characterized by a high level of research and development (R&D) spending, which is a key factor in its success. The industry is also characterized by a high level of marketing spending, which is used to promote its products. The industry is a major source of employment in the United States.

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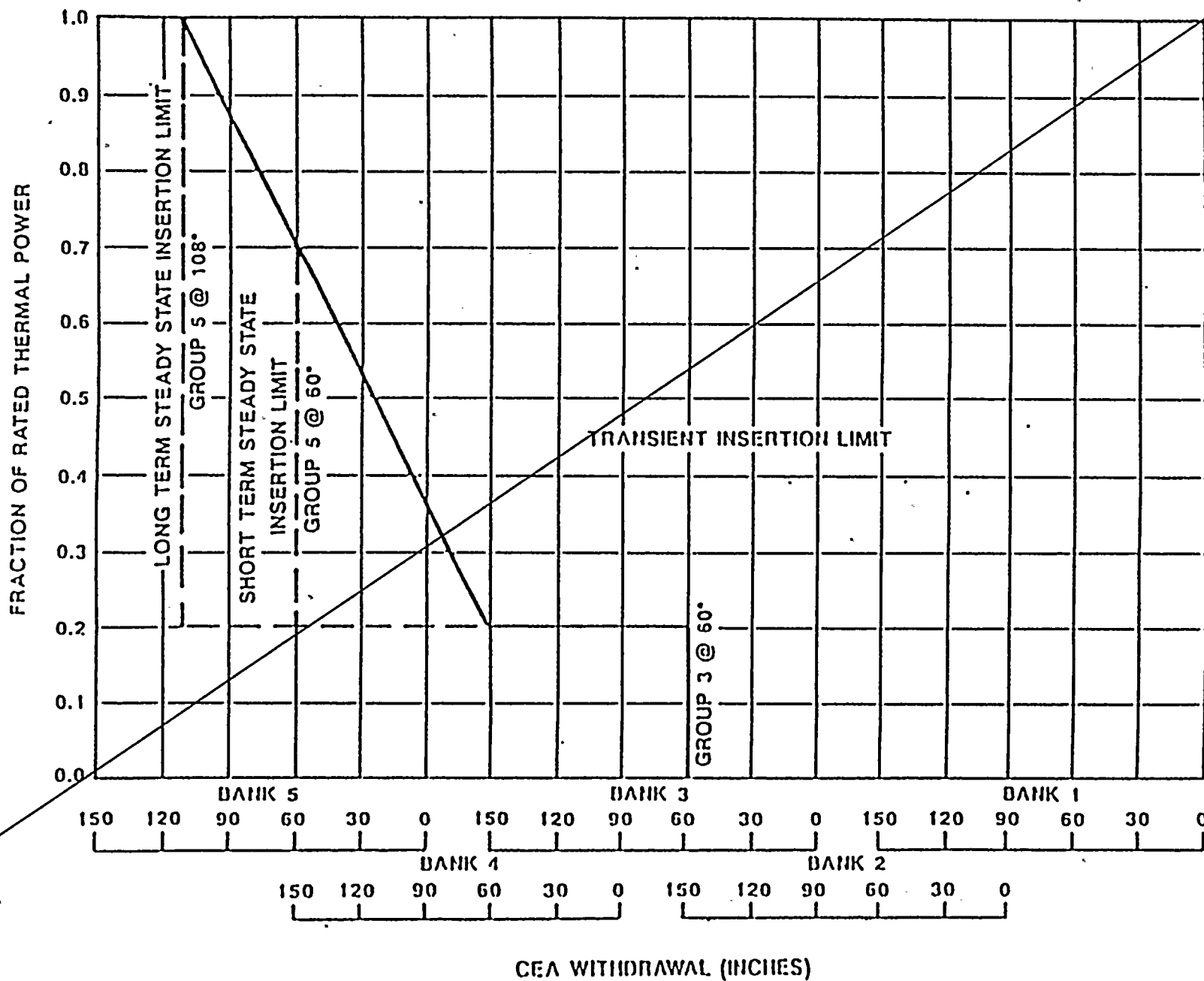
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FIGURE 3.1-3
CEA INSERTION LIMITS vs. THERMAL POWER
(COLSS IN SERVICE)



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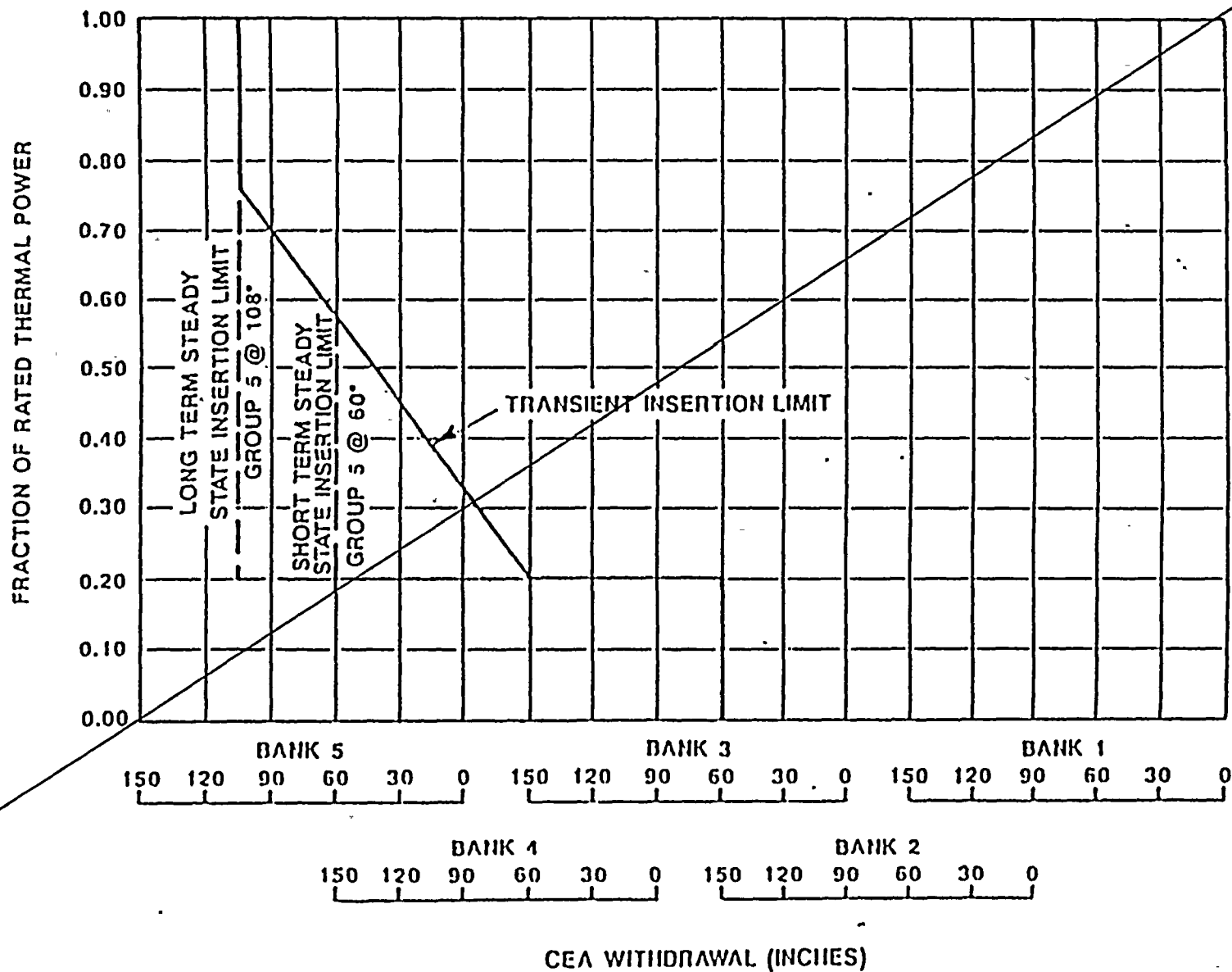
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FIGURE 3.1-4
CEA INSERTION LIMITS vs. THERMAL POWER
(COLSS OUT OF SERVICE)



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REACTIVITY CONTROL SYSTEMS

PART LENGTH CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.7 The part length CEA groups shall be maintained within the following limits with COLSS in service or out of service:

a. One or more CEACs OPERABLE

Specified in the CORE OPERATING LIMITS REPORT

The part length CEA groups shall be limited to the insertion limits shown on Figure 3.1-5 with PLCEA insertion between the Long Term Steady State Insertion Limit and the Transient Insertion Limit restricted to:

1. ≤ 7 EFPD per 30 EFPD interval, and
2. ≤ 14 EFPD per calendar year.

b. Both CEACs INOPERABLE

The part length CEA groups must be maintained fully withdrawn (> 144.75 inches) which is the Transient Insertion Limit when both CEACs are inoperable.

APPLICABILITY: MODES 1* and 2*

ACTION:

a. With the part length CEA groups inserted beyond the Transient Insertion Limit, except for surveillance testing pursuant to Specification 4.1.3.1.2, within two hours, either;

1. Restore the part length CEA groups to within the limits, or
2. Reduce THERMAL POWER as follows:

a) One or more CEACs OPERABLE

- 1) Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the PLCEA group position, using Figure 3.1-5, or

- 2) Specified in the CORE OPERATING LIMITS REPORT
Be in at least HOT STANDBY within 6 hours.

b) Both CEACs INOPERABLE

Be in at least HOT STANDBY within 6 hours.

*See Special Test Exceptions 3.10.2 and 3.10.4.

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REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- b. With the part length CEA groups inserted between the Long Term Steady State Insertion Limit and the Transient Insertion Limit for intervals > 7 EFPD per 30 EFPD interval or > 14 EFPD per calendar year, either:
 1. Restore the part length group within the Long Term Steady State Insertion Limit within two hours, or
 2. Be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.7 The positions of the part length CEA groups shall be determined to be within the Transient Insertion Limit at least once per 12 hours except during time intervals when both CEACs are inoperable then verify the part length CEA group positions at least once per 4 hours.



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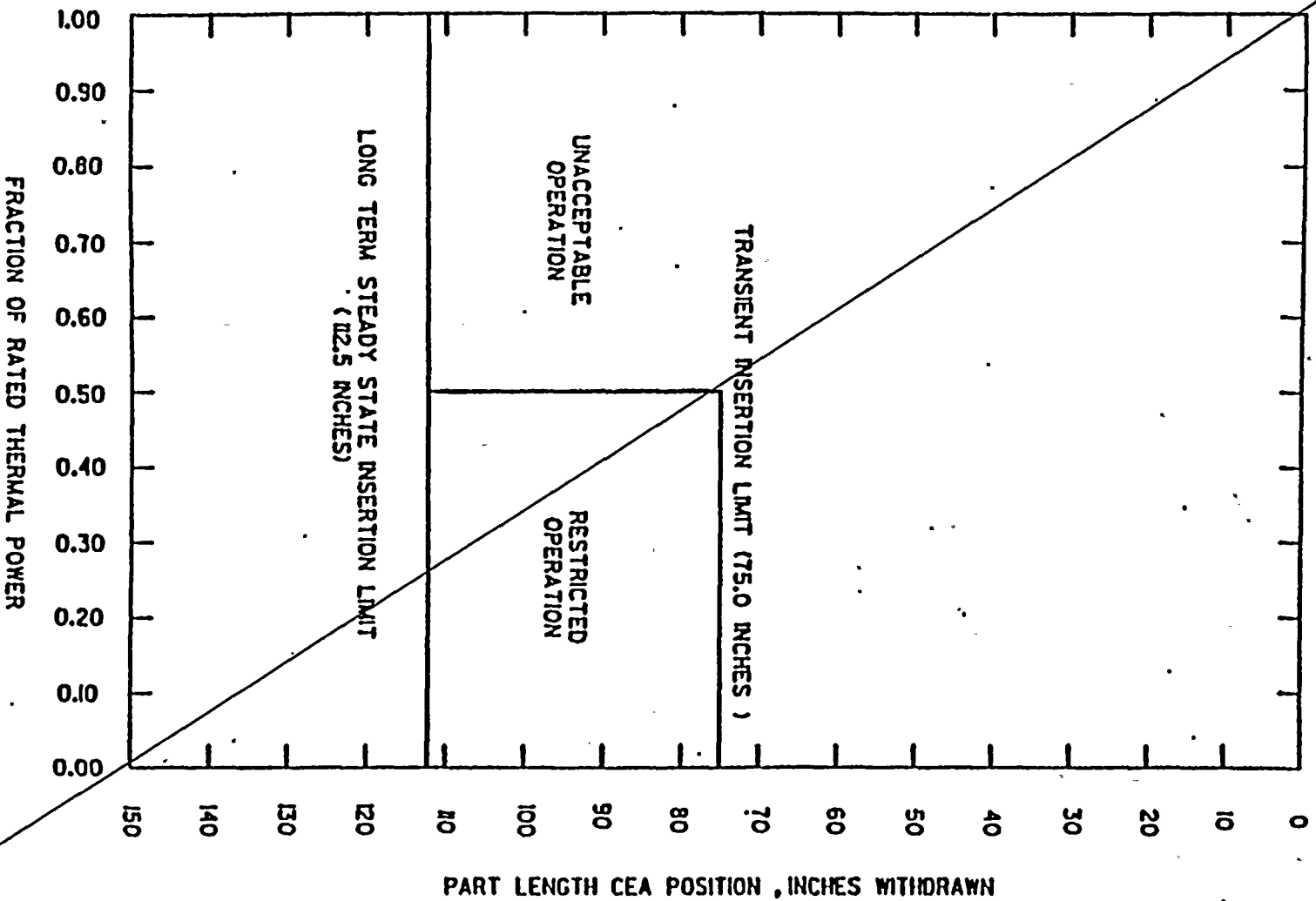


FIGURE 3.1-5

PART LENGTH CEA INSERTION LIMIT VS THERMAL POWER

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3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

specified in the CORE OPERATING LIMITS REPORT

3.2.1 The linear heat rate limit ~~of 13.5 kW/ft~~ shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to the COLSS calculated power operating limit based on linear heat rate (when COLSS is in service); or
- b. Maintaining peak linear heat rate within its limit using any operable CPC channel (when COLSS is out of service).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With the linear heat rate limit not being maintained as indicated by:

1. COLSS calculated core power exceeding the COLSS calculated core power operating limit based on linear heat rate; or
2. Peak linear heat rate outside its limit using any operable CPC channel (when COLSS is out of service);

within 15 minutes initiate corrective action to reduce the linear heat rate to within the limits and either:

- a. Restore the linear heat rate to within its limits within 1 hour, or
- b. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limit when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within its limit.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on linear heat rate.

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POWER DISTRIBUTION LIMITS

3/4.2.3 AZIMUTHAL POWER TILT - T_q

LIMITING CONDITION FOR OPERATION

3.2.3 The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the following limits:

- a. The AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs), and

specified in the CORE OPERATING LIMITS REPORT

- b.1. The limit ~~in Figure 3.2-1A~~ with COLSS in service, or

- b.2. $T_q \leq 0.10$ with COLSS out of service.

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.

specified in the CORE OPERATING LIMITS REPORT

- b. With the measured AZIMUTHAL POWER TILT determined to exceed the limit ~~in Figure 3.2-1A~~ with COLSS in service or 0.10 with COLSS out of service:

1. Due to misalignment of either a part-length or full-length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1 and 4.2.4) is detecting the CEA misalignment.
2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and verify that the Variable Overpower Trip Setpoint has been reduced as appropriate within the next 4 hours.
3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

*See Special Test Exception 3.10.2.

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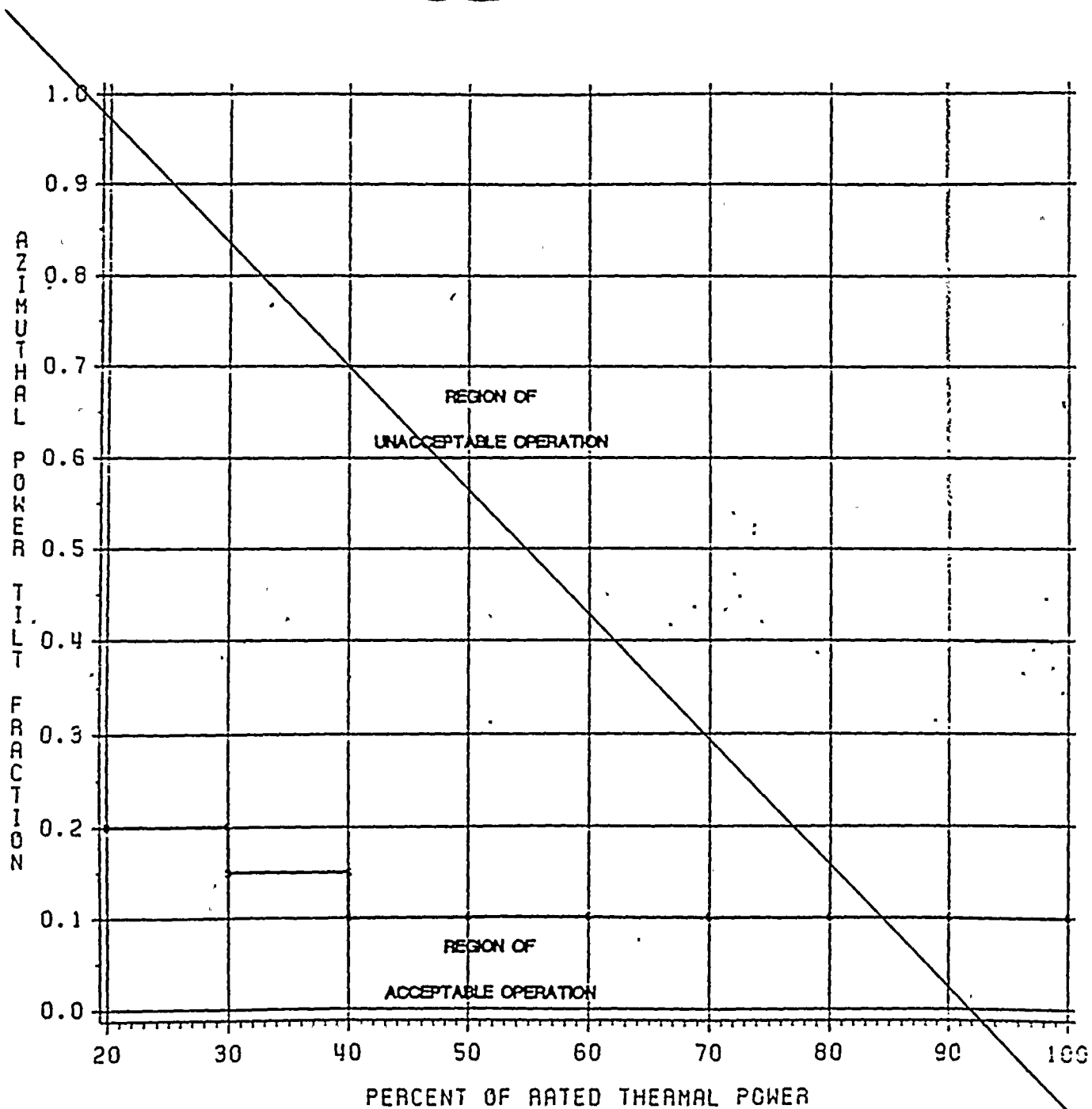


FIGURE 3.2 - 1A
AZIMUTHAL POWER TILT LIMIT
VS
THERMAL POWER
(COLSS IN SERVICE)

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POWER DISTRIBUTION LIMITS

3/4.2.4 DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by one of the following methods:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
specified in the CORE OPERATING LIMITS REPORT
- b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance shown in Figure 3.2-1 (when COLSS is in service and neither CEAC is operable); or
specified in the CORE OPERATING LIMITS REPORT
- c. Operating within the region of acceptable operation of Figure 3.2-2 using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
specified in the CORE OPERATING LIMITS REPORT
- d. Operating within the region of acceptable operation of Figure 3.2-2A using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With the DNBR not being maintained:

1. As indicated by COLSS calculated core power exceeding the appropriate COLSS calculated power operating limit; or
2. With COLSS out of service, operation outside the region of acceptable operation of Figure 3.2-2 or 3.2-2A, as applicable;
specified in the CORE OPERATING LIMITS REPORT

within 15 minutes initiate corrective action to increase the DNBR to within the limits and either:

- a. Restore the DNBR to within its limits within 1 hour, or
- b. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit shown on Figure 3.2-2 or Figure 3.2-2A.
specified in the CORE OPERATING LIMITS REPORT

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

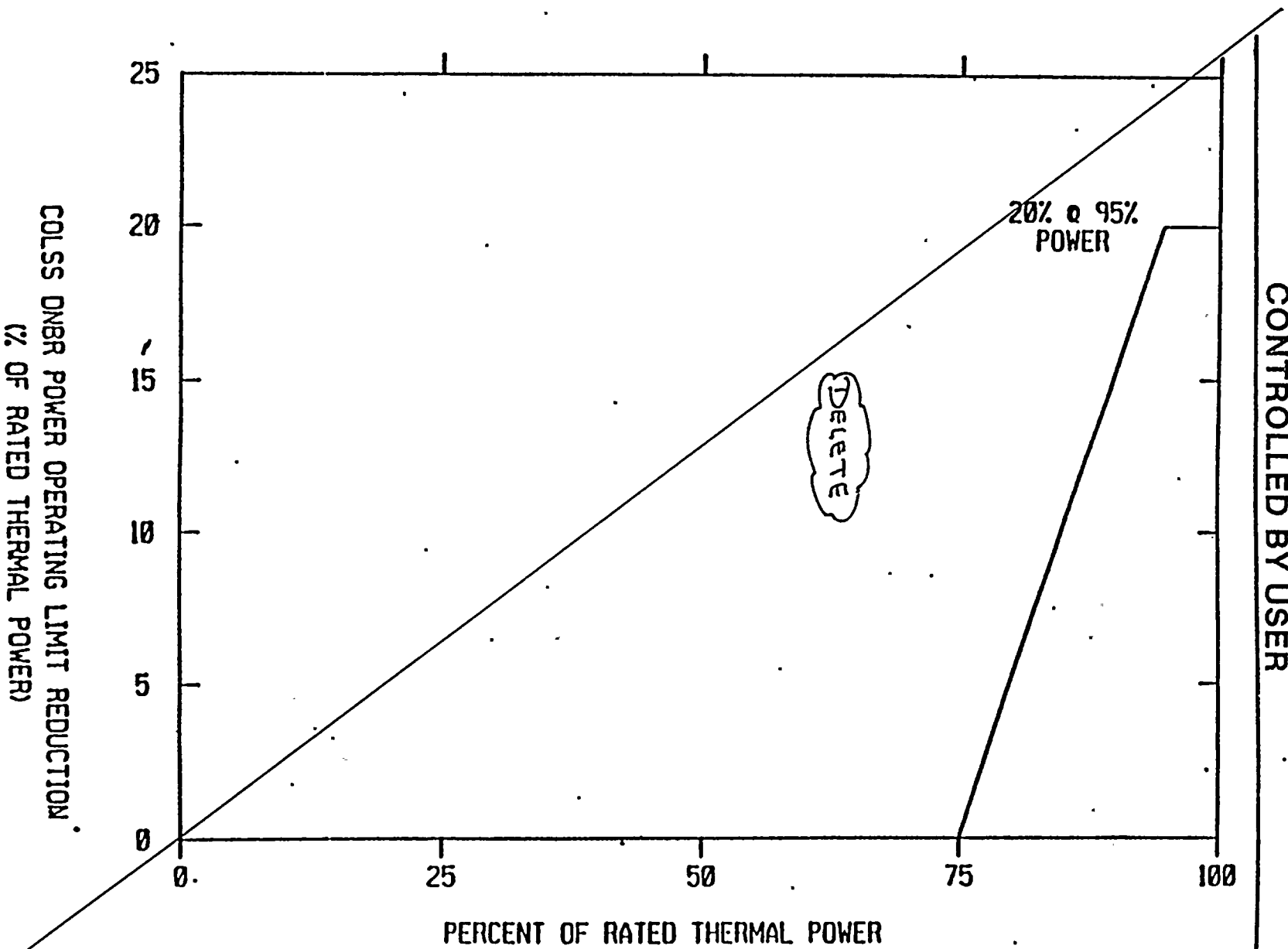
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COLSS DNBR POWER OPERATING LIMIT
REDUCTION (% OF RATED THERMAL POWER)

FIGURE 3.2-1

COLSS DNBR POWER OPERATING LIMIT
ALLOWANCE FOR BOTH CEACS INOPERABLE

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COLSS OUT OF SERVICE DNBR LIMIT LINE

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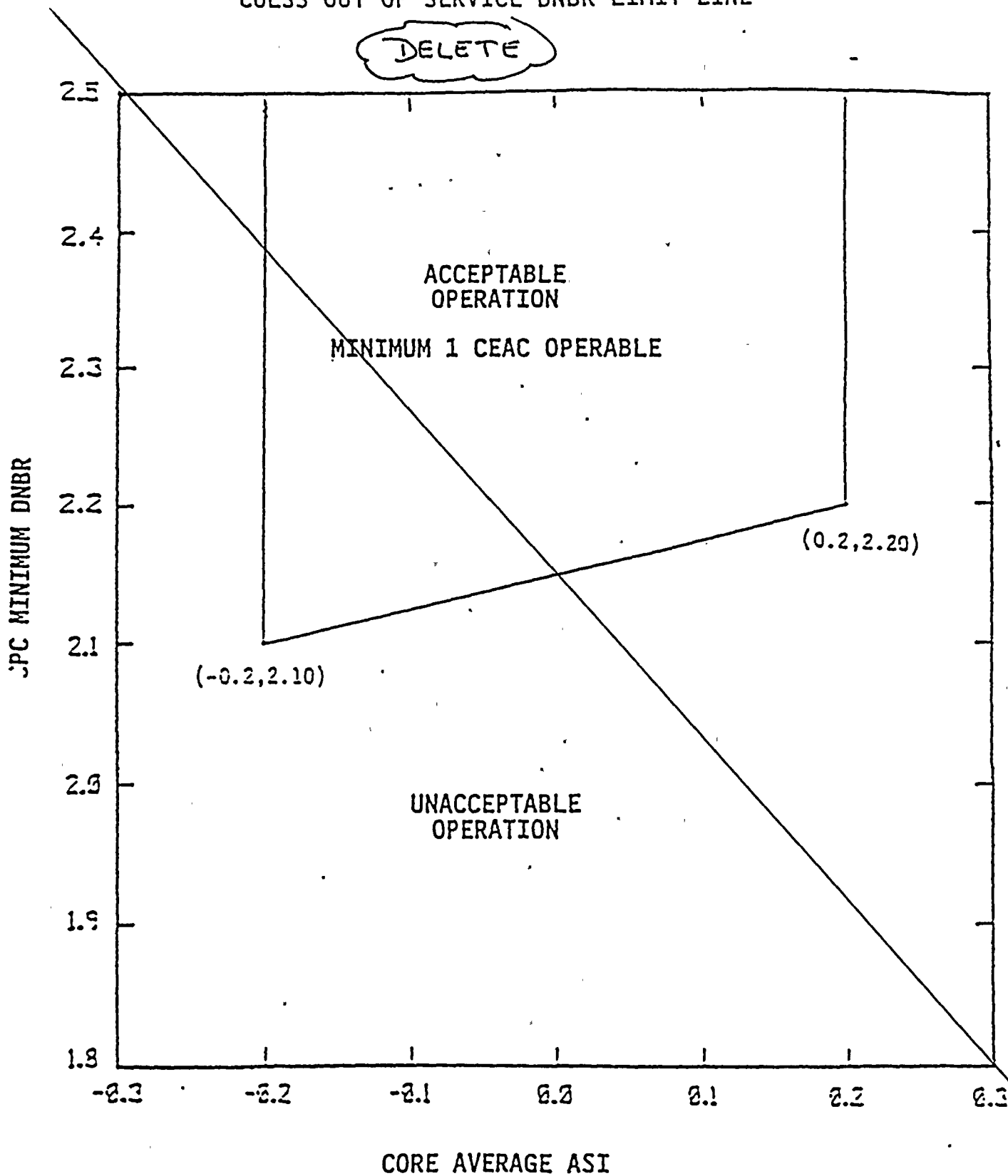


FIGURE 3.2-2

DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEACs OPERABLE)

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COLSS OUT OF SERVICE DNBR LIMIT LINE

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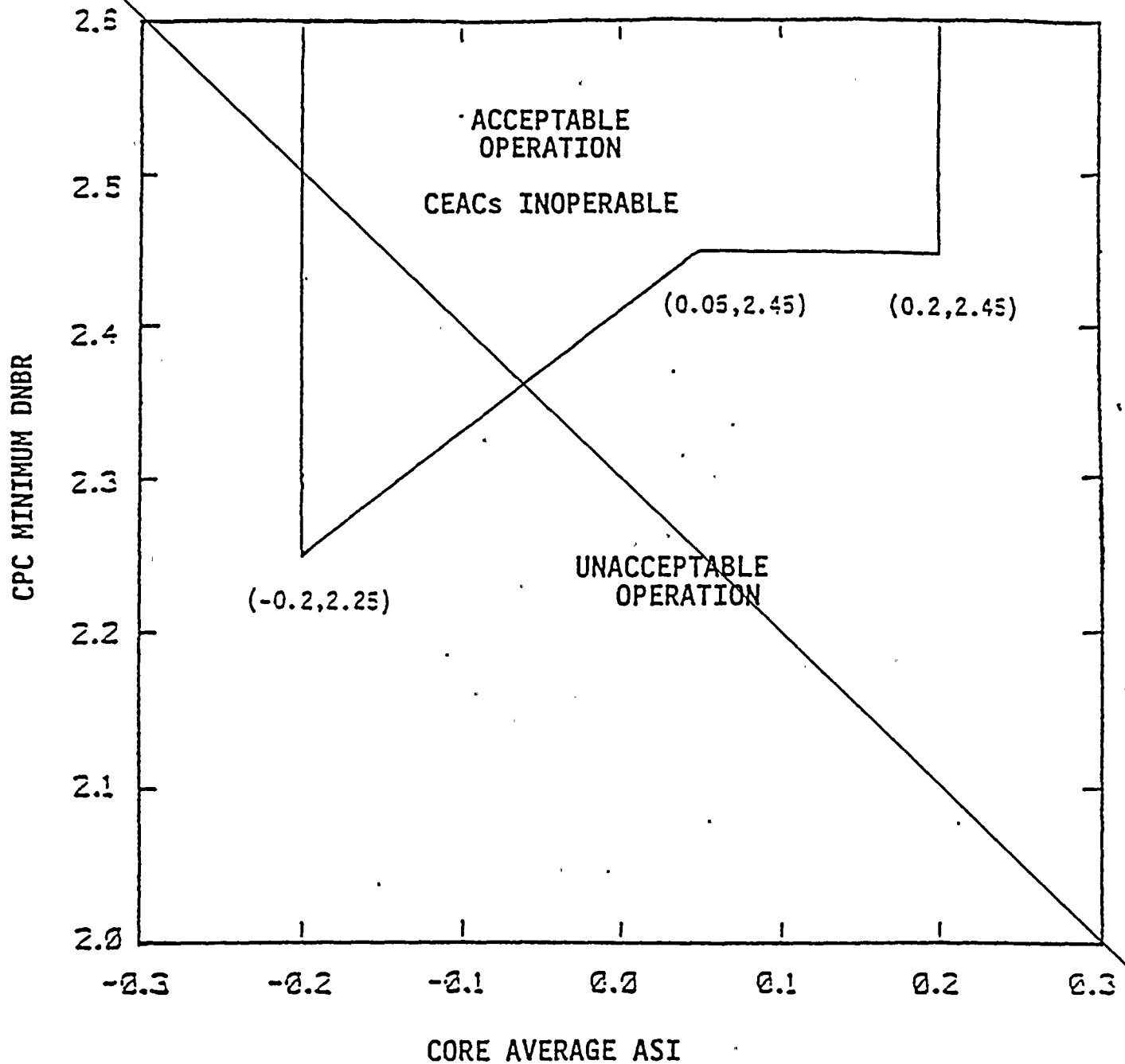


FIGURE 3.2-2a

DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEACs INOPERABLE)

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POWER DISTRIBUTION LIMITS

3/4.2.5 RCS FLOW RATE

LIMITING CONDITION FOR OPERATION

3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to 155.8×10^6 lbm/hr.

APPLICABILITY: MODE 1.

ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5 The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to its limit at least once per 12 hours.

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POWER DISTRIBUTION LIMITS

3/4.2.6 REACTOR COOLANT COLD LEG TEMPERATURE

LIMITING CONDITION FOR OPERATION

3.2.6 The reactor coolant cold leg temperature (T_c) shall be within the Area of Acceptable Operation shown in Figure 3.2-3.

3.2-1

APPLICABILITY: MODES 1* and 2*#.

ACTION:

With the reactor coolant cold leg temperature exceeding its limit, restore the temperature to within its limit within 2 hours or be in HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.6 The reactor coolant cold leg temperature shall be determined to be within its limit at least once per 12 hours.

*See Special Test Exception 3.10.4.

#With K_{eff} greater than or equal to 1



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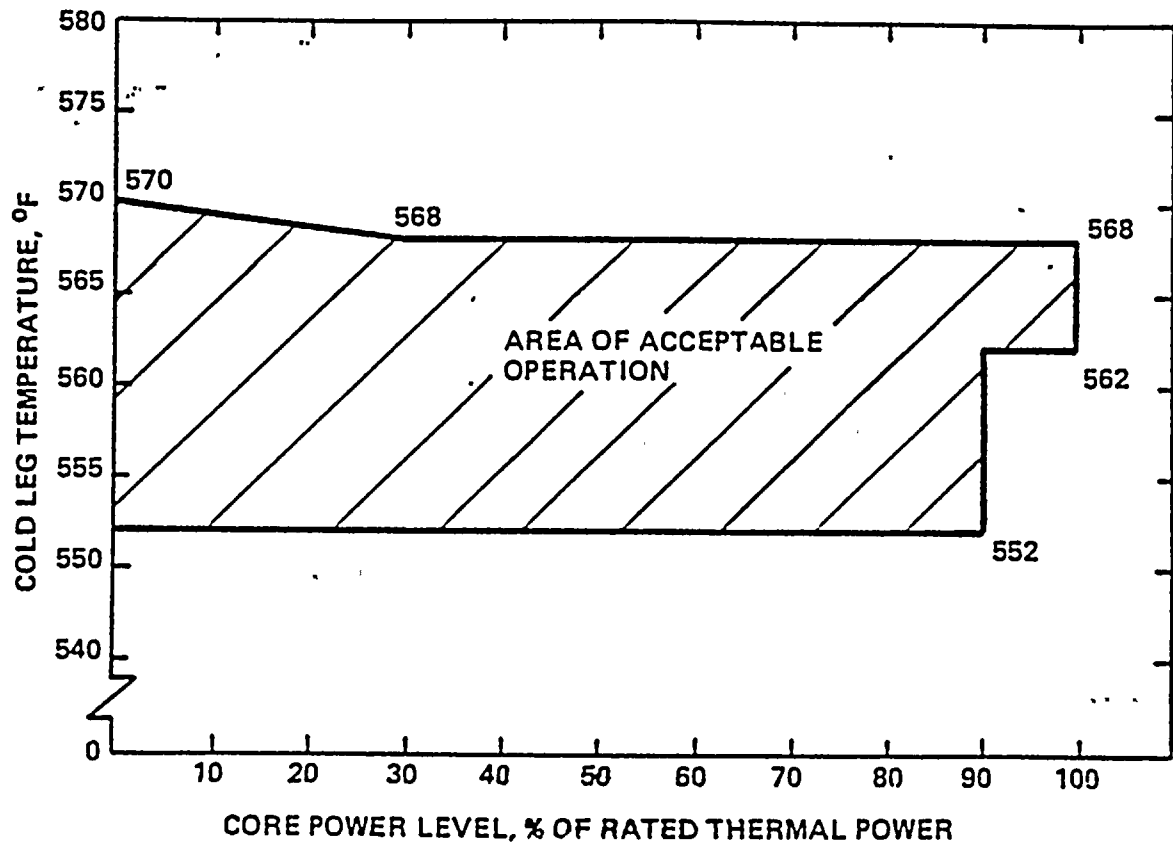


FIGURE 3.2-8

REACTOR COOLANT COLD LEG TEMPERATURE VS. CORE POWER LEVEL



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POWER DISTRIBUTION LIMITS

3/4.2.7 AXIAL SHAPE INDEX

LIMITING CONDITION FOR OPERATION

3.2.7 The core average AXIAL SHAPE INDEX (ASI) shall be maintained within the following limits ^{as specified in the CORE OPERATING LIMITS REPORT.}

a. ~~COLSS OPERABLE~~
 ~~$-0.27 \leq ASI \leq 0.27$~~

b. ~~COLSS OUT OF SERVICE (CPC)~~
 ~~$-0.20 \leq ASI \leq +0.20$~~

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

With the core average AXIAL SHAPE INDEX outside ^{the} its ~~above-limits~~, restore the core average ASI to within its limit within 2 hours or reduce THERMAL POWER to less than 20% of RATED THERMAL POWER within the next 4 hours.

specified in the CORE OPERATING LIMITS REPORT

SURVEILLANCE REQUIREMENTS

3.2.7 The core average AXIAL SHAPE INDEX shall be determined to be within its limit at least once per 12 hours using the COLSS or any OPERABLE Core Protection Calculator channel.

* See Special Test Exception 3.10.2.

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POWER DISTRIBUTION LIMITS

3/4.2.8 PRESSURIZER PRESSURE

LIMITING CONDITION FOR OPERATION

3.2.8 The pressurizer pressure shall be maintained between 2025 psia and 2300 psia.

APPLICABILITY: MODES 1 and 2.

ACTION:

With the pressurizer pressure outside its above limits, restore the pressure to within its limit within 2 hours or be in at least HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.8 The pressurizer pressure shall be determined to be within its limit at least once per 12 hours.



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EMERGENCY CORE COOLING SYSTEMS

3/4.5.4 REFUELING WATER TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water tank (RWT) shall be OPERABLE with:

- a. A minimum borated water volume as specified in Figure ^{3.1-1}~~3.1-2~~ of Specification 3.1.2.5, and
- b. A boron concentration between 4000 and 4400 ppm of boron, and
- c. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 1, 2, 3; and 4.

ACTION:

With the refueling water tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWT shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1. Verifying the contained borated water volume in the tank, and
 - 2. Verifying the boron concentration of the water.
- b. At least once per 24 hours by verifying the RWT temperature when the (outside) air temperature is outside the 60°F to 120°F range.

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REACTIVITY CONTROL SYSTEMS

BASES

MOVABLE CONTROL ASSEMBLIES (Continued)

and load maneuvering. Analyses are performed based on the expected mode of operation of the NSSS (base load maneuvering, etc.) and from these analyses CEA insertions are determined and a consistent set of radial peaking factors defined. The Long Term Steady State and Short Term Insertion Limits are determined based upon the assumed mode of operation used in the analyses and provide a means of preserving the assumptions on CEA insertions used. The limits specified serve to limit the behavior of the radial peaking factors within the bounds determined from analysis. The actions specified serve to limit the extent of radial xenon redistribution effects to those accommodated in the analyses. The Long and Short Term Insertion Limits of Specifications 3.1.3.6 and 3.1.3.7 are specified for the plant which has been designed for primarily base loaded operation but which has the ability to accommodate a limited amount of load maneuvering.

The Transient Insertion Limits of Specifications 3.1.3.6 and 3.1.3.7 the Shutdown CEA Insertion Limits of Specification 3.1.3.5 ensure that (1) the minimum SHUTDOWN MARGIN is maintained, and (2) the potential effects of a CEA ejection accident are limited to acceptable levels. Long-term operation at the Transient Insertion Limits is not permitted since such operation could have effects on the core power distribution which could invalidate assumptions used to determine the behavior of the radial peaking factors.

The PVNGS CPC and COLSS systems are responsible for the safety and monitoring functions, respectively, of the reactor core. COLSS monitors the DNB Power Operating Limit (POL) and various operating parameters to help the operator maintain plant operation within the limiting conditions for operation (LCO). Operating within the LCO guarantees that in the event of an Anticipated Operational Occurrence (AOO), the CPCs will provide a reactor trip in time to prevent unacceptable fuel damage.

specified in the CORE OPERATING LIMITS REPORT

The COLSS reserves the Required Overpower Margin (ROPM) to account for the Loss of Flow (LOF) and CEA misoperation transients. When the COLSS is Out of Service (COOS), the monitoring function is performed via the CPC calculation of DNBR in conjunction with Technical Specification COOS Limit Lines, ~~(Figures 3.2-2 and 3.2-2A)~~ which restricts the reactor power sufficiently to preserve the ROM.

The reduction of the CEA deviation penalties in accordance with the CEAC (Control Element Assembly Calculator) sensitivity reduction program has been performed. This task involved setting many of the inward single CEA deviation penalty factors to 1.0. An inward CEA deviation event in effect would not be accompanied by the application of the CEA deviation penalty in either the CPC DNB and LHR (Linear Heat Rate) calculations for those CEAs with the reduced penalty factors. The protection for an inward CEA deviation event is thus accounted for separately.

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REACTIVITY CONTROL SYSTEMS

BASES

MOVABLE CONTROL ASSEMBLIES (Continued)

in the CORE OPERATING LIMITS REPORTS

If an inward CEA deviation event occurs, the current CPC algorithm applies two penalty factors to each of the DNB and LHR calculations. The first, a static penalty factor, is applied upon detection of the event. The second, a xenon redistribution penalty, is applied linearly as a function of time after the CEA drop. The expected margin degradation for the inward CEA deviation event for which the penalty factor has been reduced is accounted for in two ways. The ROPM reserved in COLSS is used to account for some of the margin degradation. Further, a power reduction in accordance with the curve ~~in Figure 3.1-2A~~ is required. In addition, the part length CEA maneuvering is restricted in accordance with ~~Figure 3.1-5~~ to justify reduction of the PLR deviation penalty factors.

limits specified in the CORE OPERATING LIMITS REPORT

The technical specification permits plant operation if both CEACs are considered inoperable for safety purposes after this period.

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3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE

The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limits ~~of 13.5 kW/ft~~ are not exceeded. *specified in the CORE OPERATING LIMITS REPORT*

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the maximum linear heat rate calculated by COLSS is conservative with respect to the actual maximum linear heat rate existing in the core. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB, and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the linear heat rate limit can be maintained by utilizing any operable CPC channel. The above listed uncertainty and penalty factors plus those associated with the CPC startup test acceptance criteria are also included in the CPCs.

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POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic surveillance requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provides assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

3/4.2.3 AZIMUTHAL POWER TILT - T_q

specified in the CORE OPERATING LIMITS REPORT

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than the limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

The AZIMUTHAL POWER TILT is equal to $(P_{\text{tilt}}/P_{\text{untilt}})-1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_q g \cos (\theta - \theta_0)$$

where:

T_q is the peak fractional tilt amplitude at the core periphery

g is the radial normalizing factor

θ is the azimuthal core location

θ_0 is the azimuthal core location of maximum tilt

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POWER DISTRIBUTION LIMITS

BASES

AZIMUTHAL POWER TILT - T_q (Continued)

$P_{\text{tilt}}/P_{\text{untilt}}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions and which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on DNBR includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the core power limits calculated by COLSS (based on the minimum DNBR Limit) is conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement. specified in the CORE OPERATING LIMITS REPORT

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits of ~~Figures 3.2-2 and 3.2-2A~~ can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

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ADMINISTRATIVE CONTROLS

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (Continued)

The Semiannual Radioactive Effluent Release Report to be submitted 60 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1, October 1977.

The Semiannual Radioactive Effluent Release Reports shall include the following information for each class of solid waste (as defined by 10 CFR Part 61) shipped offsite during the report period:

- a. Container volume,
- b. Total curie quantity (specify whether determined by measurement or estimate),
- c. Principal radionuclides (specify whether determined by measurement or estimate),
- d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),
- e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and
- f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Semiannual Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Semiannual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM and to the OFFSITE DOSE CALCULATION MANUAL, as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

SPECIAL REPORTS

← INSERT 2

6.9.2 Special reports shall be submitted to the Regional Administrator of the Regional Office of the NRC within the time period specified for each report.

6.9.3 Violations of the requirements of the fire protection program described in the Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be reported in accordance with 10 CFR 50.73.

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CORE OPERATING LIMITS REPORT

6.9.1.9 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, and are as follows:

"C-E Method for Control Element Assembly Ejection Analysis,"
CENPD-190-A, January, 1976;

"The ROCS and DIT Computer Codes for Nuclear Design,"
CENPD-266-P-A, April, 1983;

"INCA/CECOR Power Peaking Uncertainty," CENPD-153-P, Revision
1-P-A, May, 1980;

"Safety Evaluation Report Related to the Final Design of the
Standard Nuclear Steam Supply Reference Systems CESSAR System
80, Docket No. STN 50-470," NUREG-0852 (November 1981),
Supplements No. 1 (March 1983), No. 2 (September 1983), No. 3
(December 1987);

"Modified Statistical Combination of Uncertainties,"
CEN-356(V)-P-A, Revision 01-P-A, May, 1988.

The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermalhydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements thereto, shall be provided upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

PVNGS UNIT 3

**MARKED UP TECHNICAL SPECIFICATIONS
TO SUPPORT NRC GENERIC LETTER 88-16**

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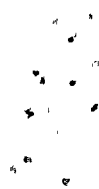
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DEFINITIONS

DOSE EQUIVALENT I-131

1.10 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134 and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites."

\bar{E} - AVERAGE DISINTEGRATION ENERGY

1.11 \bar{E} shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half-lives greater than 15 minutes, making up at least 95% of the total noniodine activity in the coolant.

ENGINEERED SAFETY FEATURES RESPONSE TIME

1.12 The ENGINEERED SAFETY FEATURES RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays where applicable.

FREQUENCY NOTATION

1.13 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

GASEOUS RADWASTE SYSTEM

1.14 A GASEOUS RADWASTE SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

IDENTIFIED LEAKAGE

1.15 IDENTIFIED LEAKAGE shall be:

- a. Leakage into closed systems, other than reactor coolant pump controlled bleed-off flow, such as pump seal or valve packing leaks that are captured and conducted to a sump or collecting tank, or
- b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or
- c. Reactor Coolant System leakage through a steam generator to the secondary system.



INSERT 1

CORE OPERATING LIMITS REPORT

1.9a The CORE OPERATING LIMITS REPORT is the unit-specific document that provides core operating limits for the current operating reload cycle. These cycle-specific core operating limits shall be determined for each reload cycle in accordance with Technical Specification 6.9.1. Plant operation within these operating limits is addressed in individual specifications.



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REACTIVITY CONTROL SYSTEMS

SHUTDOWN MARGIN - K_{N-1} - ANY CEA WITHDRAWN

LIMITING CONDITION FOR OPERATION

3.1.1.2

Specified in the CORE OPERATING LIMITS REPORT

- a. The SHUTDOWN MARGIN shall be greater than or equal to that ~~shown in Figure 3.1-1A,~~ and
- b. For T_{cold} less than or equal to 500°F, K_{N-1} shall be less than 0.99.

APPLICABILITY: MODES 1, 2*, 3*, 4*, and 5* with any full-length CEA fully or partially withdrawn.

ACTION:

Specified in the CORE OPERATING LIMITS REPORT

- a. With the SHUTDOWN MARGIN less than that ~~in Figure 3.1-1A,~~ immediately initiate and continue boration at greater than or equal to 26 gpm to the reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored, and
- b. With T_{cold} less than or equal to 500°F and K_{N-1} greater than or equal to 0.99, immediately vary CEA positions and/or initiate and continue boration at greater than or equal to 26 gpm to the reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required K_{N-1} is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.2.1 With any full-length CEA fully or partially withdrawn, the SHUTDOWN MARGIN shall be ~~determined to be greater than or equal to that in Figure 3.1-1A:~~

Specified in the CORE OPERATING LIMITS REPORT

- a. ~~Within 1 hour~~ after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable as a result of excessive friction or mechanical interference or known to be untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

*See Special Test Exceptions 3.10.1 and 3.10.9.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are written in a printed hand. The list is organized in two columns, with names on the left and addresses on the right.

2. The second part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are written in a printed hand. The list is organized in two columns, with names on the left and addresses on the right.

3. The third part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are written in a printed hand. The list is organized in two columns, with names on the left and addresses on the right.

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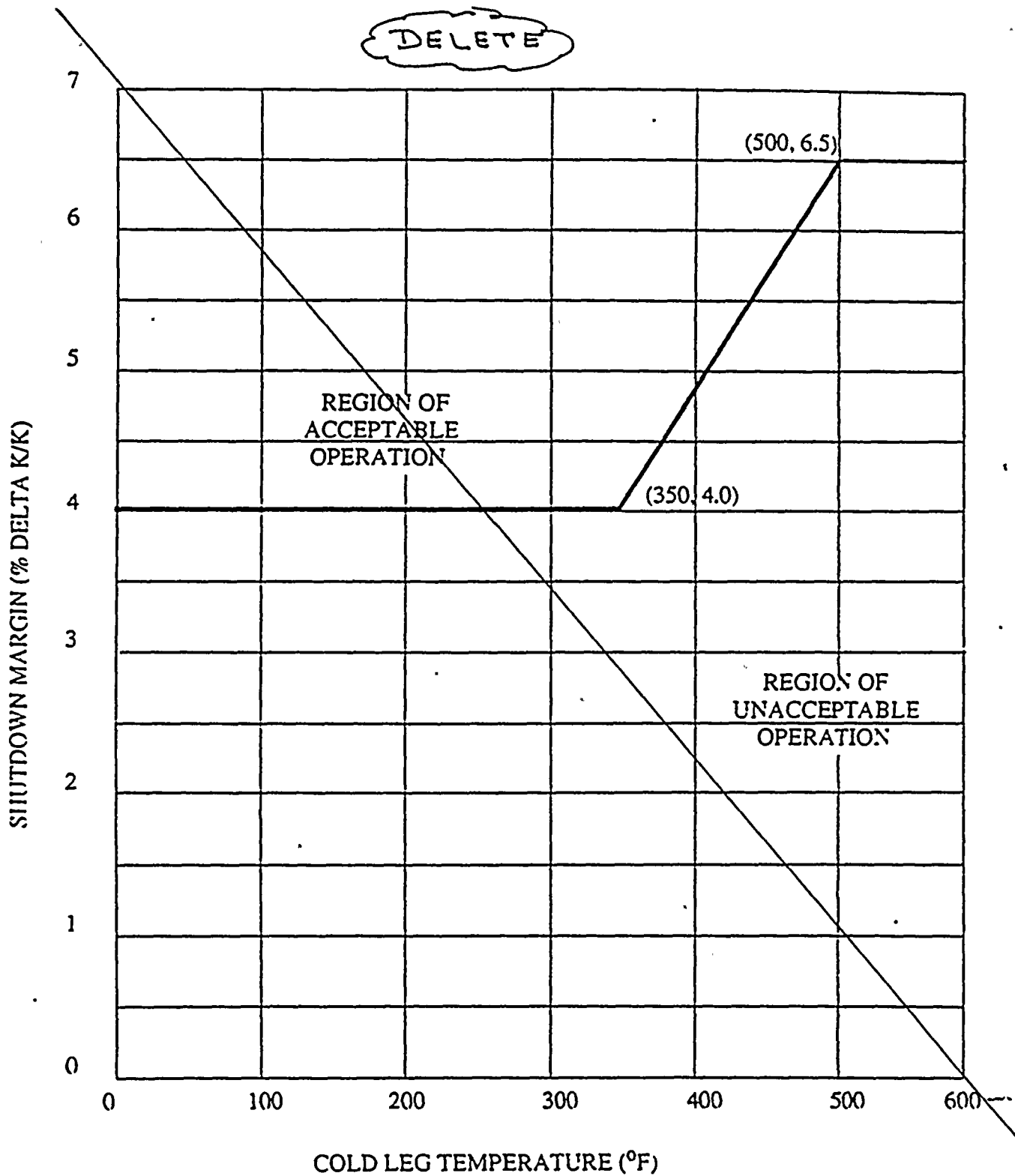


FIGURE 3.1-1A

SHUTDOWN MARGIN VERSUS COLD LEG TEMPERATURE

1971. 3. 4

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MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

specified in the CORE OPERATING LIMITS REPORT

3.1.1.3 The moderator temperature coefficient (MTC) shall be within the area of Acceptable Operation, ~~shown on Figure 3.1-1.~~

APPLICABILITY: MODES 1 and 2*#.

ACTION:

specified in the CORE OPERATING LIMITS REPORT

With the moderator temperature coefficient outside the area of Acceptable Operation, ~~shown on Figure 3.1-1,~~ be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.1.3.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the above limits, specified in the CORE OPERATING LIMITS REPORT.

4.1.1.3.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

- a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.
- b. At any THERMAL POWER, within 7 EFPD after reaching a core average exposure of 40 EFPD burnup into the current cycle.
- c. At any THERMAL POWER, within 7 EFPD after reaching a core average exposure equivalent to two-thirds of the expected current cycle end-of-cycle core average burnup.

*With Keff greater than or equal to 1.0.

#See Special Test Exception 3.10.2.

1. The first part of the document is a list of names and addresses of the members of the committee.

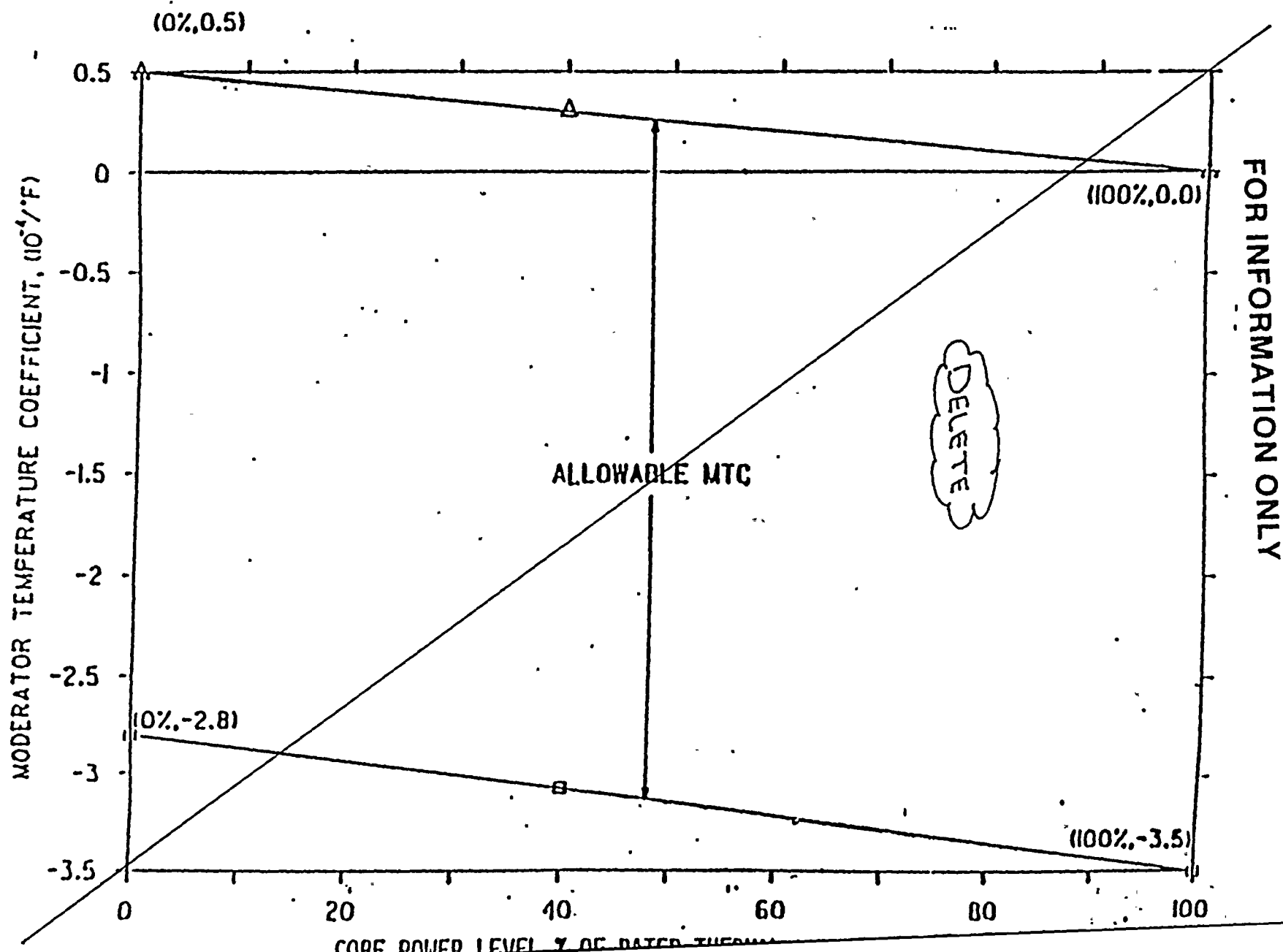
2. The second part of the document is a list of names and addresses of the members of the committee.

3. The third part of the document is a list of names and addresses of the members of the committee.

FIGURE 3.1-1

ALLOWABLE MTC MODES 1 AND 2

PALO VERDE UNIT 3



PALO VERDE - UNIT 3

3/4 1-5

AMENDMENT NO. 18

1944

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MINIMUM TEMPERATURE FOR CRITICALITY

LIMITING CONDITION FOR OPERATION

3.1.1.4 The Reactor Coolant System lowest operating loop temperature (T_{cold}) shall be greater than or equal to 552°F.

APPLICABILITY: MODES 1 and 2#.

ACTION:

With a Reactor Coolant System operating loop temperature (T_{cold}) less than 552°F, restore T_{cold} to within its limit within 15 minutes or be in HOT STANDBY within the next 15 minutes.

SURVEILLANCE REQUIREMENTS

c = 4.1.1.4 The Reactor Coolant System temperature (T_{cold}) shall be determined to be greater than or equal to 552°F:

- a. Within 15 minutes prior to achieving reactor criticality, and
- b. At least once per 30 minutes when the reactor is critical and the Reactor Coolant System T_{cold} is less than 557°F.

#With K_{eff} greater than or equal to 1.0.



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3/4.1.2 BORATION SYSTEMS

FLOW PATHS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.1 As a minimum, one of the following boron injection flow paths shall be OPERABLE:

- a. If only the spent fuel pool in Specification 3.1.2.5a. is OPERABLE, a flow path from the spent fuel pool via a gravity feed connection and a charging pump to the Reactor Coolant System.
- b. If only the refueling water tank in Specification 3.1.2.5b. is OPERABLE, a flow path from the refueling water tank via either a charging pump, a high pressure safety injection pump, or a low pressure safety injection pump to the Reactor Coolant System.

APPLICABILITY: MODES 5 and 6.

ACTION:

With none of the above flow paths OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.1 At least one of the above required flow paths shall be demonstrated OPERABLE at least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.



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REACTIVITY CONTROL SYSTEMS

FLOW PATHS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.2 At least two of the following three boron injection flow paths shall be OPERABLE:

- a. A gravity feed flow path from either the refueling water tank or the spent fuel pool through CH-536 (RWT Gravity Feed Isolation Valve) and a charging pump to the Reactor Coolant System,
- b. A gravity feed flow path from the refueling water tank through CH-327 (RWT Gravity Feed/Safety Injection System Isolation Valve) and a charging pump to the Reactor Coolant System,
- c. A flow path from either the refueling water tank or the spent fuel pool through CH-164 (Boric Acid Filter Bypass Valve), utilizing gravity feed and a charging pump to the Reactor Coolant System.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one of the above required boron injection flow paths to the Reactor Coolant System OPERABLE, restore at least two boron injection flow paths to the Reactor Coolant System to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore at least two flow paths to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.2.1 At least two of the above required flow paths shall be demonstrated OPERABLE:

- a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.
- b. At least once per 18 months when the Reactor Coolant System is at normal operating pressure by verifying that the flow path required by Specification 3.1.2.2 delivers at least 26 gpm for 1 charging pump and 68 gpm for two charging pumps to the Reactor Coolant System.

4.1.2.2.2 The provisions of Specification 4.0.4 are not applicable for entry into Mode 3 or Mode 4 to perform the surveillance testing of Specification 4.1.2.2.1.b provided the testing is performed within 24 hours after achieving normal operating pressure in the reactor coolant system.

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CHARGING PUMPS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.3 At least one charging pump or one high pressure safety injection pump or one low pressure safety injection pump in the boron injection flow path required OPERABLE pursuant to Specification 3.1.2.1 shall be OPERABLE and capable of being powered from an OPERABLE emergency power source.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no charging pump or high pressure safety injection pump or low pressure safety injection pump OPERABLE or capable of being powered from an OPERABLE emergency power source, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.3 No additional Surveillance Requirements other than those required by Specification 4.0.5.



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CHARGING PUMPS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.4 At least two charging pumps shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one charging pump OPERABLE, restore at least two charging pumps to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore at least two charging pumps to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.4 No additional Surveillance Requirements other than those required by Specification 4.0.5.



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BORATED WATER SOURCES - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.5 As a minimum, one of the following borated water sources shall be OPERABLE:

- a. The spent fuel pool with:
 - 1. A minimum borated water volume of 33,500 gallons and
 - 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 - 3. A solution temperature between 60°F and 180°F.
- b. The refueling water tank with:
 - 1. A minimum contained borated water volume of 33,500 gallons and
 - 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 - 3. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 5* and 6*.

ACTION:

With no borated water sources OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one borated water source is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

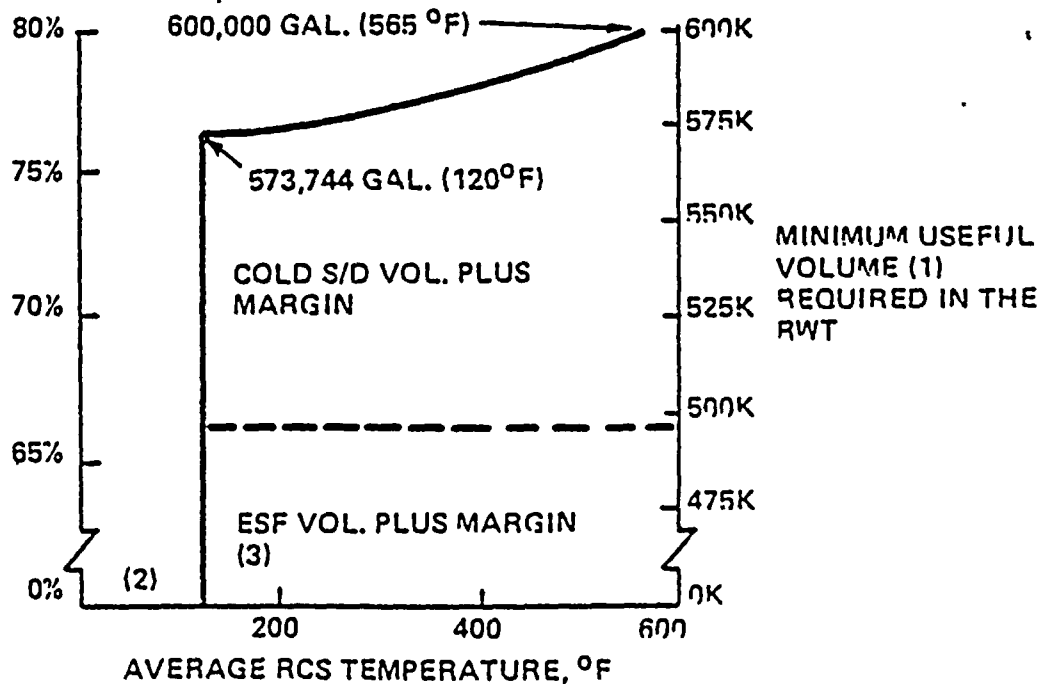
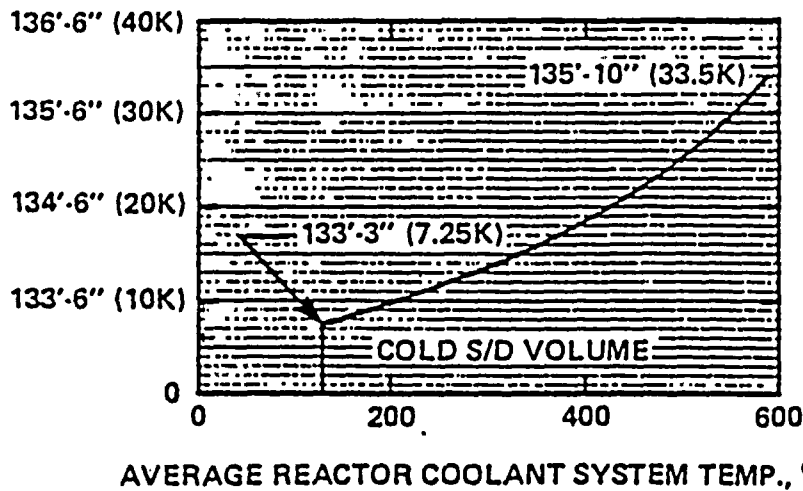
4.1.2.5 The above required borated water sources shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1. Verifying the boron concentration of the water, and
 - 2. Verifying the contained borated water volume of the refueling water tank or the spent fuel pool.
- b. At least once per 24 hours by verifying the refueling water tank temperature when it is the source of borated water and the outside air temperature is outside the 60°F to 120°F range.
- c. At least once per 24 hours by verifying the spent fuel pool temperature when it is the source of borated water and irradiated fuel is present in the pool.

*See Special Test Exception 3.10.7.



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- (1) THE TANK LEVEL AND VOLUME SHOWN ARE THE USEFUL LEVEL AND VOLUME ABOVE THAT IN THE TANK WHICH IS REQUIRED FOR VORTEX CONSIDERATIONS
- (2) DURING MODE 5 AND 6 ONE OF THESE BORATED SOURCES SHALL CONTAIN A MINIMUM OF 33,500 GALLONS.
- (3) THIS VOLUME IS NOT REQUIRED DURING MODE 6

FIGURE 3.1-¹~~2~~
MINIMUM BORATED WATER VOLUMES



2.

12

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BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.6 Each of the following borated water sources shall be OPERABLE:

- a. The spent fuel pool with:
 1. A minimum borated water volume as specified in Figure ^(3.1-1)~~3.1-2~~, and
 2. A boron concentration of between 4000 ppm and 4400 ppm boron, and
 3. A solution temperature between 60°F and 180°F.
- b. The refueling water tank with:
 1. A minimum ~~contained~~ borated water volume as specified in Figure ^(3.1-1)~~3.1-2~~, and
 2. A boron concentration of between 4000 and 4400 ppm of boron, and
 3. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 1, 2,* 3,* and 4*.

ACTION:

- a. With the above required spent fuel pool inoperable, restore the pool to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the above required spent fuel pool to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.
- b. With the refueling water tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.6 Each of the above required borated water sources shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 1. Verifying the boron concentration in the water, and
 2. Verifying the contained borated water volume of the water source.
- b. At least once per 24 hours by verifying the refueling water tank temperature when the outside air temperature is outside the 60°F to 120°F range.
- c. At least once per 24 hours by verifying the spent fuel pool temperature when irradiated fuel is present in the pool.

* See Special Test Exception 3.10.7.



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BORON DILUTION ALARMS

LIMITING CONDITION FOR OPERATION

3.1.2.7 Both startup channel high neutron flux alarms shall be OPERABLE.

APPLICABILITY: MODES 3*, 4, 5, and 6.

ACTION:

- a. With one startup channel high neutron flux alarm inoperable:
 1. Determine the RCS boron concentration when entering MODE 3, 4, 5, or 6 or at the time the alarm is determined to be inoperable. From that time, the RCS boron concentration shall be determined at the applicable monitoring frequency ~~in Tables 3.1.1 through 3.1.5~~ by either boronmeter or RCS sampling.** specified in the CORE OPERATING LIMITS REPORT
- b. With both startup channel high neutron flux alarms inoperable:
 1. Determine the RCS boron concentration by either boronmeter and RCS sampling** or by independent collection and analysis of two RCS samples when entering Mode 3, 4, or 5 or at the time both alarms are determined to be inoperable. From that time, the RCS boron concentration shall be determined at the applicable monitoring frequency ~~in Tables 3.1.1 through 3.1.5~~, as applicable, by either boronmeter and RCS sampling** or by collection and analysis of two independent RCS samples. If redundant determination of RCS boron concentration cannot be accomplished immediately, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until the method for determining and confirming RCS boron concentration is restored.
 2. When in MODE 5 with the RCS level below the centerline of the hotleg or MODE 6, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one startup channel high neutron flux alarm is restored to OPERABLE status.
- c. The provisions of Specification 3.0.3 are not applicable.

specified in the CORE OPERATING LIMITS REPORT

SURVEILLANCE REQUIREMENTS

4.1.2.7 Each startup channel high neutron flux alarm shall be demonstrated OPERABLE by performance of:

*Within 1 hour after the neutron flux is within the startup range following a reactor shutdown.

**With one or more reactor coolant pumps (RCP) operating the sample should be obtained from the hot leg. With no RCP operating, the sample should be obtained from the discharge line of the low pressure safety injection (LPSI) pump operating in the shutdown cooling mode.

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SURVEILLANCE REQUIREMENTS (Continued)

a. A CHANNEL CHECK:

1. At least once per 12 hours.
2. When initially setting setpoints at the following times:
 - a) One hour after a reactor trip.
 - b) After a controlled reactor shutdown: Within 1 hour after the neutron flux is within the startup range in MODE 3.

b. A CHANNEL FUNCTIONAL TEST every 31 days of cumulative operation during shutdown.



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TABLE 3.1-1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $K_{eff} > 0.98$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	1 hour	ONA	ONA
4 not on SCS	12 hours	1 hour	ONA	ONA
5 not on SCS	8 hours	1 hour	ONA	ONA
4 & 5 on SCS	ONA	ONA	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed

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TABLE 3.1-2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT
OPERATIONAL MODES FOR $0.98 \geq K_{eff} > 0.97$

OPERATIONAL MODE	<u>Number of Operating Charging Pumps</u>			
	0	1	2	3
3	12 hours	2.0 hours	0.5 hour	ONA
4 not on SCS	12 hours	2.5 hours	1 hour	0.5 hours
5 not on SCS	8 hours	2.5 hours	1 hour	0.5 hours
4 & 5 on SCS	8 hours	0.5 hours	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed

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TABLE 3.1-3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $0.97 \geq K_{eff} > 0.96$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	3.5 hours	1.5 hours	0.5 hour
4 not on SCS	12 hours	3.5 hours	1.5 hours	1 hour
5 not on SCS	8 hours	3.5 hours	1.5 hours	1 hour
4 & 5 on SCS	8 hours	1 hour	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed

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TABLE 3.1-4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $0.96 \geq K_{eff} > 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	5 hours	2 hours	1 hour
4 not on SCS	12 hours	5 hours	2 hours	1 hour
5 not on SCS	8 hours	5 hours	2 hours	1 hour
4 & 5 on SCS	8 hours	2 hours	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed

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TABLE 3.1-5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION
DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS
AND PLANT OPERATIONAL MODES FOR $K_{eff} \leq 0.95$

OPERATIONAL MODE	<u>Number of Operating Charging Pumps</u>			
	0	1	2	3
3	12 hours	6 hours	2.5 hours	1.5 hours
4 not on SCS	12 hours	6 hours	3 hours	1.5 hours
5 not on SCS	8 hours	6 hours	3 hours	1.5 hours
4 & 5 on SCS	8 hours	2 hours	1 hour	0.5 hours
6	24 hours	8 hours	4 hours	2 hours

Note: SCS = Shutdown Cooling System

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REACTIVITY CONTROL SYSTEMS

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 All full-length (shutdown and regulating) CEAs, and all part-length CEAs which are inserted in the core, shall be OPERABLE with each CEA of a given group positioned within 6.6 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

- a. With one or more full-length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is satisfied within 1 hour and be in at least HOT STANDBY within 6 hours.
- b. With more than one full-length or part-length CEA inoperable or misaligned from any other CEA in its group by more than 19 inches (indicated position), be in at least HOT STANDBY within 6 hours.
- c. With one or more full-length or part-length CEAs misaligned from any other CEAs in its group by more than 6.6 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with ~~Figure 3.1-2A~~ and that within 1 hour the misaligned CEA(s) is either:
 - 1. Restored to OPERABLE status within its above specified alignment requirements, or
 - 2. Declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is satisfied. After declaring the CEA(s) inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specifications 3.1.3.6 and 3.1.3.7 provided:
 - a) Within 1 hour the remainder of the CEAs in the group with the inoperable CEA(s) shall be aligned to within 6.6 inches of the inoperable CEA(s) while maintaining the allowable CEA sequence and insertion limits and the THERMAL POWER level restrictions of Specifications 3.1.3.6 and 3.1.3.7 during subsequent operation.

the limits specified in the CORE OPERATING LIMITS REPORT

*See Special Test Exceptions 3.10.2 and 3.10.4.

Journal of Management Studies, 19(6), 701-718.

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LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.2 is determined at least once per 12 hours:
 - Otherwise, be in at least HOT STANDBY within 6 hours.
- d. With one full-length CEA inoperable due to causes other than addressed by ACTION a., above, but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.
- e. With one part-length CEA inoperable and inserted in the core, operation may continue provided the alignment of the inoperable part length CEA is maintained within 6.6 inches (indicated position) of all other part-length CEAs in its group and the CEA is maintained pursuant to the requirements of Specification 3.1.3.7.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full-length and part-length CEA shall be determined to be within 6.6 inches (indicated position) of all other CEAs in its group at least once per 12 hours except during time intervals when one CEAC is inoperable or when both CEACs are inoperable, then verify the individual CEA positions at least once per 4 hours.

4.1.3.1.2 Each full-length CEA not fully inserted and each part-length CEA which is inserted in the core shall be determined to be OPERABLE by movement of at least 5 inches in any one direction at least once per 31 days.



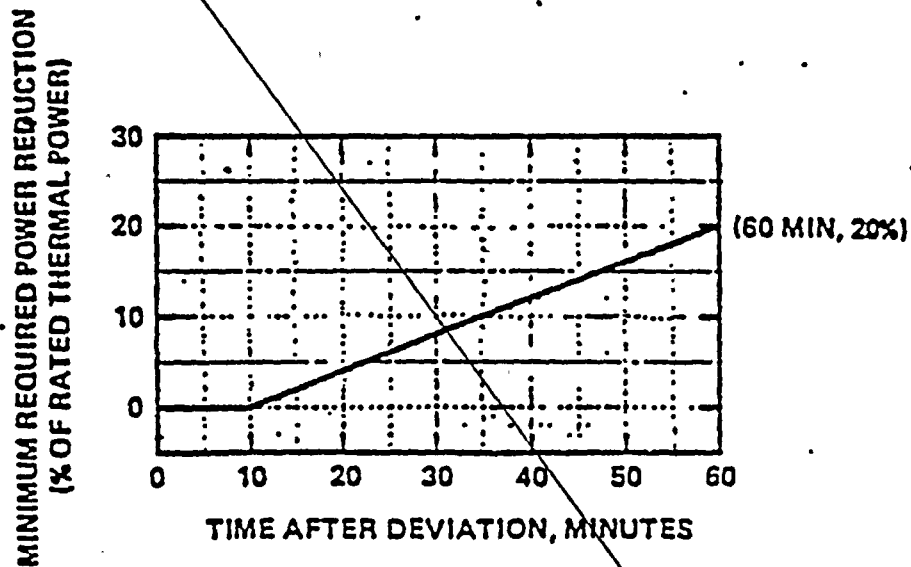
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*WHEN CORE POWER IS REDUCED TO 55% OF RATED THERMAL POWER PER THIS LIMIT CURVE, FURTHER REDUCTION IS NOT REQUIRED

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FIGURE 3.1-2A

CORE POWER LIMIT AFTER CEA DEVIATION*



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POSITION INDICATOR CHANNELS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2 At least two of the following three CEA position indicator channels shall be OPERABLE for each CEA:

- a. CEA Reed Switch Position Transmitter (RSPT 1) with the capability of determining the absolute CEA positions within 5.2 inches,
- b. CEA Reed Switch Position Transmitter (RSPT 2) with the capability of determining the absolute CEA positions within 5.2 inches, and
- c. The CEA pulse counting position indicator channel.

APPLICABILITY: MODES 1 and 2.

ACTION:

With a maximum of one CEA per CEA group having only one of the above required CEA position indicator channels OPERABLE, within 6 hours either:

- a. Restore the inoperable position indicator channel to OPERABLE status, or
- b. Be in at least HOT STANDBY, or
- c. Position the CEA group(s) with the inoperable position indicator(s) at its fully withdrawn position while maintaining the requirements of Specifications 3.1.3.1, 3.1.3.5, 3.1.3.6 and 3.1.3.7. Operation may then continue provided the CEA group(s) with the inoperable position indicator(s) is maintained fully withdrawn, except during surveillance testing pursuant to the requirements of Specification 4.1.3.1.2, and each CEA in the group(s) is verified fully withdrawn at least once per 12 hours thereafter by its "Full Out" limit*.

SURVEILLANCE REQUIREMENTS

4.1.3.2 Each of the above required position indicator channels shall be determined to be OPERABLE by verifying that for the same CEA, the position indicator channels agree within 5.2 inches of each other at least once per 12 hours.

*CEAs are fully withdrawn (Full Out) when withdrawn to at least 144.75 inches.



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REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.3.3 At least one CEA Reed Switch Position Transmitter indicator channel shall be OPERABLE for each shutdown, regulating or part-length CEA not fully inserted.

APPLICABILITY: MODES 3*, 4*, and 5*.

ACTION:

With less than the above required position indicator channel(s) OPERABLE, immediately open the reactor trip breakers.

SURVEILLANCE REQUIREMENTS

4.1.3.3 The above required CEA Reed Switch Position Transmitter indicator channel(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

*With the reactor trip breakers in the closed position.



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CEA DROP TIME

LIMITING CONDITION FOR OPERATION

3.1.3.4 The individual full-length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be less than or equal to 4 seconds from when the electrical power is interrupted to the CEA drive mechanism until the CEA reaches its 90% insertion position with:

- a. T_{cold} greater than or equal to 552°F, and
- b. All reactor coolant pumps operating.

APPLICABILITY: MODES 1 and 2.

ACTION:

- a. With the drop time of any full-length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to MODE 1 or 2.

SURVEILLANCE REQUIREMENTS

4.1.3.4 The CEA drop time of full-length CEAs shall be demonstrated through measurement prior to reactor criticality:

- a. For all CEAs following each removal and reinstallation of the reactor vessel head,
- b. For specifically affected individual CEAs following any maintenance on or modification to the CEA drive system which could affect the drop time of those specific CEAs, and
- c. At least once per 18 months.



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SHUTDOWN CEA INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown CEAs shall be withdrawn to at least 144.75 inches.

APPLICABILITY: MODES 1 and 2*#.

ACTION:

With a maximum of one shutdown CEA withdrawn to less than 144.75 inches, except for surveillance testing pursuant to Specification 4.1.3.1.2, within 1 hour either:

- a. Withdraw the CEA to at least 144.75 inches, or
- b. Declare the CEA inoperable and comply with Specification 3.1.3.1.

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown CEA shall be determined to be withdrawn to at least 144.75 inches:

- a. Within 15 minutes prior to withdrawal of any CEAs in regulating groups during an approach to reactor criticality, and
- b. At least once per 12 hours thereafter except during time intervals when both CEAC's are inoperable, then verify the individual CEA positions at least once per 4 hours.

*See Special Test Exception 3.10.2.

#With K_{eff} greater than or equal to 1.



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REGULATING CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.6 The regulating CEA groups shall be maintained within the following limits:

a. One or more CEAC's operable:

specified in the CORE OPERATING LIMITS REPORT

1. The regulating CEA groups shall be limited to the withdrawal sequence, and to the insertion limits ~~## shown on Figure 3.1-3 when the COLSS is in service or shown on Figure 3.1-4 when the COLSS is not in service.~~ The CEA insertion between the Long Term Steady State Insertion Limits and the Transient Insertion Limits is restricted to:

- a) Less than or equal to 5 Effective Full Power Days per 30 Effective Full Power Day-interval, and
- b) Less than or equal to 14 Effective Full Power Days per 18 Effective Full Power Months.

2. CEA insertion between the Short Term Steady State Insertion Limits and the Transient Insertion Limits shall be restricted to ≤ 4 hours per 24 hour interval.

b. Both CEAC's Inoperable (with or without COLSS in service):

Regulating CEA group 5 may be inserted no further than 127.5 inches withdrawn which is the Transient Insertion Limit when both CEAC's are inoperable.

Regulating CEA groups which are excluded by these insertion limits must be maintained fully withdrawn ≥ 144.75 inches, which is the Transient Insertion Limit, except for surveillance testing pursuant to Specification 4.1.3.1.2.

APPLICABILITY: MODES 1* and 2*#.

ACTION:

a. With the regulating CEA groups inserted beyond the Transient Insertion Limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, within 2 hours either:

- 1. Restore the regulating CEA groups to within the limits, or
- 2. Reduce THERMAL POWER as follows:

a) One or more CEAC's Operable

- 1) Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the CEA group position, ~~using Figures 3.1-3 or 3.1-4,~~ or *specified in the CORE OPERATING LIMITS REPORT*

2) Be in at least HOT STANDBY within 6 hours.

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REGULATING CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

b) Both CEAC's Inoperable

Be in at least HOT STANDBY within 6 hours.

- b. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Transient Insertion Limits for intervals greater than 5 EFPD per 30 EFPD interval or greater than 14 EFPD per 18 Effective Full Power Months, either:
1. Restore the regulating groups to within the Long Term Steady State Insertion Limits within 2 hours, or
 2. Be in at least HOT STANDBY within 6 hours.
- c. With the regulating CEA groups inserted between the Short Term Steady State Insertion Limits and the Transient Insertion Limits for intervals > 4 hours per 24 hour interval, operation may proceed provided any subsequent increase in THERMAL POWER is restricted to $\leq 5\%$ of RATED THERMAL POWER per hour.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The position of each regulating CEA group shall be determined to be within the Transient Insertion Limits at least once per 12 hours except during time intervals when the PDIL Auctioneer Alarm Circuit is inoperable, or both CEAC's are inoperable, then verify the CEA group positions at least once per 4 hours. The accumulated times during which the regulating CEA groups are inserted beyond the Long Term Steady State Insertion Limits but within the Transient Insertion Limits shall be determined at least once per 24 hours.

*See Special Test Exceptions 3.10.2 and 3.10.4.

#With K_{eff} greater than or equal to 1.

##A reactor power cutback will cause either (Case 1) Regulating Group 5 or Regulating Group 4 and 5 to be dropped with no sequential insertion of additional Regulating Groups (Groups 1, 2, 3, and 4) or (Case 2) Regulating Group 5 or Regulating Groups 4 and 5 to be dropped with all or part of the remaining Regulating Groups (Groups 1, 2, 3, and 4) being sequentially inserted. In either case, the Transient Insertion Limit and the withdrawal sequence of Figure 3.1-3 or Figure 3.1-4 can be exceeded for up to 2 hours.

specified in the CORE OPERATING LIMITS REPORT



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REACTIVITY CONTROL SYSTEMS

PART LENGTH CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.7 The part length CEA groups shall be maintained within the following limits with COLSS in service or out of service:

a. One or more CEACs OPERABLE

specified in the CORE OPERATING LIMITS REPORT

The part length CEA groups shall be limited to the insertion limits ~~shown on Figure 3.1-5~~ with PLCEA insertion between the Long Term Steady State Insertion Limit and the Transient Insertion Limit restricted to:

1. ≤ 7 EFPD per 30 EFPD interval, and
2. ≤ 14 EFPD per calendar year.

b. Both CEACs INOPERABLE

The part length CEA groups must be maintained fully withdrawn (≥ 144.75 inches) which is the Transient Insertion Limit when both CEAC's are inoperable.

APPLICABILITY: MODES 1* and 2*

ACTION:

a. With the part length CEA groups inserted beyond the Transient Insertion Limit, except for surveillance testing pursuant to Specification 4.1.3.1.2, within two hours, either:

1. Restore the part length CEA groups to within the limits, or
2. Reduce THERMAL POWER as follows:

a) One or more CEACs OPERABLE

- 1) Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the PLCEA group position, ~~using Figure 3.1-5~~, or specified in the CORE OPERATING LIMITS REPORT
- 2) Be in at least HOT STANDBY within 6 hours.

b) Both CEACs INOPERABLE

Be in at least HOT STANDBY within 6 hours.

Figure 1 is a line graph with the x-axis labeled 'Number of days after the start of the growing season' and the y-axis labeled 'Number of days until the start of the growing season'. Both axes range from 0 to 100. The graph shows a series of points connected by lines, forming a zig-zag pattern. The points are labeled with numbers 1 through 10. The pattern starts at (0, 0) and ends at (100, 100). The points are approximately at (0, 0), (10, 10), (20, 20), (30, 30), (40, 40), (50, 50), (60, 60), (70, 70), (80, 80), (90, 90), and (100, 100). The lines connect these points in a sequence that follows the diagonal of the graph.

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REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- b. With the part length CEA groups inserted between the Long Term Steady State Insertion Limit and the Transient Insertion Limit for intervals > 7 EFPD per 30 EFPD interval or > 14 EFPD per calendar year, either:
 - 1. Restore the part length groups within the Long Term Steady State Insertion Limit within two hours, or
 - 2. Be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.7 The positions of the part length CEA groups shall be determined to be within the Transient Insertion Limit at least once per 12 hours except during time intervals when both CEACs are inoperable, then verify the part length CEA group positions at least once per 4 hours.

*See Special Test Exceptions 3.10.2 and 3.10.4.



CORE OPERATING LIMITS REPORT

PALO VERDE NUCLEAR GENERATING STATION (PVNGS)

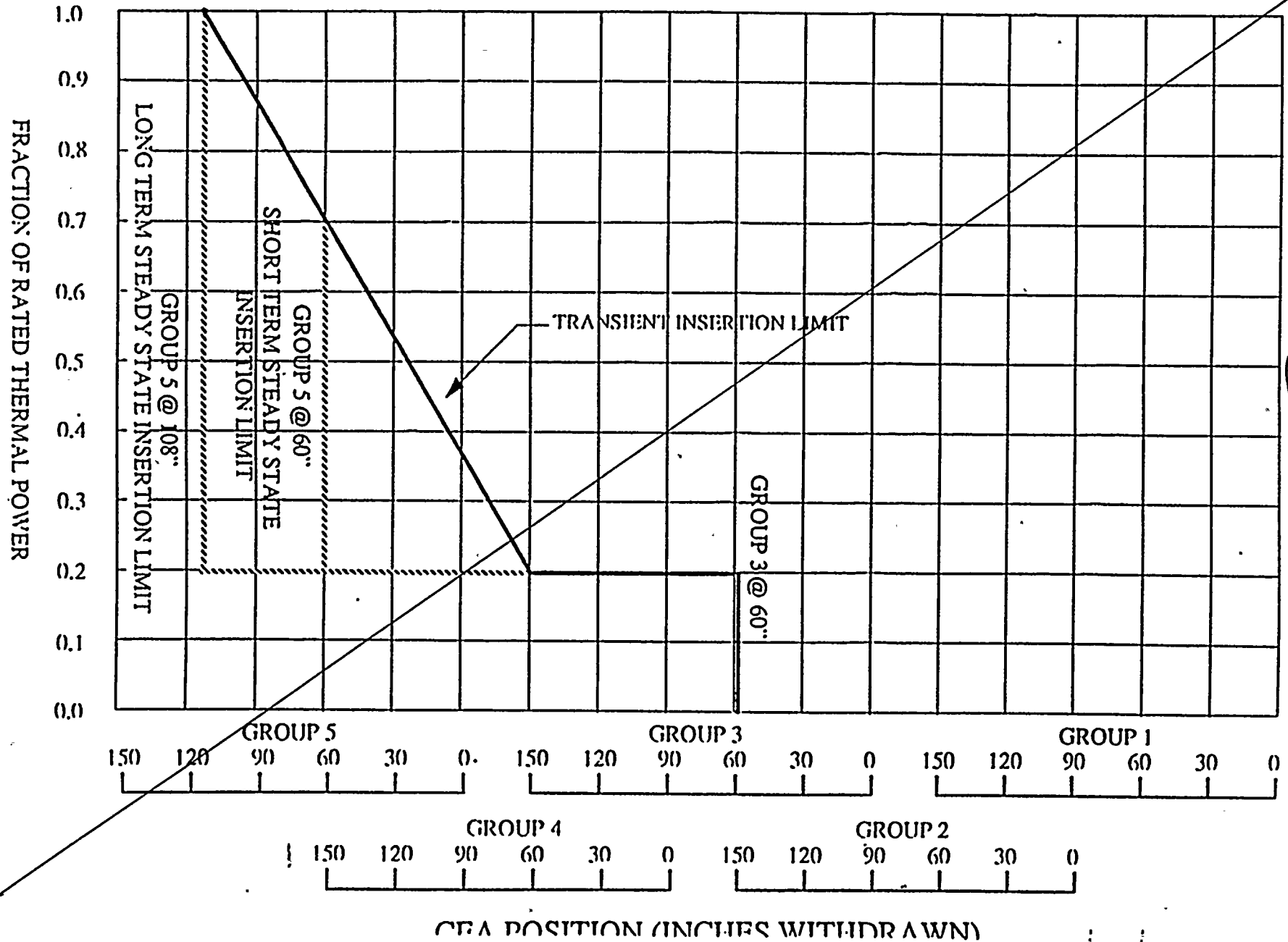
UNIT 1 CYCLE 3

9203270202 920319
PDR ADOCK 0500052B
P PDR



FIGURE 3.1-3

CEA INSERTION LIMITS VERSUS THERMAL POWER
(COLSS IN SERVICE)



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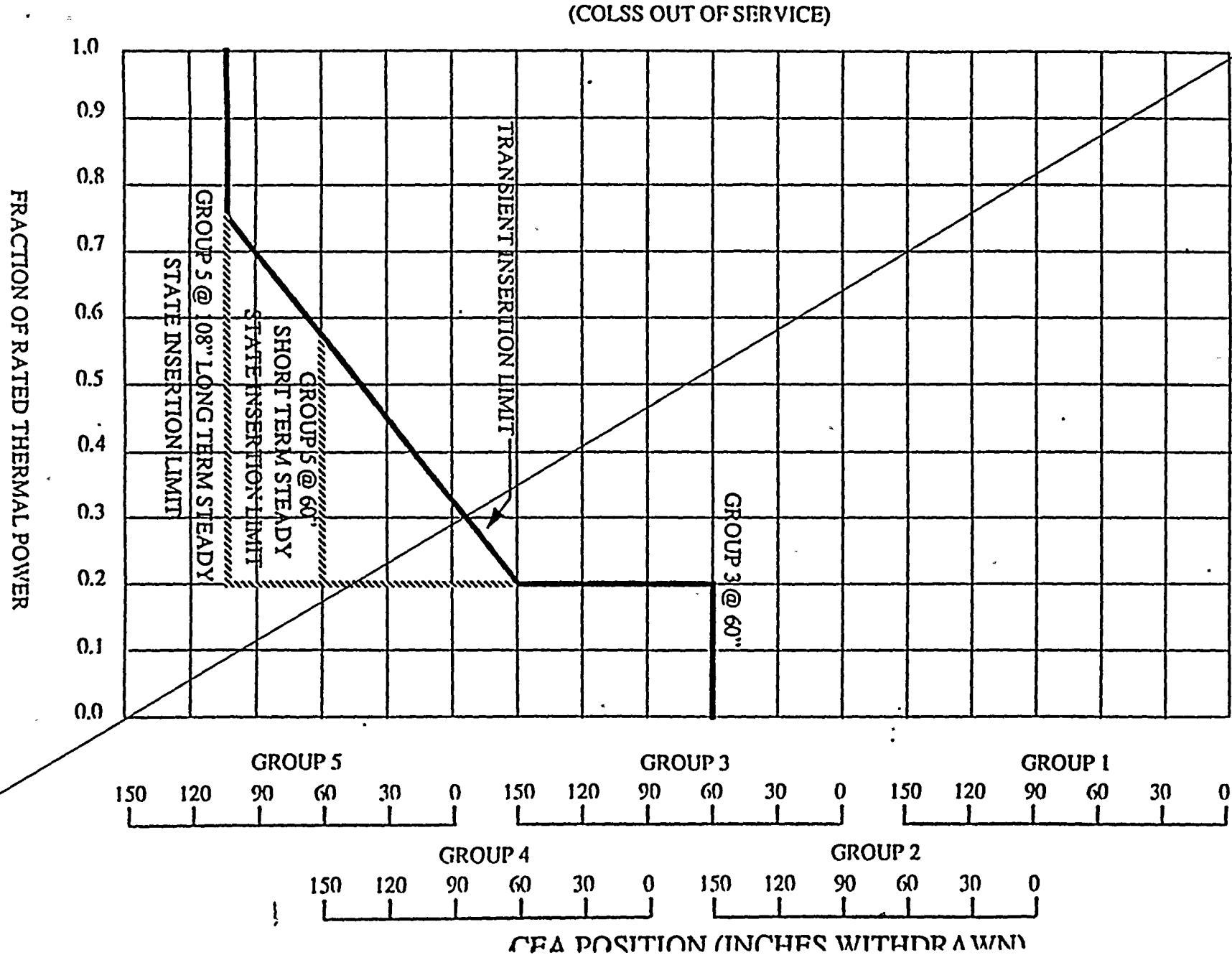
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FIGURE 3.1-4

CEA INSERTION LIMITS VERSUS THERMAL POWER
(COLSS OUT OF SERVICE)



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1 2 3 4 5 6 7 8 9 10



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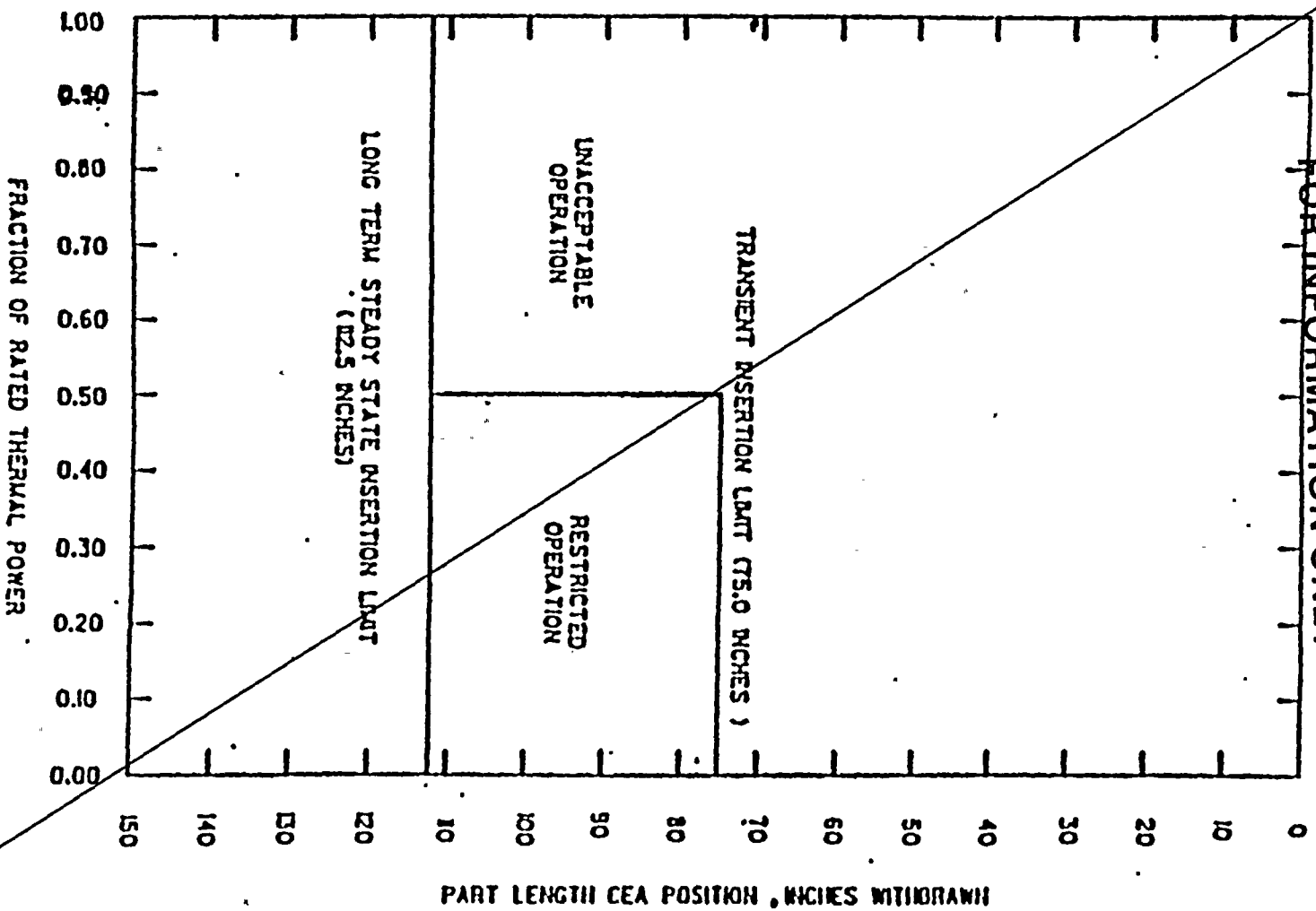


FIGURE 3.1-5

PART LENGTH CEA INSERTION LIMIT VS THERMAL POWER

PALO VERDE - UNIT 3

3/4 1-33

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3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

specified in the CORE OPERATING LIMITS REPORT

3.2.1 The linear heat rate limit, ~~of 13.5 kW/ft~~ shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to the COLSS calculated power operating limit based on linear heat rate (when COLSS is in service); or
- b. Maintaining peak linear heat rate within its limit using any operable CPC channel (when COLSS is out of service).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With the linear heat rate limit not being maintained, as indicated by:

1. COLSS calculated core power exceeding the COLSS calculated core power operating limit based on linear heat rate; or
2. Peak linear heat rate outside its limit using any operable CPC channel (when COLSS is out of service);

within 15 minutes initiate corrective action to reduce the linear heat rate to within the limits and either:

- a. Restore the linear heat rate to within its limits within 1 hour, or
- b. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limit when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within its limit.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on linear heat rate.

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POWER DISTRIBUTION LIMITS

3/4.2.3 AZIMUTHAL POWER TILT - T_q

LIMITING CONDITION FOR OPERATION

3.2.3 The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the following limits:

- a. The AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs), and
specified in the CORE OPERATING LIMITS REPORT
- b.1. The limit in Figure 3.2-1A with COLSS in service, or
- b.2. $T_q \leq 0.10$ with COLSS out of service.

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.
- b. With the measured AZIMUTHAL POWER TILT determined to exceed the limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service. specified in the CORE OPERATING LIMITS REPORT
 - 1. Due to misalignment of either a part-length or full-length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1 and 4.2.4) is detecting the CEA misalignment.
 - 2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and verify that the Variable Overpower Trip Setpoint has been reduced as appropriate within the next 4 hours.
 - 3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

*See Special Test Exception 3.10.2.

1. The first part of the document is a list of names and addresses of the members of the committee.

2. The second part of the document is a list of names and addresses of the members of the committee.

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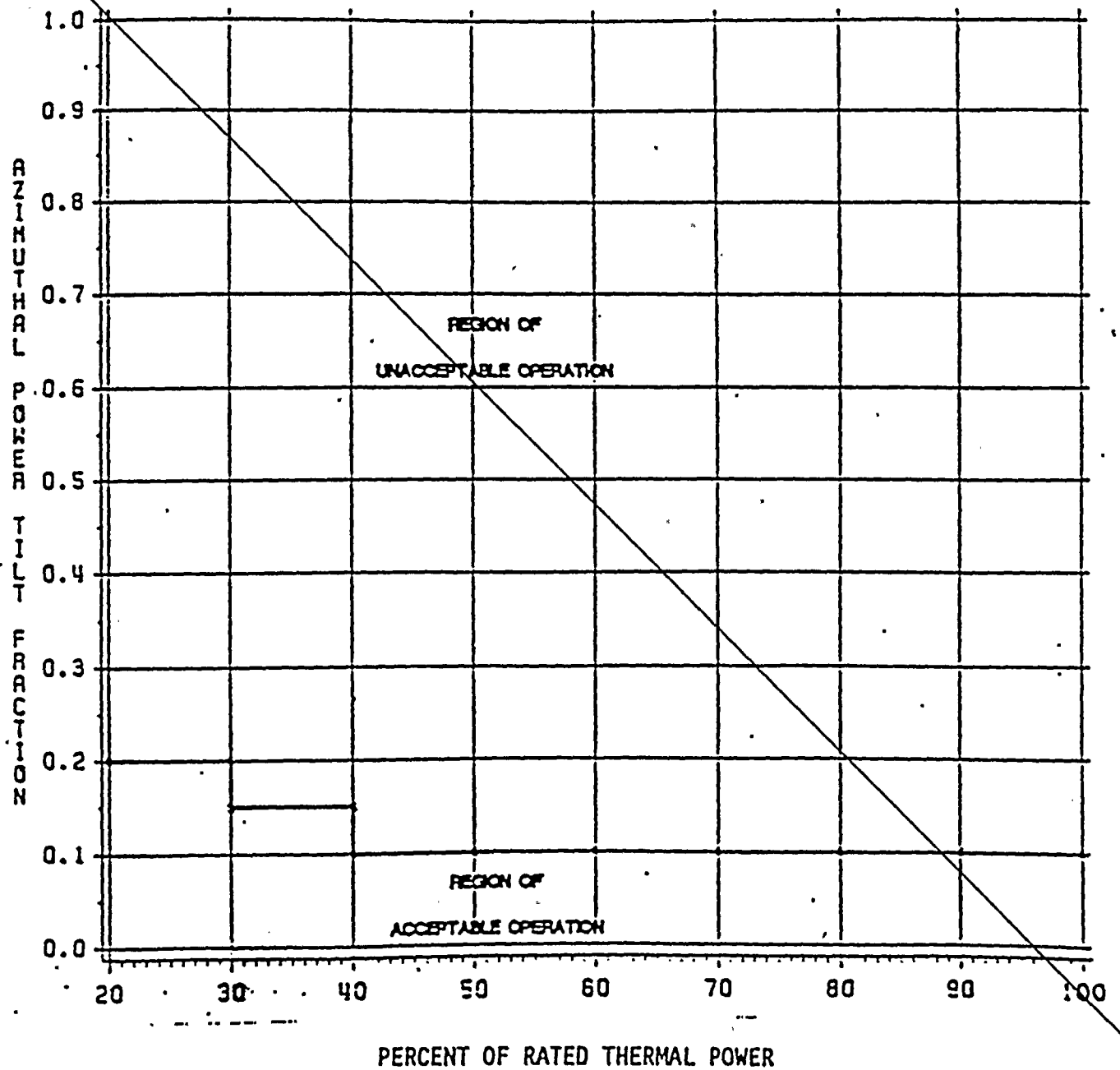


FIGURE 3.2-1A
AZIMUTHAL POWER TILT LIMIT
VS
THERMAL POWER
(COLSS IN SERVICE)

1 2 3 4 5 6 7 8 9 10



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POWER DISTRIBUTION LIMITS

3/4.2.4 DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by one of the following methods:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
specified in the CORE OPERATING LIMITS REPORT
- b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance shown in Figure 3.2-1 (when COLSS is in service and neither CEAC is operable); or
specified in the CORE OPERATING LIMITS REPORT
- c. Operating within the region of acceptable operation of Figure 3.2-2 using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
specified in the CORE OPERATING LIMITS REPORT
- d. Operating within the region of acceptable operation of Figure 3.2-2A using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With the DNBR not being maintained:

1. As indicated by COLSS calculated core power exceeding the appropriate COLSS calculated power operating limit; or
 2. With COLSS out of service, operation outside the region of acceptable operation of Figure 3.2-2 or 3.2-2A, as applicable;
specified in the CORE OPERATING LIMITS REPORT
- within 15 minutes initiate corrective action to increase the DNBR to within the limits and either:
- a. Restore the DNBR to within its limits within 1 hour, or
 - b. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit shown on Figure 3.2-2 or Figure 3.2-2A.
specified in the CORE OPERATING LIMITS REPORT

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

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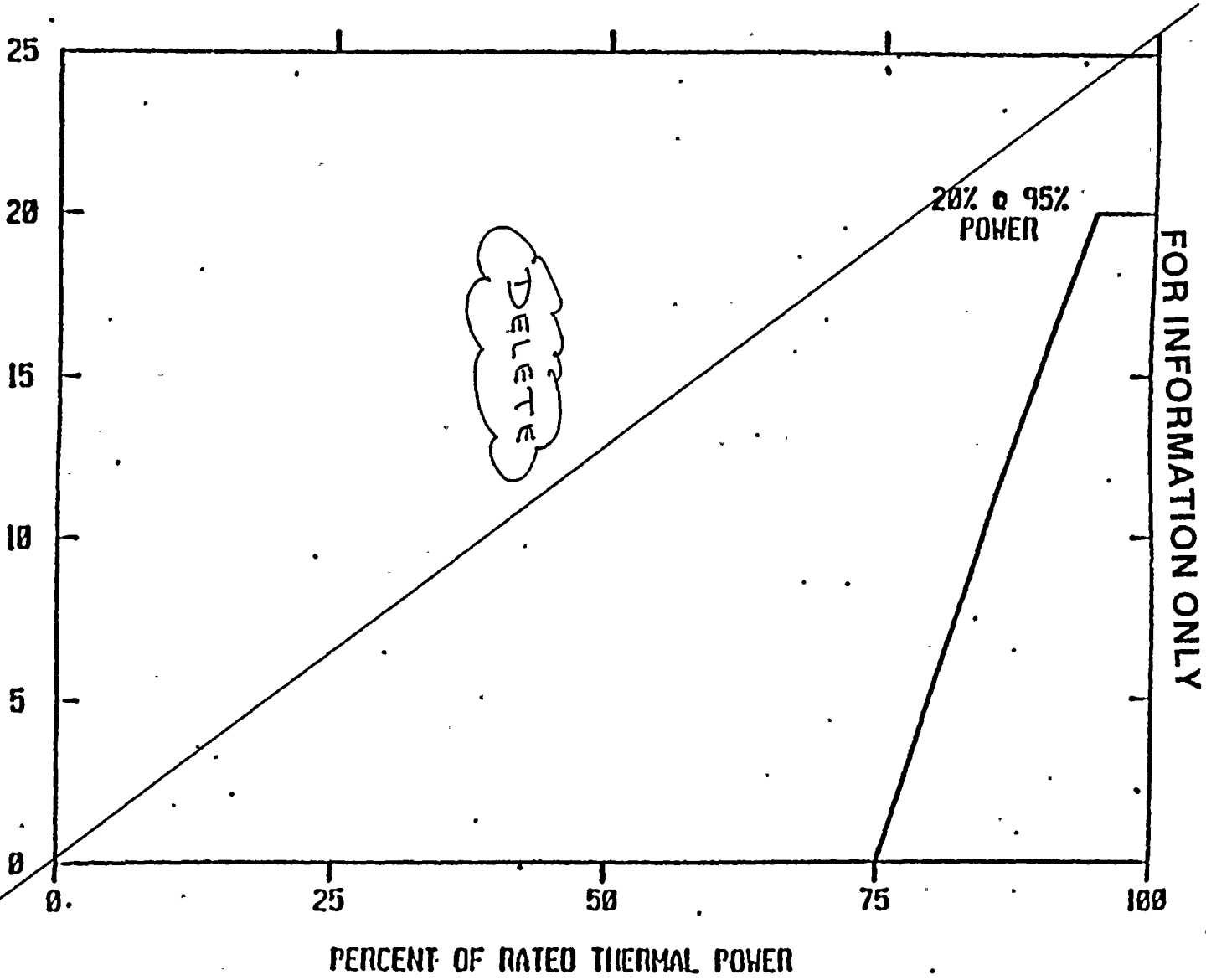
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COLSS DNBR POWER OPERATING LIMIT REDUCTION
(% OF RATED THERMAL POWER)

FIGURE 3.2-1

COLSS DNBR POWER OPERATING LIMIT ALLOWANCE FOR BOTH CEACS INOPERABLE

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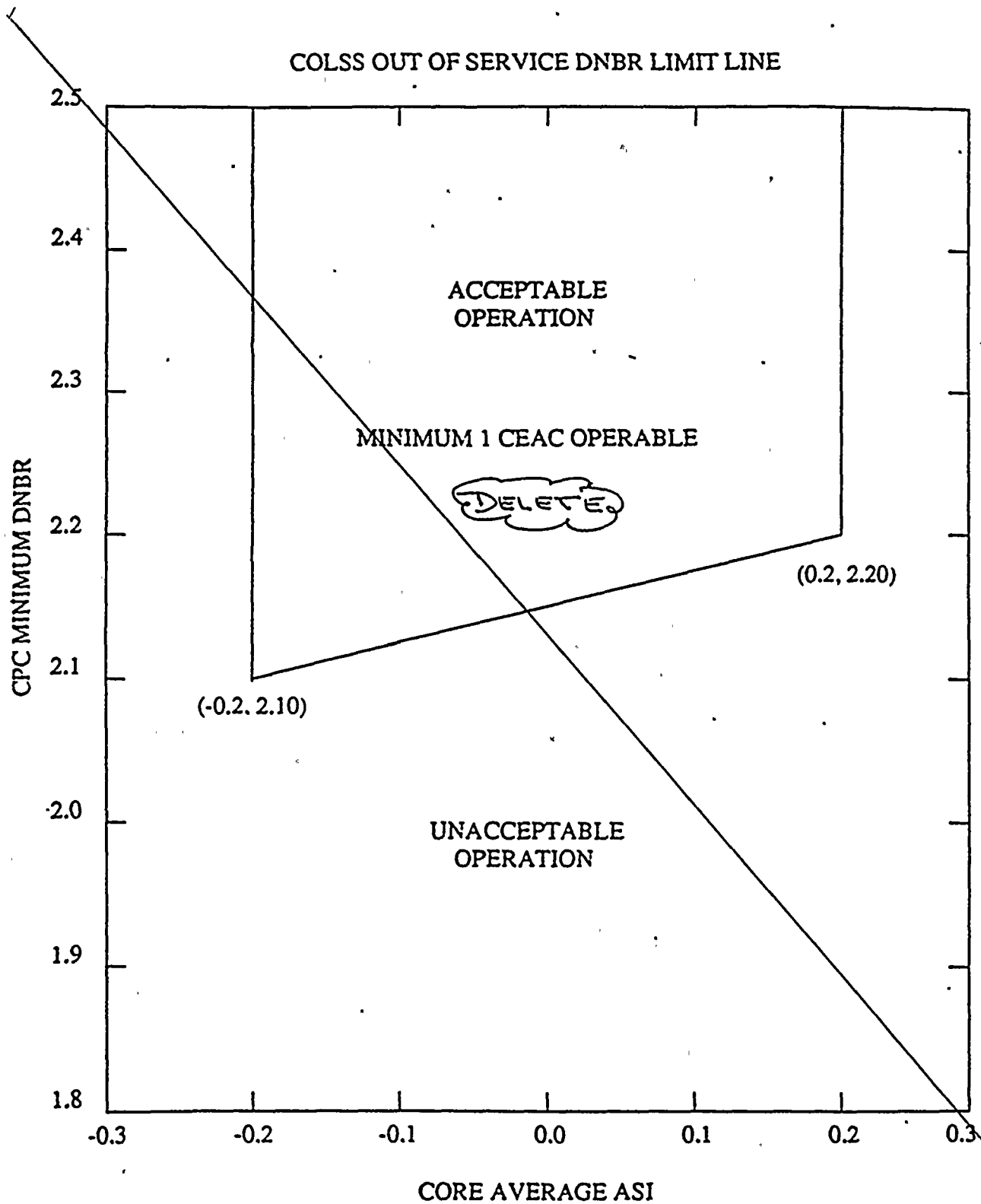


FIGURE 3.2-2

DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEACs OPERABLE)



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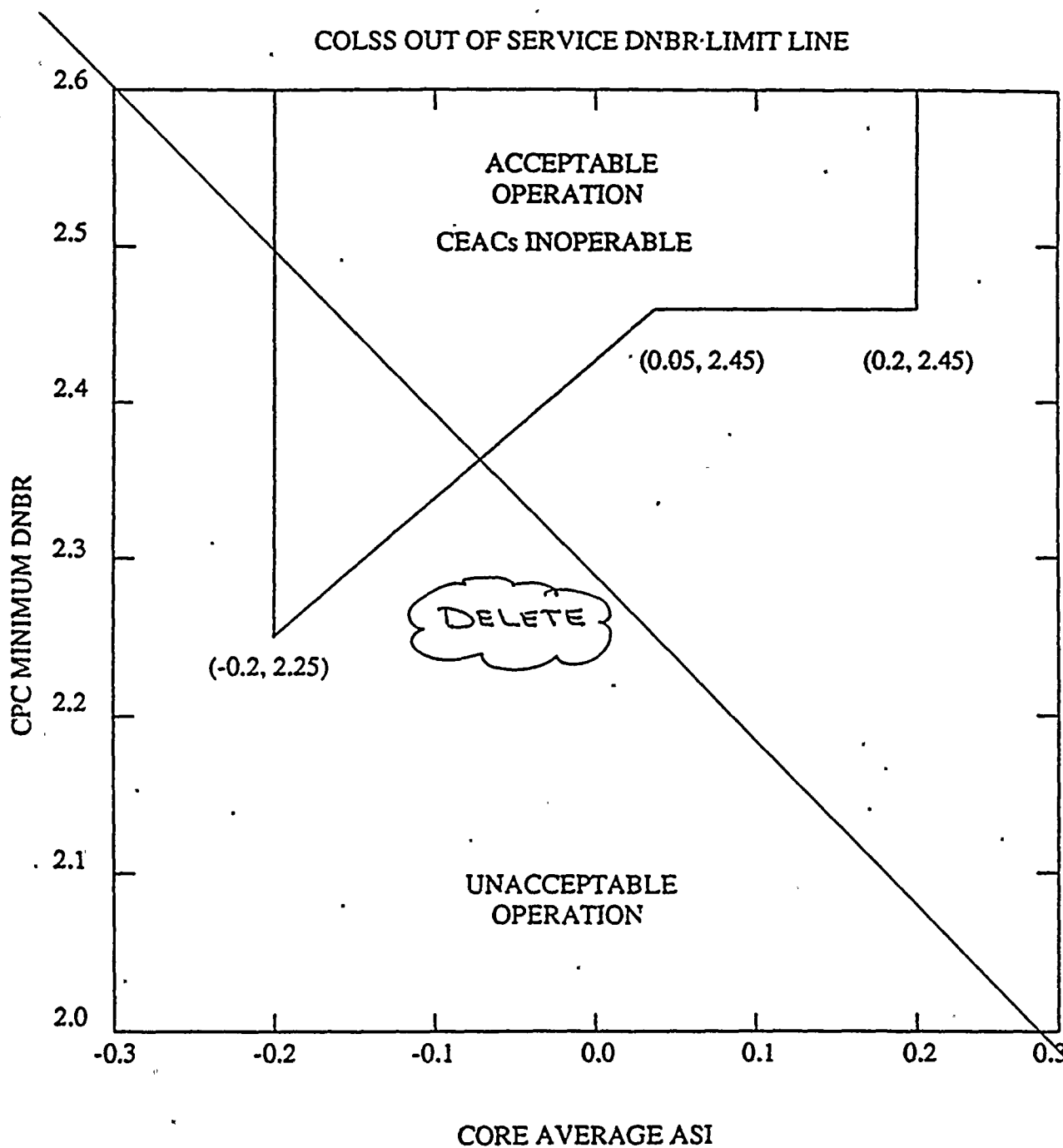
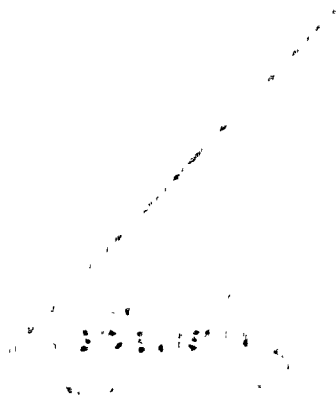


FIGURE 3.2-2A

DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEACs INOPERABLE)



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POWER DISTRIBUTION LIMITS

3/4.2.5 RCS FLOW RATE

LIMITING CONDITION FOR OPERATION

3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to 155.8×10^6 lbm/hr.

APPLICABILITY: MODE 1.

ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.5 The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to its limit at least once per 12 hours.



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POWER DISTRIBUTION LIMITS

3/4.2.6 REACTOR COOLANT COLD LEG TEMPERATURE

LIMITING CONDITION FOR OPERATION

3.2.6 The reactor coolant cold leg temperature (T_c) shall be within the Area of Acceptable Operation shown in Figure ~~3-2-3~~.

3-2-1.

APPLICABILITY: MODES 1* and 2*#.

ACTION:

With the reactor coolant cold leg temperature exceeding its limit, restore the temperature to within its limit within 2 hours or be in HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.6 The reactor coolant cold leg temperature shall be determined to be within its limit at least once per 12 hours.

*See Special Test Exception 3.10.4.

#With K_{eff} greater than or equal to 1



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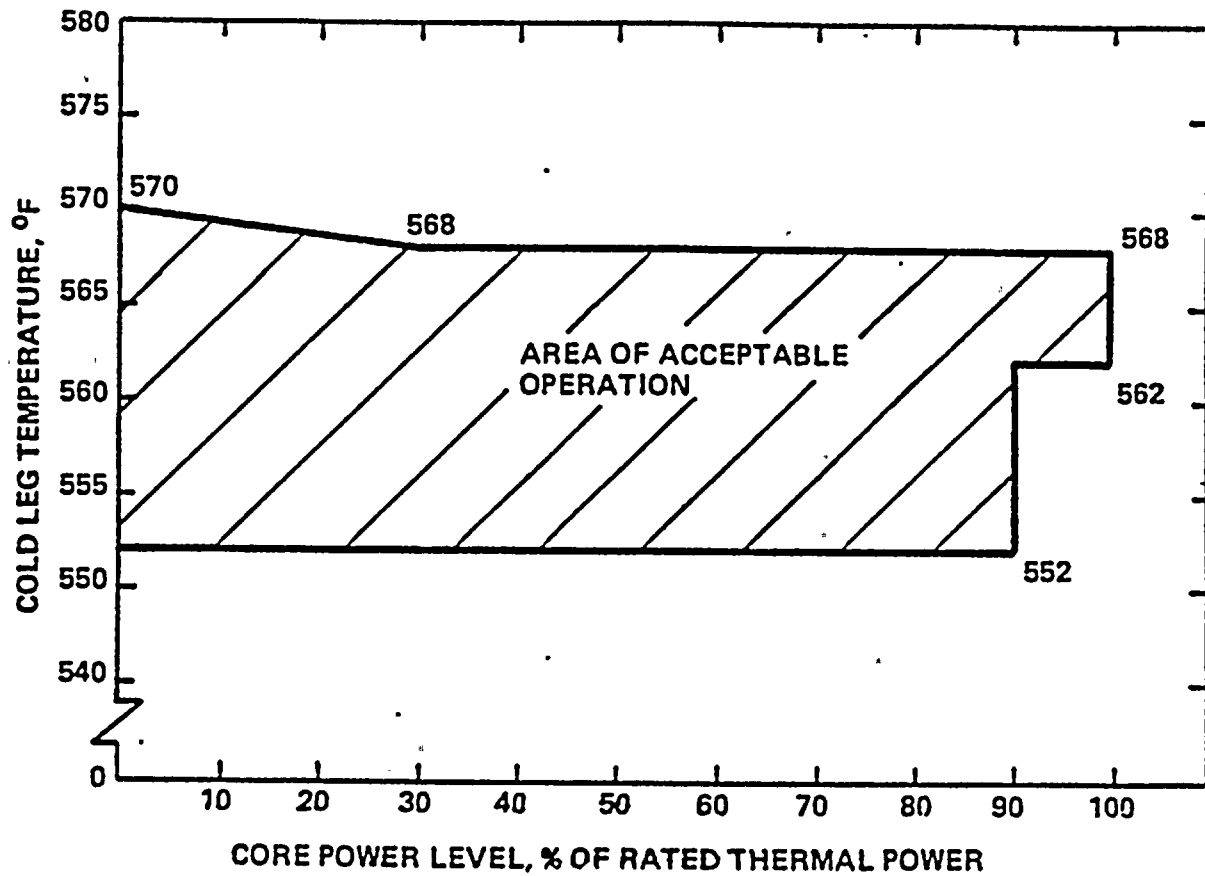


FIGURE 3.2-¹₃

REACTOR COOLANT COLD LEG TEMPERATURE VS. CORE POWER LEVEL



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POWER DISTRIBUTION LIMITS

3/4.2.7 AXIAL SHAPE INDEX

LIMITING CONDITION FOR OPERATION

3.2.7 The core average AXIAL SHAPE INDEX (ASI) shall be maintained within the following limits ^{specified in the CORE OPERATING LIMITS REPORT.}

- ~~a. COLSS OPERABLE~~
 ~~$-0.27 \leq ASI \leq 0.27$~~
- ~~b. COLSS OUT OF SERVICE (CPC)~~
 ~~$-0.20 \leq ASI \leq 0.20$~~

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

specified in the CORE OPERATING LIMITS REPORT

ACTION:

With the core average AXIAL SHAPE INDEX outside ^{the} its ~~above~~ limits, restore the core average ASI to within its limit within 2 hours or reduce THERMAL POWER to less than 20% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.7 The core average AXIAL SHAPE INDEX shall be determined to be within its limit at least once per 12 hours using the COLSS or any OPERABLE Core Protection Calculator channel.

*See Special Test Exception 3.10.2.



1. The first part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are written in a printed hand. The list is organized in two columns, with the names in the left column and the addresses in the right column. The names are: John A. Smith, James B. Jones, William C. Brown, Charles D. White, and Thomas E. Black. The addresses are: 123 Main Street, New York, N.Y.; 456 Elm Street, Boston, Mass.; 789 Oak Street, Philadelphia, Pa.; 101 Pine Street, Chicago, Ill.; and 202 Cedar Street, San Francisco, Calif.

2.

3.

4. The second part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are written in a printed hand. The list is organized in two columns, with the names in the left column and the addresses in the right column. The names are: John A. Smith, James B. Jones, William C. Brown, Charles D. White, and Thomas E. Black. The addresses are: 123 Main Street, New York, N.Y.; 456 Elm Street, Boston, Mass.; 789 Oak Street, Philadelphia, Pa.; 101 Pine Street, Chicago, Ill.; and 202 Cedar Street, San Francisco, Calif.

5. The third part of the document is a list of names and addresses of the members of the committee. The names are written in a cursive hand, and the addresses are written in a printed hand. The list is organized in two columns, with the names in the left column and the addresses in the right column. The names are: John A. Smith, James B. Jones, William C. Brown, Charles D. White, and Thomas E. Black. The addresses are: 123 Main Street, New York, N.Y.; 456 Elm Street, Boston, Mass.; 789 Oak Street, Philadelphia, Pa.; 101 Pine Street, Chicago, Ill.; and 202 Cedar Street, San Francisco, Calif.



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POWER DISTRIBUTION LIMITS

3/4.2.8 PRESSURIZER PRESSURE

LIMITING CONDITION FOR OPERATION

3.2.8 The pressurizer pressure shall be maintained between 2025 psia and 2300 psia.

APPLICABILITY: MODES 1 and 2.

ACTION:

With the pressurizer pressure outside its above limits, restore the pressure to within its limit within 2 hours or be in at least HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.8 The pressurizer pressure shall be determined to be within its limit at least once per 12 hours.



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EMERGENCY CORE COOLING SYSTEMS

3/4.5.4 REFUELING WATER TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water tank (RWT) shall be OPERABLE with:

- a. A minimum borated water volume as specified in Figure ^{3.1-1}~~3.1-2~~ of Specification 3.1.2.5, and
- b. A boron concentration between 4000 and 4400 ppm of boron, and
- c. A solution temperature between 60°F and 120°F.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the refueling water tank inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWT shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1. Verifying the contained borated water volume in the tank, and
 - 2. Verifying the boron concentration of the water.
- b. At least once per 24 hours by verifying the RWT temperature when the (outside) air temperature is outside the 60°F to 120°F range.

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FOR INFORMATION ONLY
REACTIVITY CONTROL SYSTEMS

BASES

MOVABLE CONTROL ASSEMBLIES (Continued)

and load maneuvering. Analyses are performed based on the expected mode of operation of the NSSS (base load maneuvering, etc.) and from these analyses CEA insertions are determined and a consistent set of radial peaking factors defined. The Long Term Steady State and Short Term Insertion Limits are determined based upon the assumed mode of operation used in the analyses and provide a means of preserving the assumptions on CEA insertions used. The limits specified serve to limit the behavior of the radial peaking factors within the bounds determined from analysis. The actions specified serve to limit the extent of radial xenon redistribution effects to those accommodated in the analyses. The Long and Short Term Insertion Limits of Specifications 3.1.3.6 and 3.1.3.7 are specified for the plant which has been designed for primarily base loaded operation but which has the ability to accommodate a limited amount of load maneuvering.

The Transient Insertion Limits of Specifications 3.1.3.6 and 3.1.3.7 and the Shutdown CEA Insertion Limits of Specification 3.1.3.5 ensure that (1) the minimum SHUTDOWN MARGIN is maintained, and (2) the potential effects of a CEA ejection accident are limited to acceptable levels. Long-term operation at the Transient Insertion Limits is not permitted since such operation could have effects on the core power distribution which could invalidate assumptions used to determine the behavior of the radial peaking factors.

The PVNGS CPC and COLSS systems are responsible for the safety and monitoring functions, respectively, of the reactor core. COLSS monitors the DNB Power Operating Limit (POL) and various operating parameters to help the operator maintain plant operation within the limiting conditions for operation (LCO). Operating within the LCO guarantees that in the event of an Anticipated Operational Occurrence (AOO), the CPCs will provide a reactor trip in time to prevent unacceptable fuel damage.

Specified in the CORE OPERATING LIMITS REPORT

The COLSS reserves the Required Overpower Margin (ROPM) to account for Loss of Flow (LOF) and CEA misoperation transients. When the COLSS is Out of Service (COOS), the monitoring function is performed via the CPC calculation of DNBR in conjunction with Technical Specification COOS Limit Lines, ~~(Figures 3.2-2 and 3.2-2a)~~ which restricts the reactor power sufficiently to preserve the ROM.

The reduction of the CEA deviation penalties in accordance with the CEAC (Control Element Assembly Calculator) sensitivity reduction program has been performed. This task involved setting many of the inward single CEA deviation penalty factors to 1.0. An inward CEA deviation event in effect would not be accompanied by the application of the CEA deviation penalty in either the CPC DNB and LHR (Linear Heat Rate) calculations for those CEAs with the reduced penalty factors. The protection for an inward CEA deviation event is thus accounted for separately.



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FOR INFORMATION ONLY

REACTIVITY CONTROL SYSTEMS

BASES

in the CORE OPERATING LIMITS REPORT

MOVABLE CONTROL ASSEMBLIES (Continued)

If an inward CEA deviation event occurs, the current CPC algorithm applies two penalty factors to each of the DNB and LHR calculations. The first, a static penalty factor, is applied upon detection of the event. The second, a xenon redistribution penalty, is applied linearly as a function of time after the CEA drop. The expected margin degradation for the inward CEA deviation event for which the penalty factor has been reduced is accounted for in two ways. The ROPM reserved in COLSS is used to account for some of the margin degradation. Further, a power reduction in accordance with the curve in Figure 3.1-2A is required. In addition, the part length CEA maneuvering is restricted in accordance with Figure 3.1-5 to justify reduction of the PLR deviation penalty factors.

limits specified in the CORE OPERATING LIMITS REPORT

The technical specification permits plant operation if both CEACs are considered inoperable for safety purposes after this period.

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FOR INFORMATION ONLY

3/4.2 POWER DISTRIBUTION LIMITS

BASES

3/4.2.1 LINEAR HEAT RATE

The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limits of ~~13.5 kW/ft~~ are not exceeded. specified in the CORE OPERATING LIMITS REPORT

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the maximum linear heat rate calculated by COLSS is conservative with respect to the actual maximum linear heat rate existing in the core. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB, and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the linear heat rate limit can be maintained by utilizing any operable CPC channel. The above listed uncertainty and penalty factors plus those associated with the CPC startup test acceptance criteria are also included in the CPCs.

FOR INFORMATION ONLY

POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic surveillance requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provides assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

3/4.2.3 AZIMUTHAL POWER TILT - T_q

specified in the CORE OPERATING LIMITS REPORT

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than the limit in Figure 3-2-1A with COLSS in service or 0.10 with COLSS out of service is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

The AZIMUTHAL POWER TILT is equal to $(P_{\text{tilt}}/P_{\text{untilt}})-1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_q g \cos (\theta - \theta_0)$$

where:

T_q is the peak fractional tilt amplitude at the core periphery

g is the radial normalizing factor

θ is the azimuthal core location

θ_0 is the azimuthal core location of maximum tilt

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POWER DISTRIBUTION LIMITS

BASES

AZIMUTHAL POWER TILT - T_q (Continued)

$P_{\text{tilt}}/P_{\text{untilt}}$ is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

The AZIMUTHAL POWER TILT allowance used in the CPCs is defined as the value of CPC addressable constant TR-1.0.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on DNBR includes appropriate penalty factors which provide, with a 95/95 probability/confidence level, that the core power limits calculated by COLSS (based on the minimum DNBR Limit) are conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurement, engineering heat flux, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. *specified in the CORE OPERATING LIMITS REPORT* Therefore, in the event that the COLSS is not being used, operation within the limits of ~~Figures 3.2-2 and 3.2-2a~~ can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

[illegible]

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ADMINISTRATIVE CONTROLS

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (Continued)

The Semiannual Radioactive Effluent Release Report to be submitted 60 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1, October 1977.

The Semiannual Radioactive Effluent Release Reports shall include the following information for each class of solid waste (as defined by 10 CFR Part 61) shipped offsite during the report period:

- a. Container volume,
- b. Total curie quantity (specify whether determined by measurement or estimate),
- c. Principal radionuclides (specify whether determined by measurement or estimate),
- d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),
- e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and
- f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Semiannual Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Semiannual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM and to the OFFSITE DOSE CALCULATION MANUAL, as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

INSERT 2

SPECIAL REPORTS

6.9.2 Special reports shall be submitted to the Regional Administrator of the Regional Office of the NRC within the time period specified for each report.

6.9.3 Violations of the requirements of the fire protection program described in the Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be reported in accordance with 10 CFR 50.73.

6.10 RECORD RETENTION

In addition to the applicable record retention requirements of Title 10, Code of Federal Regulations, the following records shall be retained for at least the minimum period indicated.



INSERT 2

CORE OPERATING LIMITS REPORT

6.9.1.9 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT before each reload cycle or any remaining part of a reload cycle. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, and are as follows:

"C-E Method for Control Element Assembly Ejection Analysis,"
CENPD-190-A, January, 1976;

"The ROCS and DIT Computer Codes for Nuclear Design,"
CENPD-266-P-A, April, 1983;

"INCA/CECOR Power Peaking Uncertainty," CENPD-153-P, Revision
1-P-A, May, 1980;

"Safety Evaluation Report Related to the Final Design of the
Standard Nuclear Steam Supply Reference Systems CESSAR System
80, Docket No. STN 50-470," NUREG-0852 (November 1981),
Supplements No. 1 (March 1983), No. 2 (September 1983), No. 3
(December 1987);

"Modified Statistical Combination of Uncertainties,"
CEN-356(V)-P-A, Revision 01-P-A, May, 1988.

The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermalhydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements thereto, shall be provided upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

CORE OPERATING LIMITS REPORT
PALO VERDE NUCLEAR GENERATING STATION (PVNGS)
UNIT 1 CYCLE 3

INDEX

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AFFECTED PVNGS TECHNICAL SPECIFICATIONS	1
CORE OPERATING LIMITS	1
REFERENCES	4
LIST OF FIGURES	5
LIST OF TABLES	16



CORE OPERATING LIMITS REPORT

PALO VERDE NUCLEAR GENERATING STATION (PVNGS) UNIT 1 CYCLE 3

This Core Operating Limits Report for PVNGS Unit 1 Cycle 3 has been prepared in accordance with the requirements of Technical Specification 6.9.1. The core operating limits have been developed using the NRC approved methodologies specified in References 1 through 5.

AFFECTED PVNGS TECHNICAL SPECIFICATIONS

- | | |
|---|---|
| 1) 3.1.1.2
Shutdown Margin
K_{N-1} - Any CEA
Withdrawn | 6) 3.1.3.7
Part Length CEA
Insertion Limits |
| 2) 3.1.1.3
Moderator Temperature
Coefficient | 7) 3.2.1
Linear Heat Rate |
| 3) 3.1.2.7
Boron Dilution Alarms | 8) 3.2.3
Azimuthal Power
Tilt - T_q |
| 4) 3.1.3.1
Movable Control
Assemblies - CEA
Position | 9) 3.2.4
DNBR Margin |
| 5) 3.1.3.6
Regulating CEA Insertion
Limits | 10) 3.2.7
Axial Shape Index |

CORE OPERATING LIMITS

The cycle-specific operating limits for the specifications listed are presented below.

3.1.1.2 - Shutdown Margin K_{N-1} - Any CEA Withdrawn

The Shutdown Margin shall be greater than or equal to that shown in Figure 1.



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

CORE OPERATING LIMITS - CONTINUED

3.1.1.3 - Moderator Temperature Coefficient

The moderator temperature coefficient (MTC) shall be within the area of Acceptable Operation shown on Figure 2.

3.1.2.7 - Boron Dilution Alarms

With one or both start-up channel high neutron flux alarms inoperable, the RCS boron concentration shall be determined at the applicable monitoring frequency specified in Tables 1 through 5.

3.1.3.1 - Movable Control Assemblies - CEA Position

With one or more full-length or part-length CEAs misaligned from any other CEAs in its group by more than 6.6 inches, the minimum required MODES 1 and 2 core power reduction is specified in Figure 3.

3.1.3.6 - Regulating CEA Insertion Limits

One or more CEAC's OPERABLE: The regulation CEA groups shall be limited to the withdrawal sequence and to the insertion limits shown on Figure 4 when the COLSS is IN SERVICE or shown on Figure 5 when the COLSS is OUT OF SERVICE.

3.1.3.7 - Part Length CEA Insertion Limits

One or more CEAC's OPERABLE: The part length CEA groups shall be limited to the insertion limits shown on Figure 6.

3.2.1 - Linear Heat Rate

The linear heat rate limit of 13.5 kW/ft shall be maintained.

3.2.3 - Azimuthal Power Tilt - T_q

The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the limit in Figure 7 with COLSS IN SERVICE.



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

CORE OPERATING LIMITS - CONTINUED

3.2.4 - DNBR Margin

COLSS IN SERVICE and Both CEAC's INOPERABLE - Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operation limit based on DNBR decreased by the allowance shown in Figure 8.

COLSS OUT OF SERVICE and Either One or Both CEAC's are OPERABLE - Operating within the region of acceptable operation of Figure 9 using any operable CPC channel.

COLSS OUT OF SERVICE and CEAC's INOPERABLE - Operating within the region of acceptable operation of Figure 10 using any operable CPC channel.

3.2.7 - Axial Shape Index

The core average AXIAL SHAPE INDEX (ASI) shall be maintained within the following limits:

COLSS OPERABLE
 $-0.28 \leq \text{ASI} \leq 0.28$

COLSS OUT OF SERVICE (CPC)
 $-0.20 \leq \text{ASI} \leq 0.20$



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

REFERENCES

1. "C-E Method for Control Element Assembly Ejection Analysis," CENPD-190-A, January, 1976.
2. "The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April, 1983.
3. "INCA/CECOR Power Peaking Uncertainty," CENPD-153-P, Revision 1-P-A, May, 1980.
4. "Safety Evaluation Report Related to the Final Design of the Standard Nuclear Steam Supply Reference Systems CESSAR System 80, Docket No. STN 50-470," NUREG-0852 (November 1981), Supplements No. 1 (March 1983), No. 2 (September 1983), No. 3 (December 1987).
5. "Modified Statistical Combination of Uncertainties," CEN-356(V)-P-A Revision 01-P-A, May, 1988.



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

LIST OF FIGURES

1. Shutdown Margin Versus Cold Leg Temperature.
2. Allowable MTC Modes 1 and 2.
3. Core Power Limit After CEA Deviation.
4. CEA Insertion Limits vs Thermal Power (COLSS In Service).
5. CEA Insertion Limits vs Thermal Power (COLSS Out of Service)
6. Part Length CEA Insertion Limit vs Thermal Power.
7. Azimuthal Power Tilt Limit vs Thermal Power (COLSS In Service).
8. COLSS DNBR Power Operating Limit Allowance for Both CEACs Inoperable.
9. DNBR Margin Operating Limit Based on Core Protection Calculators (COLSS Out of Service, CEACs Operable)
10. DNBR Margin Operating Limit Based on Core Protection Calculators (COLSS Out of Service, CEACs Inoperable)



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

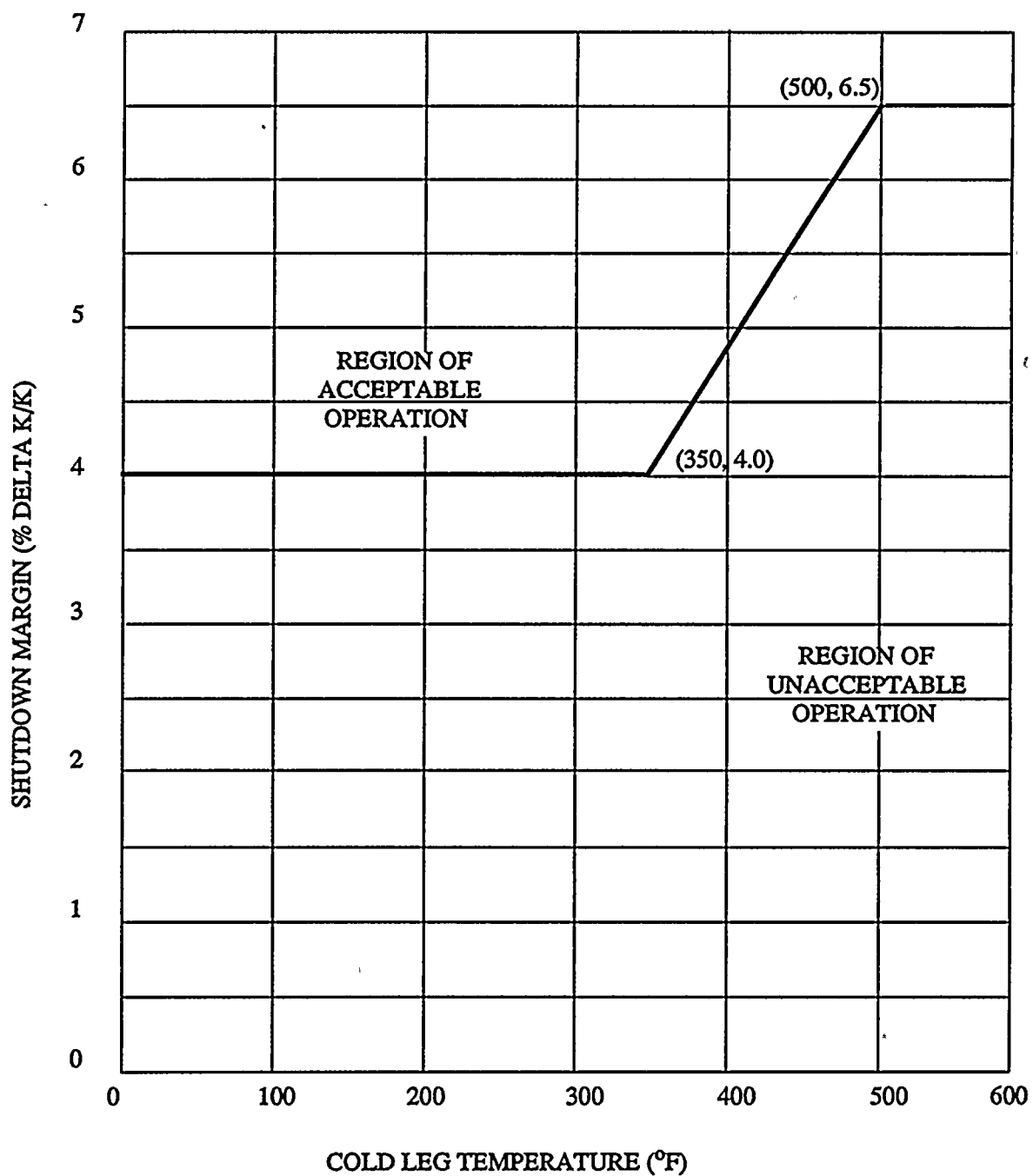


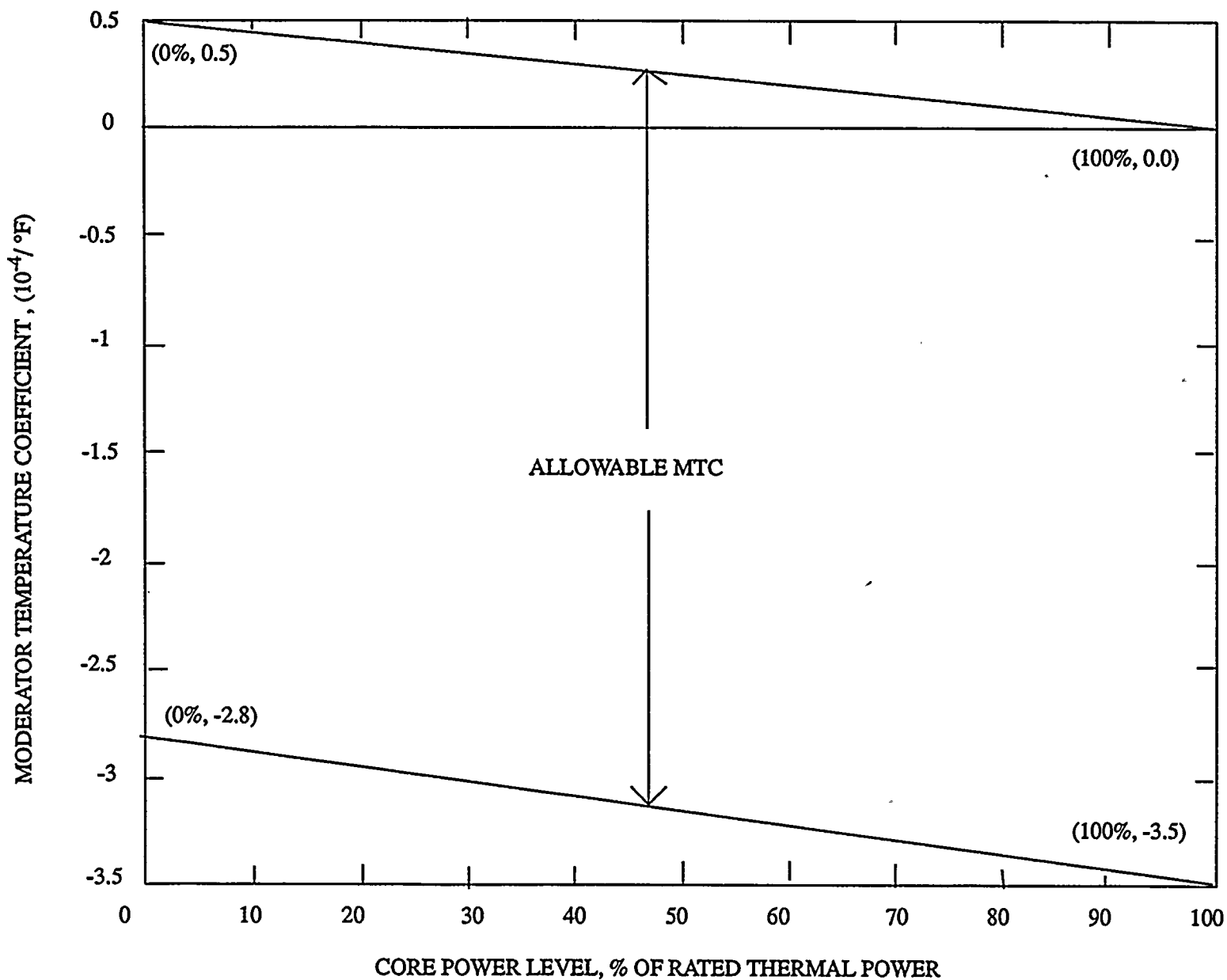
FIGURE 1

SHUTDOWN MARGIN VERSUS COLD LEG TEMPERATURE



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

FIGURE 2 - ALLOWABLE MTC MODES 1 AND 2

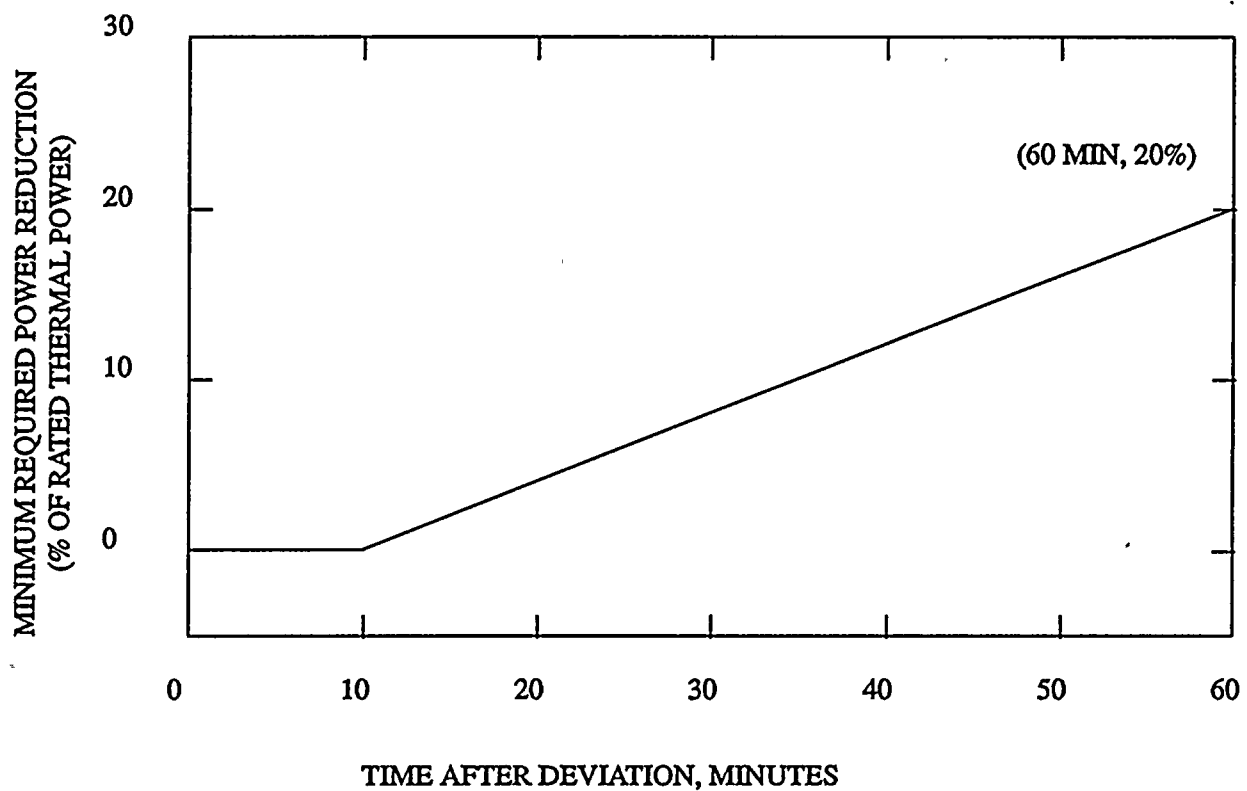




UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

FIGURE 3

CORE POWER LIMIT AFTER CEA DEVIATION*



* WHEN CORE POWER IS REDUCED TO 55% OF RATED THERMAL POWER PER THIS LIMIT CURVE, FURTHER REDUCTION IS NOT REQUIRED



FIGURE 4
CEA INSERTION LIMITS VERSUS THERMAL POWER
(COLSS IN SERVICE)

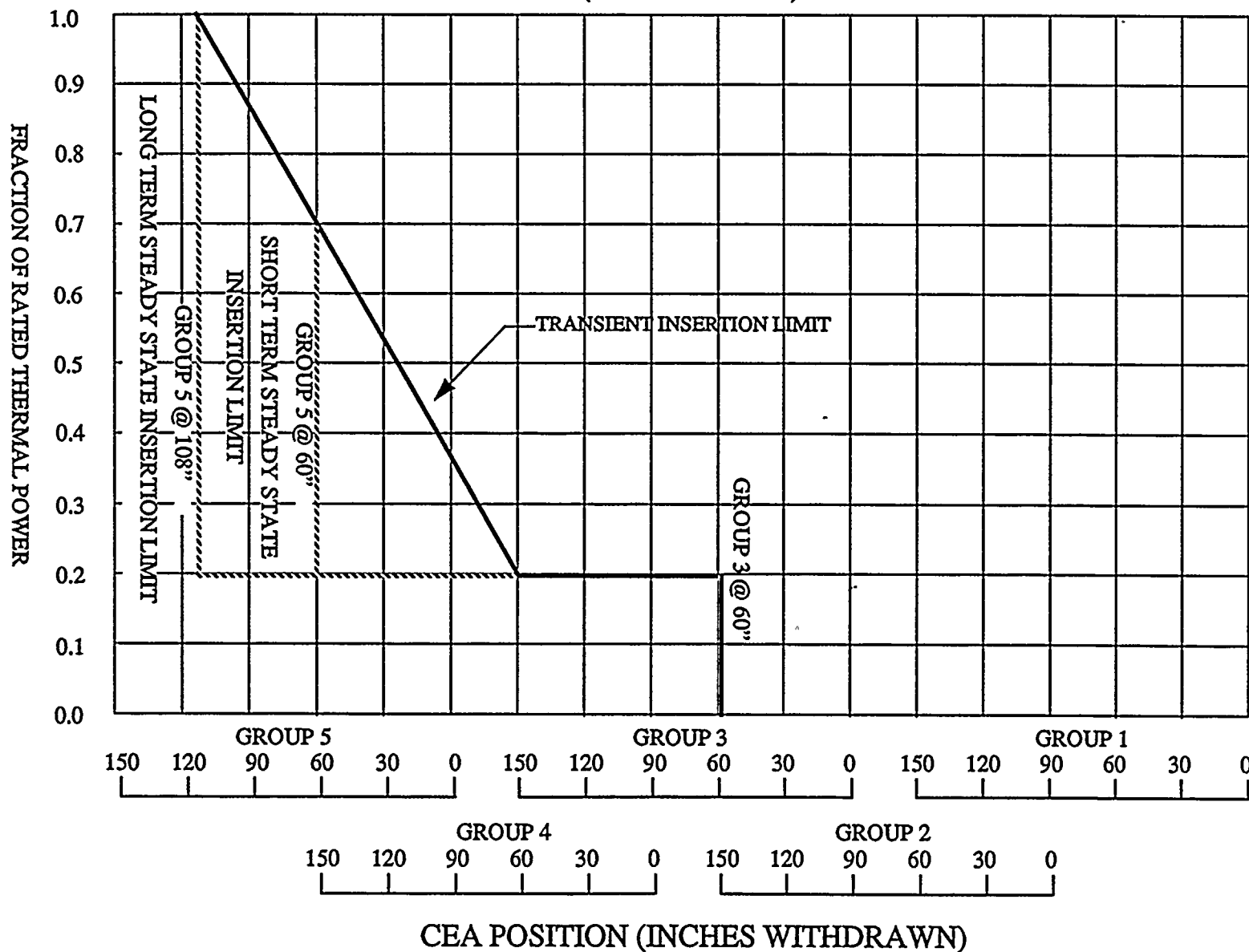
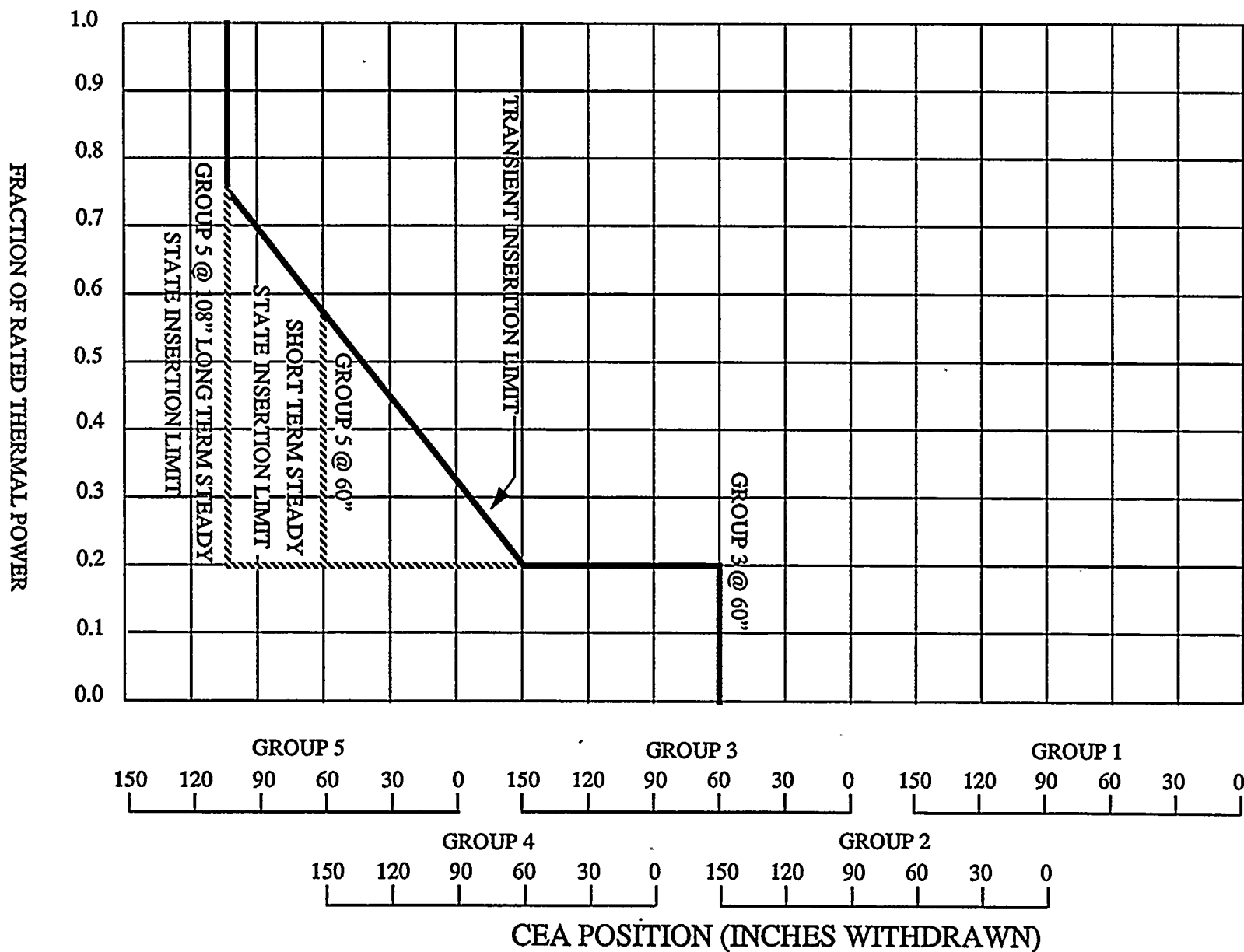




FIGURE 5
CEA INSERTION LIMITS VERSUS THERMAL POWER
(COLSS OUT OF SERVICE)





UNIT 3 CYCLE 3 CORE OPERATING LIMITS REPORT

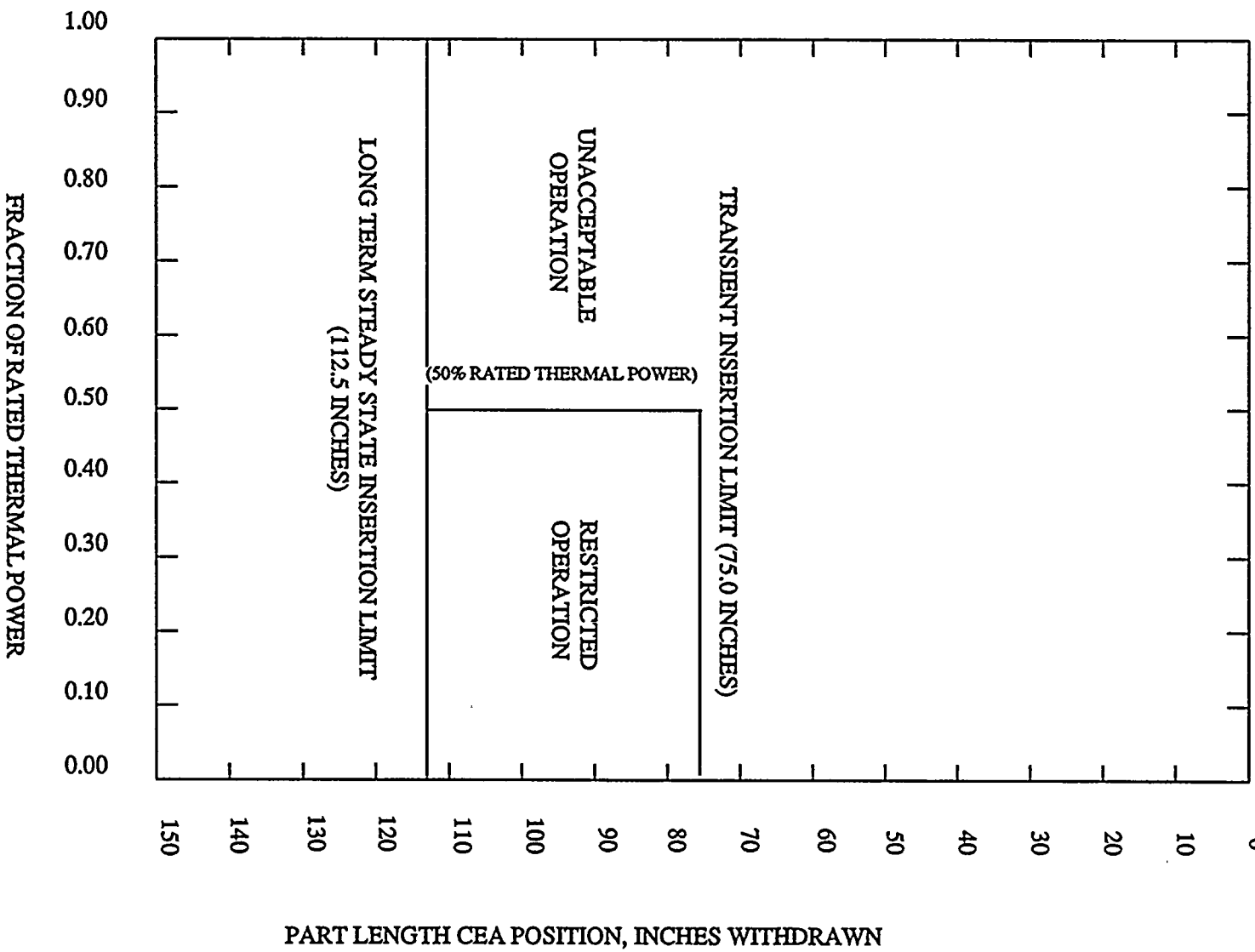


FIGURE 6

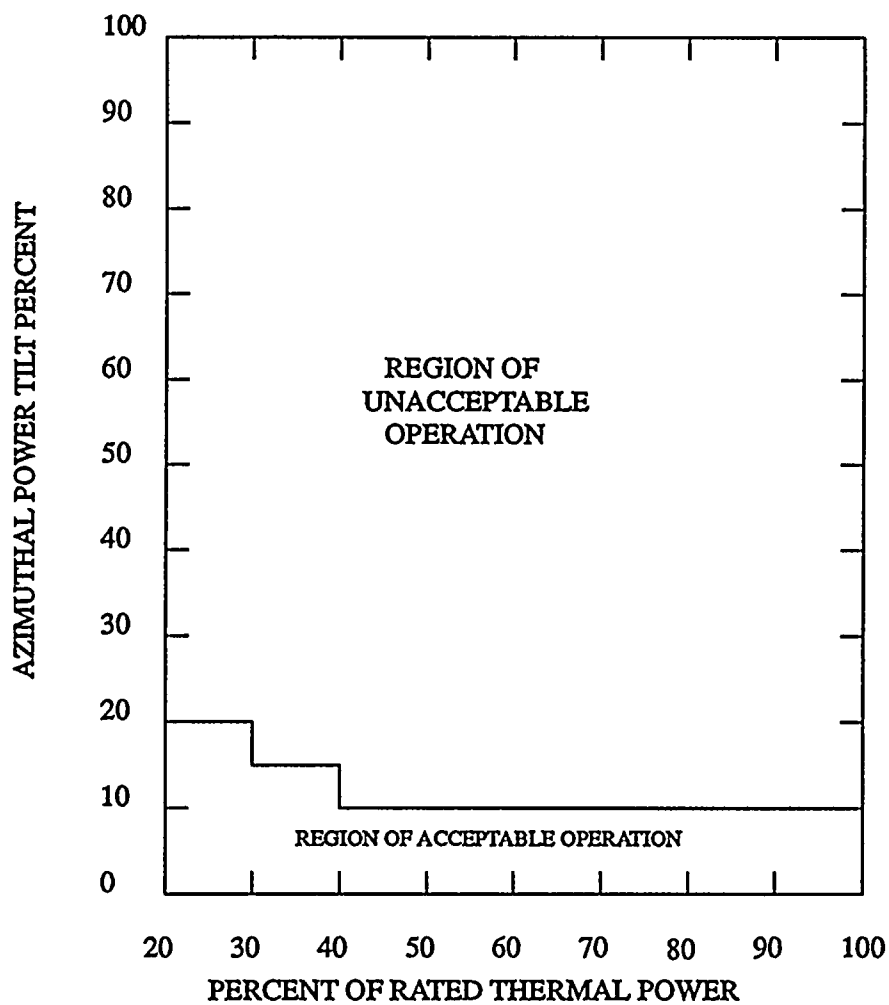
PART LENGTH CEA INSERTION LIMIT VERSUS THERMAL POWER



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

FIGURE 7

AZIMUTHAL POWER TILT LIMIT vs. THERMAL POWER
(COLSS IN SERVICE)

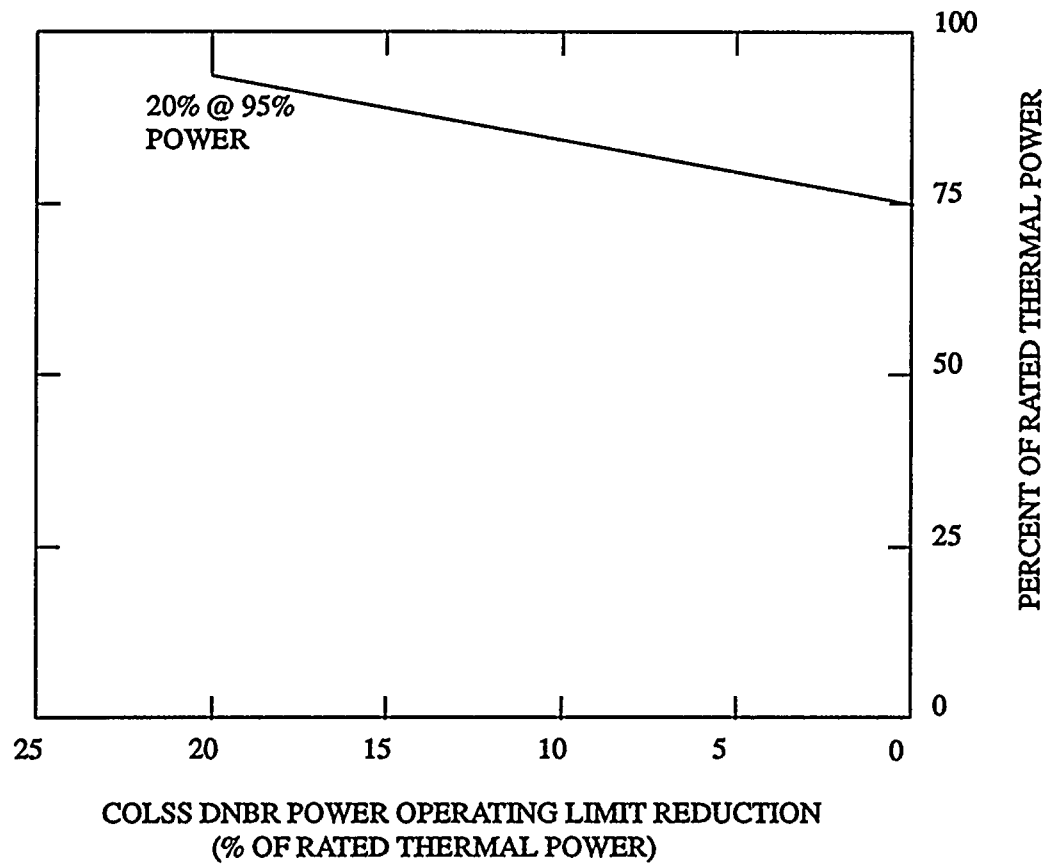




UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

FIGURE 8

COLSS DNBR POWER OPERATING LIMIT
ALLOWANCE FOR BOTH CEACs INOPERABLE





UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

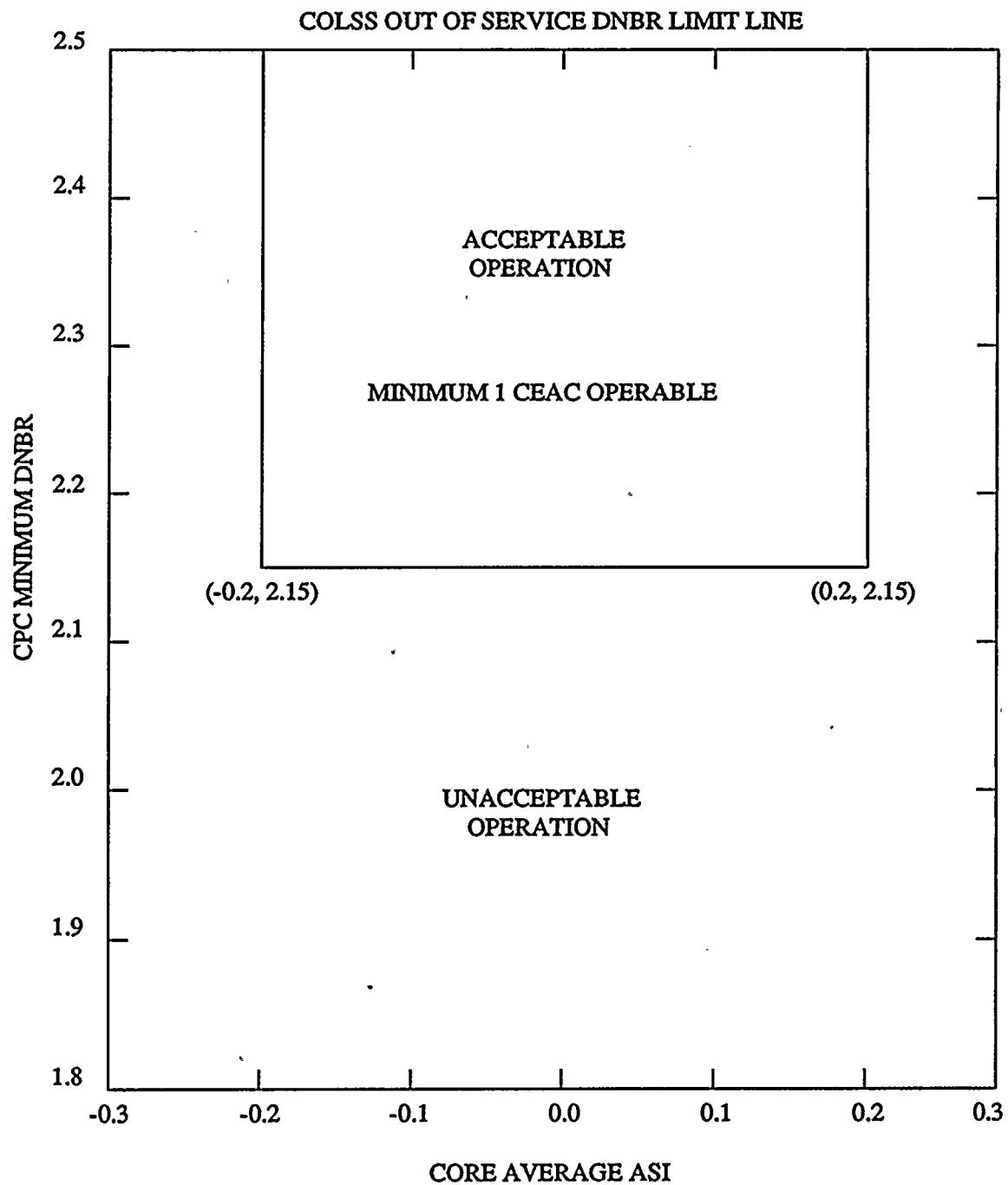


FIGURE 9
DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEACs OPERABLE)



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

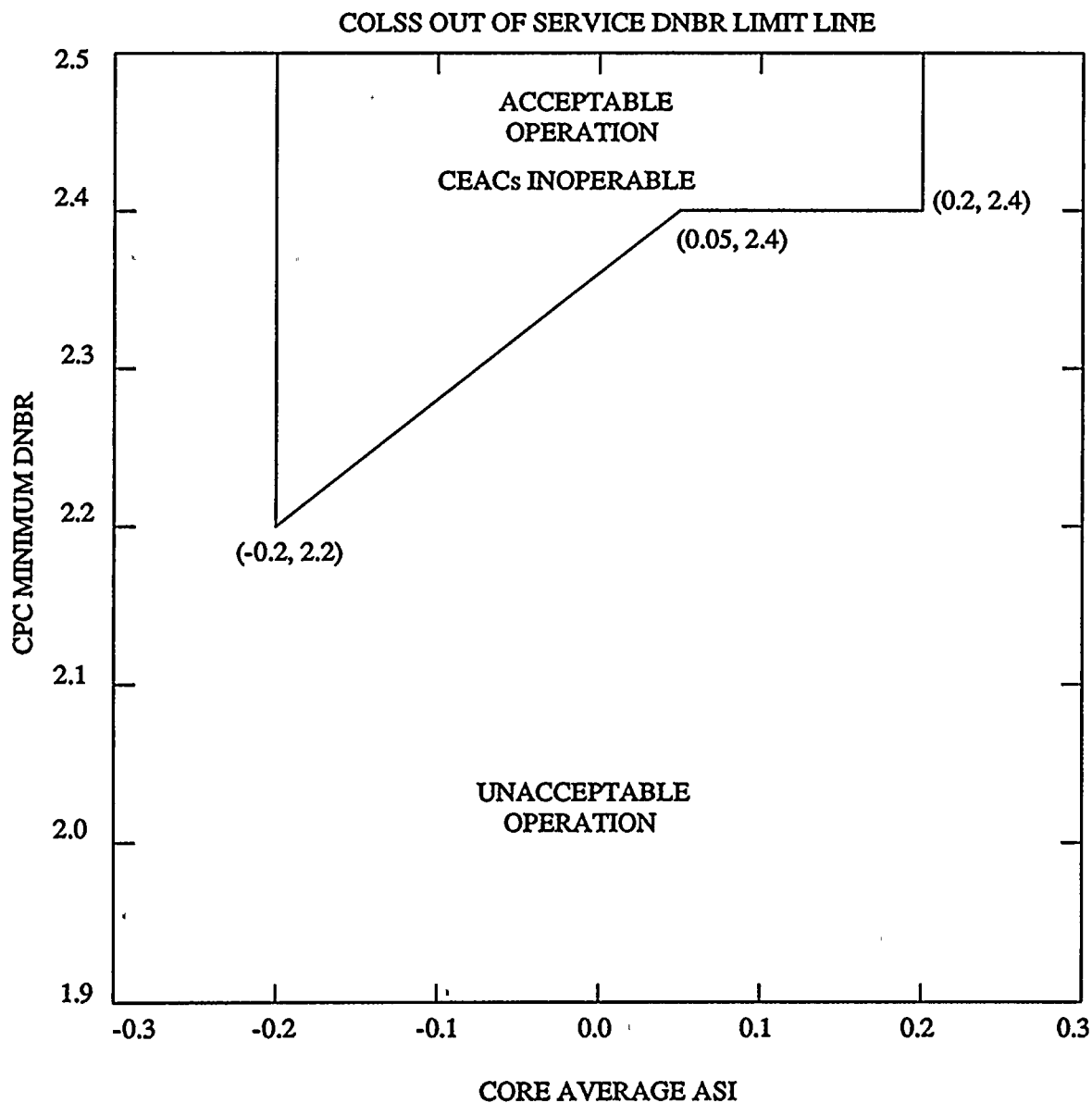


FIGURE 10

DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS
(COLSS OUT OF SERVICE, CEACs INOPERABLE)



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

LIST OF TABLES

1. Required Monitoring Frequencies for Backup Boron Dilution Detection as a Function of Operating Charging Pumps and Plant Operational Modes for $K_{eff} > 0.98$.
2. Required Monitoring Frequencies for Backup Boron Dilution Detection as a Function of Operating Charging Pumps and Plant Operational Modes for $0.98 \geq K_{eff} > 0.97$.
3. Required Monitoring Frequencies for Backup Boron Dilution Detection as a Function of Operating Charging Pumps and Plant Operational Modes for $0.97 \geq K_{eff} > 0.96$.
4. Required Monitoring Frequencies for Backup Boron Dilution Detection as a Function of Operating Charging Pumps and Plant Operational Modes for $0.96 \geq K_{eff} > 0.95$.
5. Required Monitoring Frequencies for Backup Boron Dilution Detection as a Function of Operating Charging Pumps and Plant Operational Modes for $K_{eff} \leq 0.95$.



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

TABLE 1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $K_{eff} > 0.98$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	1 hour	ONA	ONA
4 not on SCS	12 hours	1 hour	ONA	ONA
5 not on SCS	8 hours	1 hour	ONA	ONA
4 & 5 on SCS	ONA	ONA	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

TABLE 2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $0.98 \geq K_{eff} > 0.97$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	2 hours	0.5 hours	ONA
4 not on SCS	12 hours	2.5 hours	1 hour	0.5 hours
5 not on SCS	8 hours	2.5 hours	1 hour	0.5 hours
4 & 5 on SCS	8 hours	0.5 hours	ONA	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

TABLE 3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $0.97 \geq K_{eff} > 0.96$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	3.5 hours	1.5 hours	0.5 hours
4 not on SCS	12 hours	3.5 hours	1.5 hours	1 hour
5 not on SCS	8 hours	3.5 hours	1.5 hours	1 hour
4 & 5 on SCS	8 hours	1 hour	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

TABLE 4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $0.96 \geq K_{\text{eff}} > 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	5 hours	2 hours	1 hour
4 not on SCS	12 hours	5 hours	2 hours	1 hour
5 not on SCS	8 hours	5 hours	2 hours	1 hour
4 & 5 on SCS	8 hours	2 hours	0.5 hours	ONA

Notes: SCS = Shutdown Cooling System
ONA = Operation Not Allowed



UNIT 1 CYCLE 3 CORE OPERATING LIMITS REPORT

TABLE 5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON
DILUTION DETECTION AS A FUNCTION OF OPERATING
CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR $K_{eff} \leq 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps			
	0	1	2	3
3	12 hours	6 hours	2.5 hours	1.5 hours
4 not on SCS	12 hours	6 hours	3 hours	1.5 hours
5 not on SCS	8 hours	6 hours	3 hours	1.5 hours
4 & 5 on SCS	8 hours	2 hours	1 hour	0.5 hours
6	24 hours	8 hours	4 hours	2 hours

Notes: SCS = Shutdown Cooling System

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