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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

REPORTABLE EVENT

1.28 A REPORTABLE EVENT shall be any of those conditions specified in Sections 50.72 and 50.73 to 10 CFR Part 50.

SHUTDOWN MARGIN

1.29 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming:

a. No change in part-length control element assembly position, and

b. All full-length control element assemblies (shutdown and regulating) are fully inserted except for the single assembly of highest reactivity worth which is assumed to be fully withdrawn.

Add as new paragraph

With any full-length CEAs not capable of being fully inserted, the withdrawn reactivity worth of these full-length CEAs must be accounted for in the determination of the SHUTDOWN MARGIN.

SITE BOUNDARY

1.30 The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

SOFTWARE

1.31 The digital computer SOFTWARE for the reactor protection system shall be the program codes including their associated data, documentation, and procedures.

SOURCE CHECK

1.32 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

STAGGERED TEST BASIS

1.33 A STAGGERED TEST BASIS shall consist of:

a. A test schedule for n systems, subsystems, trains, or other designated components obtained by dividing the specified test interval into n equal subintervals, and

b. The testing of one system, subsystem, train, or other designated component at the beginning of each subinterval.

THERMAL POWER

1.34 THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

FOR INFORMATION ONLY

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - ~~ALL CEAs FULLY INSERTED~~ REACTOR TRIP BREAKERS OPEN**

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.0% delta k/k.

APPLICABILITY: MODES 3, 4*, and 5* with the reactor trip breakers open**, ~~all full length CEAs fully inserted~~.

ACTION:

With the SHUTDOWN MARGIN less than 1.0% delta k/k, immediately initiate and continue boration at greater than or equal to 26 gpm to reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1.0% delta k/k at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within + 1.0% delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.1.1, above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

4.1.1.1.3 With the reactor trip breakers open** and any CEA(s) fully or partially withdrawn, the SHUTDOWN MARGIN shall be verified within one hour after detection of the withdrawn CEA(s) and at least once per 12 hours thereafter while the CEA(s) are withdrawn.

Add

* See Special Test Exception 3.10.9.

** The CEA drive system not capable of CEA withdrawal.

SHUTDOWN MARGIN - ~~K_{N-1} - ANY CEA WITHDRAWN~~ REACTOR TRIP BREAKERS CLOSED**

LIMITING CONDITION FOR OPERATION

3.1.1.2

a. The SHUTDOWN MARGIN shall be greater than or equal to that specified in the CORE OPERATING LIMITS REPORT, and

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

Add c. from attached insert

APPLICABILITY: MODES 1, 2*, 3*, 4*, and 5* with the reactor trip breakers closed.** ~~any full-length CEA fully or partially withdrawn~~.

ACTION:

a. With the SHUTDOWN MARGIN less than that specified in the CORE OPERATING LIMITS REPORT, 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 the reactor trip breakers closed** ~~any full-length CEA fully or partially withdrawn~~, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that 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

** The CEA drive system capable of CEA withdrawal.

INSERT FOR LIMITING CONDITION FOR OPERATION 3.1.1.2

c. Reactor criticality shall not be achieved with shutdown group CEA movement.

FOR INFORMATION ONLY

SURVEILLANCE REQUIREMENTS (Continued)

Add attached insert

b. When in MODE 1 or MODE 2 with k_{eff} greater than or equal to 1.0, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2 with k_{eff} less than 1.0, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e. below, with the CEA groups at the Transient Insertion Limits of Specification 3.1.3.6.

e. When in MODE 3, 4, or 5, at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.2.2 When in MODE 3, 4, or 5, with the reactor trip breakers closed** ~~any full-length CEA fully or partially withdrawn~~, and T_{cold} less than or equal to 500°F, K_{N-1} shall be determined to be less than 0.99 at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration

Add new 4.1.1.2.3 from attached insert

4.1.1.2.~~3~~ 4 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within ± 1.0% delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.2.1.e or 4.1.1.2.2. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

** The CEA drive system capable of CEA withdrawal.

INSERT TO 4.1.1.2.1b:

If CEA group withdrawal is not within the Transient Insertion Limits of Specification 3.1.3.6, within 1 hour verify that SHUTDOWN MARGIN is greater than or equal to that specified in the CORE OPERATING LIMITS REPORT.

INSERT NEW 4.1.1.2.3:

4.1.1.2.3 When in MODES 3, 4, or 5 with the reactor trip breakers closed**, verify that criticality cannot be achieved with shutdown group CEA withdrawal at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

TABLE 3.3-1

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. TRIP GENERATION					
A. Process					
1. Pressurizer Pressure - High	4	2	3	1, 2	2#, 3#
2. Pressurizer Pressure - Low	4	2 (b)	3	1, 2	2#, 3#
3. Steam Generator Level - Low	4/SG	2/SG	3/SG	1, 2	2#, 3#
4. Steam Generator Level - High	4/SG	2/SG	3/SG	1, 2	2#, 3#
5. Steam Generator Pressure - Low	4/SG	2/SG	3/SG	1, 2, 3*, 4*	2#, 3#
6. Containment Pressure - High	4	2	3	1, 2	2#, 3#
7. Reactor Coolant Flow - Low	4/SG	2/SG	3/SG	1, 2	2#, 3#
8. Local Power Density - High	4	2 (c)(d)	3	1, 2	2#, 3#
9. DNBR - Low	4	2 (c)(d)	3	1, 2	2#, 3#
B. Excore Neutron Flux					
1. Variable Overpower Trip	4	2	3	1, 2	2#, 3#
2. Logarithmic Power Level - High					
a. Startup and Operating	4	2 (a)(d)	3	1, 2	2#, 3#
	4	2	3	3*, 4*, 5*	9
b. Shutdown	4	0	2	3, 4, 5	4
C. Core Protection Calculator System					
1. CEA Calculators	2	1	2 (e)	1, 2	6, 7
2. Core Protection Calculators	4	2 (c)(d)	3	1, 2, 3*, 4*, 5*	2#, 3#, 7, 10

FOR INFORMATION ONLY

TABLE 3.3-1 (Continued)

ACTION STATEMENTS

2. Within 4 hours:

   a) All full-length and part-length CEA groups must be withdrawn within the limits of Specifications 3.1.3.5, 3.1.3.6b, and 3.1.3.7b except during surveillance testing pursuant to the requirements of Specification 4.1.3.1.2. Specification 3.1.3.6b allows CEA group 5 insertion to no further than 127.5 inches withdrawn.

   b) The "RSPT/CEAC Inoperable" addressable constant in the CPCs is set to be indicated that both CEAC's are inoperable.

   c) The Control Element Drive Mechanism Control System (CEDMCS) is placed in and subsequently maintained in the "Standby" mode except during CEA motion permitted by Specifications 3.1.3.5, 3.1.3.6b, and 3.1.3.7b when the CEDMCS may be operated in either the "Manual Group" or "Manual Individual" mode.

3. CEA position surveillance must meet the requirements of Specifications 4.1.3.1.1, 4.1.3.5, 4.1.3.6, and 4.1.3.7 except during surveillance testing pursuant to Specification 4.1.3.1.2.

ACTION 7 - With three or more auto restarts, excluding periodic auto restarts (Code 30 and Code 33), of one non-bypassed calculator during a 12-hour interval, demonstrate calculator OPERABILITY by performing a CHANNEL FUNCTIONAL TEST within the next 24 hours.

ACTION 8 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore an inoperable channel to OPERABLE status within 48 hours or open an affected reactor trip breaker within the next hour.

ACTION 9 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 10 - In MODES 3, 4, or 5, the Core Protection Calculator channels are not required to be OPERABLE when the Logarithmic Power Level - High trip is OPERABLE with the trip setpoint lowered to $\leq 10^{-4}$% of Rated Thermal Power.

FOR INFORMATION ONLY

TABLE NOTATIONS

* - With reactor trip breakers in the closed position and the CEA drive system capable of CEA withdrawal, and fuel in the reactor vessel.

(1) - Each STARTUP or when required with the reactor trip breakers closed and the CEA drive system capable of rod withdrawal, if not performed in the previous 7 days.

Add attached insert

(2) - ~~Heat balance only (CHANNEL FUNCTIONAL TEST not included), above 15% of RATED THERMAL POWER; adjust the linear power level, the CPC delta T power and CPC nuclear power signals to agree with the calorimetric calculation if absolute difference is greater than 2%. During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.~~

(3) - Above 15% of RATED THERMAL POWER, verify that the linear power sub-channel gains of the excore detectors are consistent with the values used to establish the shape annealing matrix elements in the Core Protection Calculators.

(4) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

(5) - After each fuel loading and prior to exceeding 70% of RATED THERMAL POWER, the incore detectors shall be used to determine the shape annealing matrix elements and the Core Protection Calculators shall use these elements.

(6) - This CHANNEL FUNCTIONAL TEST shall include the injection of simulated process signals into the channel as close to the sensors as practicable to verify OPERABILITY including alarm and/or trip functions.

(7) - Above 70% of RATED THERMAL POWER, verify that the total steady-state RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation or by calorimetric calculations and if necessary, adjust the CPC addressable constant flow coefficients such that each CPC indicated flow is less than or equal to the actual flow rate. The flow measurement uncertainty may be included in the BERR1 term in the CPC and is equal to or greater than 4%.

(8) - Above 70% of RATED THERMAL POWER, verify that the total steady-state RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation and the ultrasonic flow meter adjusted pump curves or calorimetric calculations.

(9) - The quarterly CHANNEL FUNCTIONAL TEST shall include verification that the correct current values of addressable constants are installed in each OPERABLE CPC.

(10) - At least once per 18 months and following maintenance or adjustment of the reactor trip breakers, the CHANNEL FUNCTIONAL TEST shall include independent verification of the undervoltage and shunt trips.

INSERT FOR TABLE 4.3-1, TABLE NOTATION 2

Heat balance only (CHANNEL FUNCTIONAL TEST not included):

a. Between 15% and 80% of RATED THERMAL POWER, compare the linear power level, the CPC delta T power and the CPC nuclear power signals to the calorimetric calculation.

   If any signal is within -0.5% to 10% of the calorimetric then do not calibrate except as required during initial power ascension after refueling.

   If any signal is less than the calorimetric calculation by more than 0.5%, then adjust the affected signal(s) to agree with the calorimetric calculation.

   If any signal is greater than the calorimetric calculation by more than 10% then adjust the affected signal(s) to agree with the calorimetric calculation within 8% to 10%.

b. At or above 80% of RATED THERMAL POWER; compare the linear power level, the CPC delta T power and the CPC nuclear power signals to the calorimetric calculation. If any signal differs from the calorimetric calculation by an absolute difference of more than 2%, then adjust the affected signal(s) to agree with the calorimetric calculation.

During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.

FOR INFORMATION ONLY

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head closure bolts less than fully tensioned or with the head removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and ~~sufficient to ensure that the more restrictive of the following reactivity conditions is met:~~ within the limit specified in the Core Operating Limits Report (COLR).

~~a. Either a K_{eff} of 0.95 or less, or~~

~~b. A boron concentration of greater than or equal to 2150 ppm.~~

APPLICABILITY: MODE 6*.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 26 gpm of a solution containing $\geq$ 4000 ppm boron or its equivalent until ~~K_{eff} is reduced to less than or equal to 0.95 or~~ the boron concentration is ~~restored to greater than or equal to 2150 ppm, whichever is the more restrictive.~~ within limits.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The ~~more restrictive of the above two reactivity conditions~~ boron concentration shall be determined to be within the limit specified in the COLR prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full-length CEA in excess of 3 feet from its fully inserted position within the reactor pressure vessel.

4.9.1.2 The boron concentration of the Reactor Coolant System and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

*The reactor shall be maintained in MODE 6 whenever fuel is in the reactor vessel with the reactor vessel head closure bolts less than fully tensioned or with the head removed.

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN AND K_{N-1}

The function of SHUTDOWN MARGIN is to ensure that the reactor remains subcritical following a design basis accident or anticipated operational occurrence. The function of K_{N-1} is to maintain sufficient subcriticality to preclude inadvertent criticality following ejection of a single control element assembly (CEA). During operation in MODES 1 and 2, with k_{eff} greater than or equal to 1.0, the transient insertion limits of Specification 3.1.3.6 ensure that sufficient SHUTDOWN MARGIN is available.

SHUTDOWN MARGIN is the amount by which the core is subcritical, or would be subcritical immediately following a reactor trip, considering a single malfunction resulting in the highest worth CEA failing to insert. K_{N-1} is a measure of the core's reactivity, considering a single malfunction resulting in the highest worth inserted CEA being ejected.

SHUTDOWN MARGIN requirements vary throughout the core life as a function of fuel depletion and reactor coolant system (RCS) cold leg temperature (T_{cold}). The most restrictive condition occurs at EOL, with T_{cold} at no-load operating temperature, and is associated with a postulated steam line break accident and the resulting uncontrolled RCS cooldown. In the analysis of this accident, the specified SHUTDOWN MARGIN is required to control the reactivity transient and ensure that the fuel performance and offsite dose criteria are satisfied. As (initial) T_{cold} decreases, the potential RCS cooldown and the resulting reactivity transient are less severe and, therefore, the required SHUTDOWN MARGIN also decreases. Below T_{cold} of about ~~210°F~~ 350°F, the inadvertent deboration event becomes limiting with respect to the SHUTDOWN MARGIN requirements. Below ~~210°F~~ 350°F, the specified SHUTDOWN MARGIN ensures that sufficient time for operator actions exists between the initial indication of the deboration and the total loss of shutdown margin. Accordingly, with ~~at least one CEA partially or fully withdrawn~~ the reactor trip breakers closed and the CEA drive system capable of CEA withdrawal, the SHUTDOWN MARGIN requirements are based upon these limiting conditions.

Additional events considered in establishing requirements on SHUTDOWN MARGIN that are not limiting with respect to the Specification limits are single CEA withdrawal and startup of an inactive reactor coolant pump.

K_{N-1} requirements vary with the amount of positive reactivity that would be introduced assuming the CEA with the highest inserted worth ejects from the core. In the analysis of the CEA ejection event, the K_{N-1} requirement ensures that the radially averaged enthalpy acceptance criterion is satisfied, considering power redistribution effects. Above T_{cold} of 500°F, Doppler reactivity feedback is sufficient to preclude the need for a specific K_{N-1} requirement. With all CEAs fully inserted, K_{N-1} and SHUTDOWN MARGIN requirements are equivalent in terms of minimum acceptable core boron concentration.

Add attached insert

INSERT FOR BASES 3/4.1.1.1 AND 3/4.1.1.2

The requirement prohibiting criticality due to shutdown group CEA movement is associated with the assumptions used in the analysis of uncontrolled CEA withdrawal from subcritical conditions. Due to the high differential reactivity worth of the shutdown CEA groups, the analysis assumes that the initial shutdown reactivity is such that the reactor will remain subcritical in the event of unexpected or uncontrolled shutdown group withdrawal.

3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses. ~~The value of 0.95 or less for K_{eff} includes a 1% delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2150 ppm or greater also includes a conservative uncertainty allowance of 50 ppm boron.~~

Replace with attached insert.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the startup channel neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during CORE ALTERATIONS.

INSERT FOR BASES 3/4.9.1

The boron concentration limit specified in the COLR is based on core reactivity at the beginning of each cycle (the end of refueling) with all CEAs withdrawn and includes an uncertainty allowance. This boron concentration limit will ensure a K_{eff} of $\leq$ 0.95 during the refueling operation.

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 for the following:

a. Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~ - Reactor Trip Breakers Closed for Specification 3.1.1.2
b. Moderator Temperature Coefficient BOL and EOL limits for Specification 3.1.1.3
c. Boron Dilution Alarms for Specification 3.1.2.7
d. Movable Control Assemblies - CEA Position for Specification 3.1.3.1
e. Regulating CEA Insertion Limits for Specification 3.1.3.6
f. Part Length CEA Insertion Limits for Specification 3.1.3.7
g. Linear Heat Rate for Specification 3.2.1
h. Azimuthal Power Tilt - T_q for Specification 3.2.3
i. DNBR Margin for Specification 3.2.4
j. Axial Shape Index for Specification 3.2.7
k. Boron Concentration (Mode 6) for Specification 3.9.1

6.9.1.10 The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in:

a. "CE Method for Control Element Assembly Ejection Analysis,"CENPD-0190-A, January 1976 (Methodology for Specification 3.1.3.6, Regulating CEA Insertion Limits).

b. "The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April 1983 (Methodology for Specifications 3.1.1.2, Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~ - Reactor Trip Breakers Closed; 3.1.1.3, Moderator Temperature Coefficient BOL and EOL limits; ~~and~~ 3.1.3.6, Regulating CEA Insertion Limits; and 3.9.1, Boron Concentration (Mode 6)).

Add

c. "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 (Novenber 1981), Supplements No. 1 (March 1983), No. 2 (September 1983), No. 3 (December 1987) (Methodology for Specifications 3.1.1.2, ~~Shutdown Margin K_{N-1} - Any CEA Withdrawn~~; 3.1.1.3, Moderator Temperature Coefficient BOL and EOL limits; 3.1.2.7, Boron Dilution Alarms; 3.1.3.1, Movable Control Assemblies - CEA Position; 3.1.3.6, Regulating CEA Insertion Limits; 3.1.3.7, Part Length CEA Insertion Limits and 3.2.3 Azimuthal Power Tilt - T_q).

d. "Modified Statistical Combination of Uncertainties," CEN-356(V)-P-A Revision 01-P-A, May 1988 and "System 80™ Inlet Flow Distribution," Supplement 1-P to Enclosure 1-P to LD-82-054, February 1993 (Methodology for Specification 3.2.4, DNBR Margin and 3.2.7 Axial Shape Index).

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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

DEFINITIONS

REPORTABLE EVENT

1.28 A REPORTABLE EVENT shall be any of those conditions specified in Sections 50.72 and 50.73 to 10 CFR Part 50.

SHUTDOWN MARGIN

1.29 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming:

a. No change in part-length control element assembly position, and

b. All full-length control element assemblies (shutdown and regulating) are fully inserted except for the single assembly of highest reactivity worth which is assumed to be fully withdrawn.

Add as new paragraph

SITE BOUNDARY

1.30 The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

SOFTWARE

1.31 The digital computer SOFTWARE for the reactor protection system shall be the program codes including their associated data, documentation, and procedures.

SOURCE CHECK

1.32 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

STAGGERED TEST BASIS

1.33 A STAGGERED TEST BASIS shall consist of:

a. A test schedule for n systems, subsystems, trains, or other designated components obtained by dividing the specified test interval into n equal subintervals, and

b. The testing of one system, subsystem, train, or other designated component at the beginning of each subinterval.

THERMAL POWER

1.34 THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

With any full-length CEAs not capable of being fully inserted, the withdrawn reactivity worth of these full-length CEAs must be accounted for in the determination of the SHUTDOWN MARGIN.

REACTIVITY CONTROL SYSTEMS

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - ~~ALL CEAs FULLY INSERTED~~ REACTOR TRIP BREAKERS OPEN**

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.0% delta k/k.

APPLICABILITY: MODES 3, 4* and 5*, with ~~all full length CEAs fully inserted.~~ the reactor trip breakers open**.

ACTION:

With the SHUTDOWN MARGIN less than 1.0% delta k/k, immediately initiate and continue boration at greater than or equal to 26 gpm to reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1.0% delta k/k at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within ± 1.0% delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.1.1, above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

4.1.1.1.3 With the reactor trip breakers open** and any CEA(s) fully or partially withdrawn, the SHUTDOWN MARGIN shall be verified within one hour after detection of the withdrawn CEA(s) and at least once per 12 hours thereafter while the CEA(s) are withdrawn.

Add

* See Special Test Exception 3.10.9.

** The CEA drive system not capable of CEA withdrawal.

FOR INFORMATION ONLY

SHUTDOWN MARGIN - ~~K_{N-1} - ANY CEA WITHDRAWN~~ REACTOR TRIP BREAKERS CLOSED **

LIMITING CONDITION FOR OPERATION

3.1.1.2

Add c. from attached insert

a. The SHUTDOWN MARGIN shall be greater than or equal to that specified in the CORE OPERATING LIMITS REPORT, 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 the reactor trip breakers closed ** ~~any full-length CEA fully or partially withdrawn~~.

ACTION:

a. With the SHUTDOWN MARGIN less than that specified in the CORE OPERATING LIMITS REPORT, 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 the reactor trip breakers closed**, ~~any full-length CEA fully or partially withdrawn~~ the SHUTDOWN MARGIN shall be determined to be greater than or equal to that 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.

** The CEA drive system capable of CEA withdrawal.

INSERT FOR LIMITING CONDITION FOR OPERATION 3.1.1.2

c. Reactor criticality shall not be achieved with shutdown group CEA movement.

SURVEILLANCE REQUIREMENTS (Continued)

b. When in MODE 1 or MODE 2 with k_{eff} greater than or equal to 1.0, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.

Add attached insert

c. When in MODE 2 with k_{eff} less than 1.0, within 4 hours prior to achieving reactor criticality by verifying that predicted critical CEA position is within the limits of Specification 3.1.3.6.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e. below, with the CEA groups at the Transient Insertion Limits of Specification 3.1.3.6.

e. When in MODE 3, 4, or 5, at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.2.2 When in MODE 3, 4, or 5, with the reactor trip breakers closed **, ~~any full-length CEA fully or partially withdrawn~~ and T_{cold} less than or equal to 500°F, K_{N-1} shall be determined to be less than 0.99 at least once per 24 hours by consideration of at least the following factors.

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature
4. Fuel burnup based on gross thermal energy generation.
5. Xenon concentration, and
6. Samarium concentration.

Add new 4.1.1.2.3 from attached insert

4.1.1.2.~~3~~4 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within ± 1.0% delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.2.1.e or 4.1.1.2.2. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

** The CEA drive system capable of CEA withdrawal.

INSERT TO 4.1.1.2.1b:

If CEA group withdrawal is not within the Transient Insertion Limits of Specification 3.1.3.6, within 1 hour verify that SHUTDOWN MARGIN is greater than or equal to that specified in the CORE OPERATING LIMITS REPORT.

INSERT NEW 4.1.1.2.3:

4.1.1.2.3 When in MODES 3, 4, or 5 with the reactor trip breakers closed**, verify that criticality cannot be achieved with shutdown group CEA withdrawal at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

TABLE 3.3-1

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. TRIP GENERATION					
A. Process					
1. Pressurizer Pressure - High	4	2	3	1, 2	2#, 3#
2. Pressurizer Pressure - Low	4	2 (b)	3	1, 2	2#, 3#
3. Steam Generator Level - Low	4/SG	2/SG	3/SG	1, 2	2#, 3#
4. Steam Generator Level - High	4/SG	2/SG	3/SG	1, 2	2#, 3#
5. Steam Generator Pressure - Low	4/SG	2/SG	3/SG	1, 2, 3*, 4*	2#, 3#
6. Containment Pressure - High	4	2	3	1, 2	2#, 3#
7. Reactor Coolant Flow - Low	4/SG	2/SG	3/SG	1, 2	2#, 3#
8. Local Power Density - High	4	2 (c)(d)	3	1, 2	2#, 3#
9. DNBR - Low	4	2 (c)(d)	3	1, 2	2#, 3#
B. Excore Neutron Flux					
1. Variable Overpower Trip	4	2	3	1, 2	2#, 3#
2. Logarithmic Power Level - High					
a. Startup and Operating	4	2 (a)(d)	3	1, 2	2#, 3#
	4	2	3	3*, 4*, 5*	9
b. Shutdown	4	0	2	3, 4, 5	4
C. Core Protection Calculator System					
1. CEA Calculators	2	1	2 (e)	1, 2	6, 7
2. Core Protection Calculators	4	2 (c)(d)	3	1, 2 ,3*, 4*, 5*	2#, 3#, 7 ,10

TABLE 3.3-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION

ACTION STATEMENTS

2. Within 4 hours:

   a) All full-length and part-length CEA groups must be withdrawn within the limits of Specifications 3.1.3.5, 3.1.3.6b, and 3.1.3.7b, except during surveillance testing pursuant to the requirements of Specification 4.1.3.1.2. Specification 3.1.3.6b allows CEA group 5 insertion to no further than 127.5 inches withdrawn.

   b) The "RSPT/CEAC Inoperable" addressable constant in the CPCs is set to indicate that both CEACs are inoperable.

   c) The Control Element Drive Mechanism Control System (CEDMCS) is placed in and subsequently maintained in the "Standby" mode except during CEA motion permitted by Specifications 3.1.3.5, 3.1.3.6b and 3.1.3.7b when the CEDMCS may be operated in either the "Manual Group" or "Manual Individual" mode.

3. CEA position surveillance must meet the requirements of Specifications 4.1.3.1.1, 4.1.3.5, 4.1.3.6, and 4.1.3.7 except during surveillance testing pursuant to Specification 4.1.3.1.2.

ACTION 7 - With three or more auto restarts, excluding periodic auto restarts (Code 30 and Code 33), of one non-bypassed calculator during a 12-hour interval, demonstrate calculator OPERABILITY by performing a CHANNEL FUNCTIONAL TEST within the next 24 hours.

ACTION 8 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore an inoperable channel to OPERABLE status within 48 hours or open an affected reactor trip breaker within the next hour.

ACTION 9 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 10 - In MODES 3, 4, or 5, the Core Protection Calculator channels are not required to be OPERABLE when the Logarithmic Power Level - High trip is OPERABLE with the trip setpoint lowered to $\leq 10^{-4}\%$ of Rated Thermal Power.

FOR INFORMATION ONLY

TABLE 4.3-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

* - With reactor trip breakers in the closed position and the CEA drive system capable of CEA withdrawal, and fuel in the reactor vessel.

(1) - Each STARTUP or when required with the reactor trip breakers closed and the CEA drive system capable of rod withdrawal, if not performed in the previous 7 days.

Add attached insert

(2) - ~~Heat balance only (CHANNEL FUNCTIONAL TEST not included), above 15% of RATED THERMAL POWER; adjust the linear power level, the CPC delta T power and CPC nuclear power signals to agree with the calorimetric calculation if absolute difference is greater than 2%. During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.~~

(3) - Above 15% of RATED THERMAL POWER, verify that the linear power subchannel gains of the excore detectors are consistent with the values used to establish the shape annealing matrix elements in the Core Protection Calculators.

(4) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

(5) - After each fuel loading and prior to exceeding 70% of RATED THERMAL POWER, the incore detectors shall be used to determine the shape annealing matrix elements and the Core Protection Calculators shall use these elements.

(6) - This CHANNEL FUNCTIONAL TEST shall include the injection of simulated process signals into the channel as close to the sensors as practicable to verify OPERABILITY including alarm and/or trip functions.

(7) - Above 70% of RATED THERMAL POWER, verify that the total steady-state RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation or by calorimetric calculations and if necessary, adjust the CPC addressable constant flow coefficients such that each CPC indicated flow is less than or equal to the actual flow rate. The flow measurement uncertainty may be included in the BERR1 term in the CPC and is equal to or greater than 4%.

(8) - Above 70% of RATED THERMAL POWER, verify that the total steady-state RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation and the ultrasonic flow meter adjusted pump curves or calorimetric calculations.

(9) - The quarterly CHANNEL FUNCTIONAL TEST shall include verification that the correct (current) values of addressable constants are installed in each OPERABLE CPC.

(10) - At least once per 18 months and following maintenance or adjustment of the reactor trip breakers, the CHANNEL FUNCTIONAL TEST shall include independent verification of the undervoltage and shunt trips.

<u>INSERT FOR TABLE 4.3-1, TABLE NOTATION 2</u>

Heat balance only (CHANNEL FUNCTIONAL TEST not included):

a. Between 15% and 80% of RATED THERMAL POWER, compare the linear power level, the CPC delta T power and the CPC nuclear power signals to the calorimetric calculation.

   If any signal is within -0.5% to 10% of the calorimetric then <u>do not</u> calibrate except as required during initial power ascension after refueling.

   If any signal is less than the calorimetric calculation by more than 0.5%, then adjust the affected signal(s) to agree with the calorimetric calculation.

   If any signal is greater than the calorimetric calculation by more than 10% then adjust the affected signal(s) to agree with the calorimetric calculation within 8% to 10%.

b. At or above 80% of RATED THERMAL POWER; compare the linear power level, the CPC delta T power and the CPC nuclear power signals to the calorimetric calculation. If any signal differs from the calorimetric calculation by an absolute difference of more than 2%, then adjust the affected signal(s) to agree with the calorimetric calculation.

During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head closure bolts less than fully tensioned or with the head removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and ~~sufficient to ensure that the more restrictive of the following reactivity conditions is met:~~ within the limit specified in the Core Operating Limits Report (COLR).

~~a. Either a K_{eff} of 0.95 or less, or~~

~~b. A boron concentration of greater than or equal to 2150 ppm.~~

APPLICABILITY: MODE 6*.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 26 gpm of a solution containing $\geq$ 4000 ppm boron or its equivalent until ~~K_{eff} is reduced to less than or equal to 0.95 or~~ the boron concentration is within limits ~~restored to greater than or equal to 2150 ppm, whichever is the more restrictive~~.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The boron concentration ~~more restrictive of the above two reactivity conditions~~ shall be determined to be within the limit specified in the COLR prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full-length CEA in excess of 3 feet from its fully inserted position within the reactor pressure vessel.

4.9.1.2 The boron concentration of the Reactor Coolant System and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

*The reactor shall be maintained in MODE 6 whenever fuel is in the reactor vessel with the reactor vessel head closure bolts less than fully tensioned or with the head removed.

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN and K_{N-1}

The function of SHUTDOWN MARGIN is to ensure that the reactor remains subcritical following a design basis accident or anticipated operational occurrence. The function of K_{N-1} is to maintain sufficient subcriticality to preclude inadvertent criticality following ejection of a single control element assembly (CEA). During operation in MODES 1 and 2, with k_{eff} greater than or equal to 1.0, the transient insertion limits of Specification 3.1.3.6 ensure that sufficient SHUTDOWN MARGIN is available.

SHUTDOWN MARGIN is the amount by which the core is subcritical, or would be subcritical immediately following a reactor trip, considering a single malfunction resulting in the highest worth CEA failing to insert. K_{N-1} is a measure of the core's reactivity, considering a single malfunction resulting in the highest worth inserted CEA being ejected.

SHUTDOWN MARGIN requirements vary throughout the core life as a function of fuel depletion and reactor coolant system (RCS) cold leg temperature (T_{cold}). The most restrictive condition occurs at EOL, with T_{cold} at no-load operating temperature, and is associated with a postulated steam line break accident and the resulting uncontrolled RCS cooldown. In the analysis of this accident, the specified SHUTDOWN MARGIN is required to control the reactivity transient and ensure that the fuel performance and offsite dose criteria are satisfied. As (initial) T_{cold} decreases, the potential RCS cooldown and the resulting reactivity transient are less severe and, therefore, the required SHUTDOWN MARGIN also decreases. Below T_{cold} of about ~~210°F,~~ 350°F the inadvertent deboration event becomes limiting with respect to the SHUTDOWN MARGIN requirements. Below ~~210°F~~ 350°F, the specified SHUTDOWN MARGIN ensures that sufficient time for operator actions exists between the initial indication of the deboration and the total loss of shutdown margin. Accordingly, with ~~at least one CEA partially or fully withdrawn,~~ the reactor trip breakers closed and the CEA drive system capable of CEA withdrawal, the SHUTDOWN MARGIN requirements are based upon these limiting conditions.

Additional events considered in establishing requirements on SHUTDOWN MARGIN that are not limiting with respect to the Specification limits are single CEA withdrawal and startup of an inactive reactor coolant pump.

K_{N-1} requirements vary with the amount of positive reactivity that would be introduced assuming the CEA with the highest inserted worth ejects from the core. In the analysis of the CEA ejection event, the K_{N-1} requirement ensures that the radially averaged enthalpy acceptance criterion is satisfied, considering power redistribution effects. Above T_{cold} of 500°F, Doppler reactivity feedback is sufficient to preclude the need for a specific K_{N-1} requirement. With all CEAs fully inserted, K_{N-1} and SHUTDOWN MARGIN requirements are equivalent in terms of minimum acceptable core boron concentration.

Add attached insert

INSERT FOR BASES 3/4.1.1.1 AND 3/4.1.1.2

The requirement prohibiting criticality due to shutdown group CEA movement is associated with the assumptions used in the analysis of uncontrolled CEA withdrawal from subcritical conditions. Due to the high differential reactivity worth of the shutdown CEA groups, the analysis assumes that the initial shutdown reactivity is such that the reactor will remain subcritical in the event of unexpected or uncontrolled shutdown group withdrawal.

3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses. ~~The value of 0.95 or less for K_{eff} includes a 1% delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2150 ppm or greater also includes a conservative uncertainty allowance of 50 ppm boron.~~

Replace with attached insert

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the startup channel neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during CORE ALTERATIONS.

INSERT FOR BASES 3/4.9.1

The boron concentration limit specified in the COLR is based on core reactivity at the beginning of each cycle (the end of refueling) with all CEAs withdrawn and includes an uncertainty allowance. This boron concentration limit will ensure a K_{eff} of $\leq$ 0.95 during the refueling operation.

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 for the following:

a. Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~ - Reactor Trip Breakers Closed for Specification 3.1.1.2

b. Moderator Temperature Coefficient BOL and EOL limits for Specification 3.1.1.3

c. Boron Dilution Alarms for Specification 3.1.2.7

d. Movable Control Assemblies - CEA Position for Specification 3.1.3.1

e. Regulating CEA Insertion Limits for Specification 3.1.3.6

f. Part Length CEA Insertion Limits for Specification 3.1.3.7

g. Linear Heat Rate for Specification 3.2.1

h. Azimuthal Power Tilt - T_q for Specification 3.2.3

i. DNBR Margin for Specification 3.2.4

j. Axial Shape Index for Specification 3.2.7

k. Boron Concentration (Mode 6) for Specification 3.9.1

6.9.1.10 The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in:

a. "CE Method for Control Element Assembly Ejection Analysis," CENPD-0190-A, January 1976 (Methodology for Specification 3.1.3.6, Regulating CEA Insertion Limits).

Add

b. "The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April 1983 [(Methodology for Specifications 3.1.1.2, Shutdown Margin - Reactor Trip Breakers Closed ~~K_{N-1} - Any CEA Withdrawn~~; 3.1.1.3, Moderator Temperature Coefficient BOL and EOL limits; ~~and~~ 3.1.3.6, Regulating CEA Insertion Limits and 3.9.1, Boron Concentration (Mode 6)].

c. "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 (Novenber 1981), Supplements No. 1 (March 1983), No. 2 (September 1983), No. 3 (December 1987) (Methodology for Specifications 3.1.1.2, Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~ - Reactor Trip Breakers Closed; 3.1.1.3, Moderator Temperature Coefficient BOL and EOL limits; 3.1.2.7, Boron Dilution Alarms; 3.1.3.1, Movable Control Assemblies - CEA Position; 3.1.3.6, Regulating CEA Insertion Limits; 3.1.3.7, Part Length CEA Insertion Limits and 3.2.3 Azimuthal Power Tilt - T_q).

d. "Modified Statistical Combination of Uncertainties," CEN-356(V)-P-A Revision 01-P-A, May 1988 (Methodology for Specification 3.2.4, DNBR Margin and 3.2.7 Axial Shape Index).

FOR INFORMATION ONLY

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

FOR INFORMATION ONLY

REPORTABLE EVENT

1.28 A REPORTABLE EVENT shall be any of those conditions specified in Sections 50.72 and 50.73 to 10 CFR Part 50.

SHUTDOWN MARGIN

1.29 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming:

Add as new paragraph

a. No change in part-length control element assembly position, and

b. All full-length control element assemblies (shutdown and regulating) are fully inserted except for the single assembly of highest reactivity worth which is assumed to be fully withdrawn.

SITE BOUNDARY

1.30 The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

SOFTWARE

1.31 The digital computer SOFTWARE for the reactor protection system shall be the program codes including their associated data, documentation, and procedures.

SOURCE CHECK

1.32 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

STAGGERED TEST BASIS

1.33 A STAGGERED TEST BASIS shall consist of:

a. A test schedule for n systems, subsystems, trains, or other designated components obtained by dividing the specified test interval into n equal subintervals, and

b. The testing of one system, subsystem, train, or other designated component at the beginning of each subinterval.

THERMAL POWER

1.34 THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

With any full-length CEAs not capable of being fully inserted, the withdrawn reactivity worth of these full-length CEAs must be accounted for in the determination of the SHUTDOWN MARGIN.

FOR INFORMATION ONLY

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - ~~ALL CEAs FULLY INSERTED~~ REACTOR TRIP BREAKERS OPEN**

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.0% delta k/k.

APPLICABILITY: MODES 3, 4*, and 5* with ~~all full length CEAs fully inserted~~ the reactor trip breakers open.**

ACTION:

With the SHUTDOWN MARGIN less than 1.0% delta k/k, immediately initiate and continue boration at greater than or equal to 26 gpm to reactor coolant system of a solution containing greater than or equal to 4000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to 1.0% delta k/k at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within ± 1.0% delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.1.1, above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

4.1.1.1.3 With the reactor trip breakers open** and any CEA(s) fully or partially withdrawn, the SHUTDOWN MARGIN shall be verified within one hour after detection of the withdrawn CEA(s) and at least once per 12 hours thereafter while the CEA(s) are withdrawn.

Add

*See Special Test Exception 3.10.9.

** The CEA drive system not capable of CEA withdrawal.

FOR INFORMATION ONLY

SHUTDOWN MARGIN - ~~K_{N-1} - ANY CEA WITHDRAWN~~ REACTOR TRIP BREAKERS CLOSED **

LIMITING CONDITION FOR OPERATION

Add c. from attached insert

3.1.1.2

a. The SHUTDOWN MARGIN shall be greater than or equal to that specified in the CORE OPERATING LIMITS REPORT, 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 the reactor trip breakers closed** ~~any full-length CEA fully or partially withdrawn~~

ACTION:

a. With the SHUTDOWN MARGIN less than that specified in the CORE OPERATING LIMITS REPORT, 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 e quivalent 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 the reactor trip breakers closed** ~~any full length CEA fully or partially withdrawn~~ the SHUTDOWN MARGIN shall be determined to be greater than or equal to that 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.

** The CEA drive system capable of CEA withdrawal.

INSERT FOR LIMITING CONDITION FOR OPERATION 3.1.1.2

c. Reactor criticality shall not be achieved with shutdown group CEA movement.

FOR INFORMATION ONLY

SURVEILLANCE REQUIREMENTS (Continued)

Add attached Insert

b. When in MODE 1 or MODE 2 with k_{eff} greater than or equal to 1.0, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2 with k_{eff} less than 1.0, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e. below, with the CEA groups at the Transient Insertion Limits of Specification 3.1.3.6.

e. When in MODE 3, 4, or 5, at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

4.1.1.2.2 When in MODE 3, 4, or 5, with the reactor trip breakers closed**, ~~any full-length CEA fully or partially withdrawn~~ and T_{cold} less than or equal to 500°F, K_{N-1} shall be determined to be less than 0.99 at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

Add new 4.1.1.2.3 from attached insert

4.1.1.2.~~3~~4 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within ± 1.0% delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.2.1.e or 4.1.1.2.2. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

** The CEA drive system capable of CEA withdrawal.

INSERT TO 4.1.1.2.1b:

If CEA group withdrawal is not within the Transient Insertion Limits of Specification 3.1.3.6, within 1 hour verify that SHUTDOWN MARGIN is greater than or equal to that specified in the CORE OPERATING LIMITS REPORT.

INSERT NEW 4.1.1.2.3:

4.1.1.2.3 When in MODES 3, 4, or 5 with the reactor trip breakers closed**, verify that criticality cannot be achieved with shutdown group CEA withdrawal at least once per 24 hours by consideration of at least the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

FOR INFORMATION ONLY

TABLE 3.3-1

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
I. TRIP GENERATION					
A. Process					
1. Pressurizer Pressure - High	4	2	3	1, 2	2#, 3#
2. Pressurizer Pressure - Low	4	2 (b)	3	1, 2	2#, 3#
3. Steam Generator Level - Low	4/SG	2/SG	3/SG	1, 2	2#, 3#
4. Steam Generator Level - High	4/SG	2/SG	3/SG	1, 2	2#, 3#
5. Steam Generator Pressure - Low	4/SG	2/SG	3/SG	1, 2, 3*, 4*	2#, 3#
6. Containment Pressure - High	4	2	3	1, 2	2#, 3#
7. Reactor Coolant Flow - Low	4/SG	2/SG	3/SG	1, 2	2#, 3#
8. Local Power Density - High	4	2 (c)(d)	3	1, 2	2#, 3#
9. DNBR - Low	4	2 (c)(d)	3	1, 2	2#, 3#
B. Excore Neutron Flux					
1. Variable Overpower Trip	4	2	3	1, 2	2#, 3#
2. Logarithmic Power Level - High					
a. Startup and Operating	4	2 (a)(d)	3	1, 2	2#, 3#
	4	2	3	3*, 4*, 5*	9
b. Shutdown	4	0	2	3, 4, 5	4
C. Core Protection Calculator System					
1. CEA Calculators	2	1	2 (e)	1, 2	6, 7
2. Core Protection Calculators	4	2 (c)(d)	3	1, 2, 3*, 4*, 5*	2#, 3#, 7, 10

TABLE 3.3-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION

ACTION STATEMENTS

1. Within 1 hour the DNBR margin required by Specification 3.2.4b (COLSS in service) or 3.2.4d (COLSS out of service) is satisfied and the Reactor Power Cutback System is disabled, and

2. Within 4 hours:

   a) All full-length and part-length CEA groups must be withdrawn within the limits of Specifications 3.1.3.5, 3.1.3.6b, and 3.1.3.7b, except during surveillance testing pursuant to the requirements of Specification 4.1.3.1.2. Specification 3.1.3.6b allows CEA Group 5 insertion to no further than 127.5 inches withdrawn.

   b) The "RSPT/CEAC Inoperable" addressable constant in the CPCs is set to indicate that both CEAC's are inoperable.

   c) The Control Element Drive Mechanism Control System (CEDMCS) is placed in and subsequently maintained in the "Standby" mode except during CEA motion permitted by Specifications 3.1.3.5, 3.1.3.6b and 3.1.3.7b, when the CEDMCS may be operated in either the "Manual Group" or "Manual Individual" mode.

3. CEA position surveillance must meet the requirements of Specifications 4.1.3.1.1, 4.1.3.5, 4.1.3.6 and 4.1.3.7 except during surveillance testing pursuant to Specification 4.1.3.1.2.

ACTION 7 - With three or more auto restarts, excluding periodic auto restarts (Code 30 and Code 33), of one non-bypassed calculator during a 12-hour interval, demonstrate calculator OPERABILITY by performing a CHANNEL FUNCTIONAL TEST within the next 24 hours.

ACTION 8 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore an inoperable channel to OPERABLE status within 48 hours or open an affected reactor trip breaker within the next hour.

ACTION 9 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 10 - In MODES 3, 4, or 5, the Core Protection Calculator channels are not required to be OPERABLE when the Logarithmic Power Level - High trip is OPERABLE with the trip setpoint lowered to $\leq 10^{-4}\%$ of Rated Thermal Power.

~~TABLE 4.3-1 (Continued)~~

REACTOR PROTECTIVE INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

* - With reactor trip breakers in the closed position and the CEA drive system capable of CEA withdrawal, and fuel in the reactor vessel.

(1) - Each STARTUP or when required with the reactor trip breakers closed and the CEA drive system capable of rod withdrawal, if not performed in the previous 7 days.

Add attached insert

(2) - ~~Heat balance only (CHANNEL FUNCTIONAL TEST not included), above 15% of RATED THERMAL POWER; adjust the linear power level, the CPC delta T power and CPC nuclear power signals to agree with the calorimetric calculation if absolute difference is greater than 2%. During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.~~

(3) - Above 15% of RATED THERMAL POWER, verify that the linear power sub-channel gains of the excore detectors are consistent with the values used to establish the shape annealing matrix elements in the Core Protection Calculators.

(4) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

(5) - After each fuel loading and prior to exceeding 70% of RATED THERMAL POWER, the incore detectors shall be used to determine the shape annealing matrix elements and the Core Protection Calculators shall use these elements.

(6) - This CHANNEL FUNCTIONAL TEST shall include the injection of simulated process signals into the channel as close to the sensors as practicable to verify OPERABILITY including alarm and/or trip functions.

(7) - Above 70% of RATED THERMAL POWER, verify that the total steady-state RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation or by calorimetric calculations and if necessary, adjust the CPC addressable constant flow coefficients such that each CPC indicated flow is less than or equal to the actual flow rate. The flow measurement uncertainty may be included in the BERR1 term in the CPC and is equal to or greater than 4%.

(8) - Above 70% of RATED THERMAL POWER, verify that the total steady-state RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation and the ultrasonic flow meter adjusted pump curves or calorimetric calculations.

(9) - The quarterly CHANNEL FUNCTIONAL TEST shall include verification that the correct (current) values of addressable constants are installed in each OPERABLE CPC.

(10) - At least once per 18 months and following maintenance or adjustment of the reactor trip breakers, the CHANNEL FUNCTIONAL TEST shall include independent verification of the undervoltage and shunt trips.

INSERT FOR TABLE 4.3-1, TABLE NOTATION 2

Heat balance only (CHANNEL FUNCTIONAL TEST not included):

a. Between 15% and 80% of RATED THERMAL POWER, compare the linear power level, the CPC delta T power and the CPC nuclear power signals to the calorimetric calculation.

   If any signal is within -0.5% to 10% of the calorimetric then do not calibrate except as required during initial power ascension after refueling.

   If any signal is less than the calorimetric calculation by more than 0.5%, then adjust the affected signal(s) to agree with the calorimetric calculation.

   If any signal is greater than the calorimetric calculation by more than 10% then adjust the affected signal(s) to agree with the calorimetric calculation within 8% to 10%.

b. At or above 80% of RATED THERMAL POWER; compare the linear power level, the CPC delta T power and the CPC nuclear power signals to the calorimetric calculation. If any signal differs from the calorimetric calculation by an absolute difference of more than 2%, then adjust the affected signal(s) to agree with the calorimetric calculation.

During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.

FOR INFORMATION ONLY

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head closure bolts less than fully tensioned or with the head removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and ~~sufficient to ensure that the more restrictive of the following reactivity conditions is met:~~ within the limit specified in the Core Operating Limits Report (COLR).

~~a. Either a K_{eff} of 0.95 or less, or~~

~~b. A boron concentration of greater than or equal to 2150 ppm.~~

APPLICABILITY: MODE 6*.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 26 gpm of a solution containing ≥ 4000 ppm boron or its equivalent until ~~K_{eff} is reduced to less than or equal to 0.95 or~~ the boron concentration is within limits. ~~restored to greater than or equal to 2150 ppm, whichever is the more restrictive~~.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The boron concentration ~~more restrictive of the above two reactivity conditions~~ shall be determined to be within the limit specified in the COLR prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full-length CEA in excess of 3 feet from its fully inserted position within the reactor pressure vessel.

4.9.1.2 The boron concentration of the Reactor Coolant System and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

*The reactor shall be maintained in MODE 6 whenever fuel is in the reactor vessel with the reactor vessel head closure bolts less than fully tensioned or with the head removed.

FOR INFORMATION ONLY

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN AND K_{N-1}

The function of SHUTDOWN MARGIN is to ensure that the reactor remains subcritical following a design basis accident or anticipated operational occurrence. The function of K_{N-1} is to maintain sufficient subcriticality to preclude inadvertent criticality following ejection of a single control element assembly (CEA). During operation in MODES 1 and 2, with k_{eff} greater than or equal to 1.0, the transient insertion limits of Specification 3.1.3.6 ensure that sufficient SHUTDOWN MARGIN is available.

SHUTDOWN MARGIN is the amount by which the core is subcritical, or would be subcritical immediately following a reactor trip, considering a single malfunction resulting in the highest worth CEA failing to insert. K_{N-1} is a measure of the core's reactivity, considering a single malfunction resulting in the highest worth inserted CEA being ejected.

SHUTDOWN MARGIN requirements vary throughout the core life as a function of fuel depletion and reactor coolant system (RCS) cold leg temperature (T_{cold}). The most restrictive condition occurs at EOL, with T_{cold} at no-load operating temperature, and is associated with a postulated steam line break accident and the resulting uncontrolled RCS cooldown. In the analysis of this accident, the specified SHUTDOWN MARGIN is required to control the reactivity transient and ensure that the fuel performance and offsite dose criteria are satisfied. As (initial) T_{cold} decreases, the potential RCS cooldown and the resulting reactivity transient are less severe and, therefore, the required SHUTDOWN MARGIN also decreases. Below T_{cold} of about ~~210°F~~ 350°F, the inadvertent deboration event becomes limiting with respect to the SHUTDOWN MARGIN requirements. Below 350°F ~~210°F~~, the specified SHUTDOWN MARGIN ensures that sufficient time for operator actions exists between the initial indication of the deboration and the total loss of shutdown margin. Accordingly, with ~~at least one CEA partially or fully withdrawn~~ the reactor trip breakers closed and the CEA drive system capable of CEA withdrawal, the SHUTDOWN MARGIN requirements are based upon these limiting conditions.

Additional events considered in establishing requirements on SHUTDOWN MARGIN that are not limiting with respect to the Specification limits are single CEA withdrawal and startup of an inactive reactor coolant pump.

K_{N-1} requirements vary with the amount of positive reactivity that would be introduced assuming the CEA with the highest inserted worth ejects from the core. In the analysis of the CEA ejection event, the K_{N-1} requirement ensures that the radially averaged enthalpy acceptance criterion is satisfied, considering power redistribution effects. Above T_{cold} of 500°F, Doppler reactivity feedback is sufficient to preclude the need for a specific K_{N-1} requirement. With all CEAs fully inserted, K_{N-1} and SHUTDOWN MARGIN requirements are equivalent in terms of minimum acceptable core boron concentration.

Add attached insert

INSERT FOR BASES 3/4.1.1.1 AND 3/4.1.1.2

The requirement prohibiting criticality due to shutdown group CEA movement is associated with the assumptions used in the analysis of uncontrolled CEA withdrawal from subcritical conditions. Due to the high differential reactivity worth of the shutdown CEA groups, the analysis assumes that the initial shutdown reactivity is such that the reactor will remain subcritical in the event of unexpected or uncontrolled shutdown group withdrawal.

3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 BORON-CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses. ~~The value of 0.95 or less for~~ ~~K_{eff}~~ ~~includes a 1% delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2150 ppm or greater also includes a conservative uncertainty allowance of 50 ppm boron.~~

Replace with attached insert

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the startup channel neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during CORE ALTERATIONS.

INSERT FOR BASES 3/4.9.1

The boron concentration limit specified in the COLR is based on core reactivity at the beginning of each cycle (the end of refueling) with all CEAs withdrawn and includes an uncertainty allowance. This boron concentration limit will ensure a K_{eff} of ≤ 0.95 during the refueling operation.

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 for the following:

a. Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~ - Reactor Trip Breakers Closed for Specification 3.1.1.2
b. Moderator Temperature Coefficient BOL and EOL limits for Specification 3.1.1.3
c. Boron Dilution Alarms for Specification 3.1.2.7
d. Movable Control Assemblies - CEA Position for Specification 3.1.3.1
e. Regulating CEA Insertion Limits for Specification 3.1.3.6
f. Part Length CEA Insertion Limits for Specification 3.1.3.7
g. Linear Heat Rate for Specification 3.2.1
h. Azimuthal Power Tilt - T_q for Specification 3.2.3
i. DNBR Margin for Specification 3.2.4
j. Axial Shape Index for Specification 3.2.7
k. Boron Concentration (Mode 6) for Specification 3.9.1

6.9.1.10 The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in:

a. "CE Method for Control Element Assembly Ejection Analysis," CENPD-0190-A, January 1976 (Methodology for Specification 3.1.3.6, Regulating CEA Insertion Limits).

Add

b. "The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April 1983 (Methodology for Specifications 3.1.1.2, Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~ - Reactor Trip Breakers Closed; 3.1.1.3, Moderator Temperature Coefficient BOL and EOL limits; ~~and~~ 3.1.3.6, Regulating CEA Insertion Limits and 3.9.1, Boron Concentration (Mode 6)).

c. "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) (Methodology for Specifications 3.1.1.2, Shutdown Margin ~~K_{N-1} - Any CEA Withdrawn~~; 3.1.1.3, Moderator Temperature Coefficient ~~BOL and EOL limits~~; 3.1.2.7, Boron Dilution Alarms; 3.1.3.1, Movable Control Assemblies - CEA Position; 3.1.3.6, Regulating CEA Insertion Limits; 3.1.3.7, Part Length CEA Insertion Limits and 3.2.3 Azimuthal Power Tilt - T_q).

d. "Modified Statistical Combination of Uncertainties," CEN-356(V)-P-A Revision 01-P-A, May 1988 and "System 80™ Inlet Flow Distribution," Supplement 1-P to Enclosure 1-P to LD-82-054, February 1993 (Methodology for Specification 3.2.4, DNBR Margin and 3.2.7 Axial Shape Index).