



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20545-0001

DUKE POWER COMPANY

NORTH CAROLINA ELECTRIC MEMBERSHIP CORPORATION

SALUDA RIVER ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-413

CATAWBA NUCLEAR STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 112
License No. NPF-35

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Catawba Nuclear Station, Unit 1 (the facility) Facility Operating License No. NPF-35 filed by the Duke Power Company, acting for itself, North Carolina Electric Membership Corporation and Saluda River Electric Cooperative, Inc. (licensees), dated September 7, 1993, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

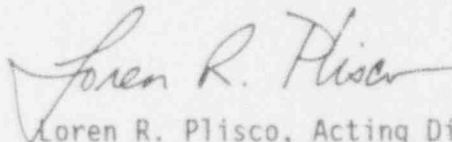
2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C.(2) of Facility Operating License No. NPF-35 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 112, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. Duke Power Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Loren R. Plisco, Acting Director
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: December 17, 1993



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DUKE POWER COMPANY

NORTH CAROLINA MUNICIPAL POWER AGENCY NO. 1

PIEDMONT MUNICIPAL POWER AGENCY

DOCKET NO. 50-414

CATAWBA NUCLEAR STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 106
License No. NPF-52

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Catawba Nuclear Station, Unit 2 (the facility) Facility Operating License No. NPF-52 filed by the Duke Power Company, acting for itself, North Carolina Municipal Power Agency No. 1 and Piedmont Municipal Power Agency (licensees), dated September 7, 1993, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

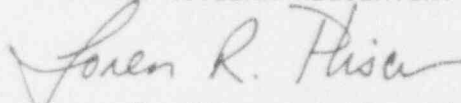
2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C.(2) of Facility Operating License No. NPF-52 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 106, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. Duke Power Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Loren R. Plisco, Acting Director
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: December 17, 1993

ATTACHMENT TO LICENSE AMENDMENT NO. 112

FACILITY OPERATING LICENSE NO. NPF-35

DOCKET NO. 50-413

AND

TO LICENSE AMENDMENT NO. 106

FACILITY OPERATING LICENSE NO. NPF-52

DOCKET NO. 50-414

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the areas of change.

<u>Remove Pages</u>	<u>Insert Pages</u>
2-8	A2-8
	B2-8
3/4 1-11	3/4 A1-11
	3/4 B1-11
3/4 1-12	3/4 A1-12
	3/4 B1-12
3/4 5-1	3/4 A5-1
	3/4 B5-1
3/4 5-2	3/4 A5-2
	3/4 B5-2
3/4 5-11	3/4 A5-11
	3/4 B5-11
3/4 9-1	3/4 A9-1
	3/4 B9-1
B 3/4 1-3	B 3/4 1-3
B 3/4 1-3a	B 3/4 1-3a
B 3/4 5-1	B 3/4 5-1
B 3/4 9-1	B 3/4 9-1
IV	IV
Va	Va
VIII	VIII
X	X

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 1: (Continued)

$T' \leq 590.8^\circ\text{F}$ (Nominal T_{avg} allowed by Safety Analysis);

$K_3 = 0.001414$;

$P =$ Pressurizer pressure, psig;

$P' = 2235$ psig (Nominal RCS operating pressure);

$S =$ Laplace transform operator, s^{-1} ;

and $f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range neutron ion chambers; with gains to be selected based on measured instrument response during plant STARTUP tests such that:

- (i) For $q_t - q_b$ between -39.9% and $+3.0\%$,
 $f_1(\Delta I) = 0$, where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER;
- (ii) For each percent ΔI that the magnitude of $q_t - q_b$ is more negative than -39.9% , the ΔT Trip Setpoint shall be automatically reduced by 3.910% of ΔT_o ; and
- (iii) For each percent ΔI that the magnitude of $q_t - q_b$ is more positive than $+3.0\%$, the ΔT Trip Setpoint shall be automatically reduced by 1.525% (Unit 1) of ΔT_o .

NOTE 2: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 3.0% .

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 1: (Continued)

$T' \leq 590.8^\circ\text{F}$ (Nominal T_{avg} allowed by Safety Analysis);

$K_3 = 0.001414$;

P = Pressurizer pressure, psig;

$P' = 2235$ psig (Nominal RCS operating pressure);

S = Laplace transform operator, s^{-1} ;

and $f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range neutron ion chambers; with gains to be selected based on measured instrument response during plant STARTUP tests such that:

(i) For $q_t - q_b$ between -39.9% and $+3.0\%$,

$f_1(\Delta I) = 0$, where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER;

(ii) For each percent ΔI that the magnitude of $q_t - q_b$ is more negative than -39.9% , the ΔT Trip Setpoint shall be automatically reduced by 3.910% of ΔT_o ; and

(iii) For each percent ΔI that the magnitude of $q_t - q_b$ is more positive than $+3.0\%$, the ΔT Trip Setpoint shall be automatically reduced by 2.316% (Unit 2) of ΔT_o .

NOTE 2: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 3.0% .

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCE - SHUTDOWN

LIMITING CONDITION FOR OPERATION

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

- a. A Boric Acid Storage System with:
 - 1) A minimum contained borated water volume of 12,000 gallons,
 - 2) A minimum boron concentration of 7000 ppm, and
 - 3) A minimum solution temperature of 65°F.
- b. The refueling water storage tank with:
 - 1) A minimum contained borated water volume of 45,000 gallons,
 - 2) A minimum boron concentration of 2175 ppm, and
 - 3) A minimum solution temperature of 70°F.

APPLICABILITY: MODES 5 and 6. (Unit 1)

ACTION:

With no borated water source OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

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

- a. At least once per 7 days by:
 - 1) Verifying the boron concentration of the water,
 - 2) Verifying the contained borated water volume, and
 - 3) Verifying the boric acid storage tank solution temperature when it is the source of borated water.
- b. At least once per 24 hours by verifying the refueling water storage tank temperature when it is the source of borated water and the outside air temperature is less than 70°F.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCE - SHUTDOWN

LIMITING CONDITION FOR OPERATION

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

- a. A Boric Acid Storage System with:
 - 1) A minimum contained borated water volume of 12,000 gallons,
 - 2) A minimum boron concentration of 7000 ppm, and
 - 3) A minimum solution temperature of 65°F.
- b. The refueling water storage tank with:
 - 1) A minimum contained borated water volume of 45,000 gallons,
 - 2) A minimum boron concentration of 2000 ppm, and
 - 3) A minimum solution temperature of 70°F.

APPLICABILITY: MODES 5 and 6. (Unit 2)

ACTION:

With no borated water source OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

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

- a. At least once per 7 days by:
 - 1) Verifying the boron concentration of the water,
 - 2) Verifying the contained borated water volume, and
 - 3) Verifying the boric acid storage tank solution temperature when it is the source of borated water.
- b. At least once per 24 hours by verifying the refueling water storage tank temperature when it is the source of borated water and the outside air temperature is less than 70°F.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.6 As a minimum, the following borated water source(s) shall be OPERABLE as required by Specification 3.1.2.2:

- a. A Boric Acid Storage System with:
 - 1) A minimum contained borated water volume of 22,000 gallons,
 - 2) A minimum boron concentration of 7000 ppm, and
 - 3) A minimum solution temperature of 65°F.
- b. The refueling water storage tank with:
 - 1) A contained borated water volume of at least 363,513 gallons,
 - 2) A minimum boron concentration of 2175 ppm,
 - 3) A minimum solution temperature of 70°F, and
 - 4) A maximum solution temperature of 100°F.

APPLICABILITY: MODES 1, 2, 3, and 4. (Unit 1)

ACTION:

- a. With the Boric Acid Storage System inoperable and being used as one of the above required borated water sources, restore the system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and borated to a SHUTDOWN MARGIN equivalent to at least 1% $\Delta k/k$ at 200°F; restore the Boric Acid Storage System to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.
- b. With the refueling water storage 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.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.6 As a minimum, the following borated water source(s) shall be OPERABLE as required by Specification 3.1.2.2:

- a. A Boric Acid Storage System with:
 - 1) A minimum contained borated water volume of 22,000 gallons,
 - 2) A minimum boron concentration of 7000 ppm, and
 - 3) A minimum solution temperature of 65°F.
- b. The refueling water storage tank with:
 - 1) A contained borated water volume of at least 363,513 gallons,
 - 2) A minimum boron concentration of 2000 ppm,
 - 3) A minimum solution temperature of 70°F, and
 - 4) A maximum solution temperature of 100°F.

APPLICABILITY: MODES 1, 2, 3, and 4. (Unit 2)

ACTION:

- a. With the Boric Acid Storage System inoperable and being used as one of the above required borated water sources, restore the system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and borated to a SHUTDOWN MARGIN equivalent to at least 1% $\Delta k/k$ at 200°F; restore the Boric Acid Storage System to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.
- b. With the refueling water storage 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.

3/4.5 EMERGENCY CORE COOLING SYSTEMS

3/4.5.1 ACCUMULATORS

COLD LEG INJECTION

LIMITING CONDITION FOR OPERATION

3.5.1 Each cold leg injection accumulator shall be OPERABLE with:

- a. The discharge isolation valve open,
- b. A contained borated water volume of between 7630 and 8079 gallons,
- c. A boron concentration of between 2000 and 2275 ppm,
- d. A nitrogen cover-pressure of between 585 and 678 psig, and
- e. A water level and pressure channel OPERABLE.

APPLICABILITY: MODES 1, 2, and 3*. (Unit 1)

ACTION:

- a. With one cold leg injection accumulator inoperable, except as a result of a closed isolation valve or boron concentration less than 2000 ppm, restore the inoperable accumulator to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.
- b. With one cold leg injection accumulator inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.
- c. With one accumulator inoperable due to boron concentration less than 2000 ppm and:
 - 1) The volume weighted average boron concentration of the accumulators 2000 ppm or greater, restore the inoperable accumulator to OPERABLE status within 24 hours of the low boron determination or be in at least HOT STANDBY within the next 6 hours and reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.
 - 2) The volume weighted average boron concentration of the accumulators less than 2000 ppm but greater than 1900 ppm, restore the inoperable accumulator to OPERABLE status or return the volume weighted average boron concentration of the accumulators to greater than 2000 ppm and

*Reactor Coolant System pressure above 1000 psig.

3/4.5 EMERGENCY CORE COOLING SYSTEMS

3/4.5.1 ACCUMULATORS

COLD LEG INJECTION

LIMITING CONDITION FOR OPERATION

3.5.1 Each cold leg injection accumulator shall be OPERABLE with:

- a. The discharge isolation valve open,
- b. A contained borated water volume of between 7630 and 8079 gallons,
- c. A boron concentration of between 1900 and 2100 ppm,
- d. A nitrogen cover-pressure of between 585 and 578 psig, and
- e. A water level and pressure channel OPERABLE.

APPLICABILITY: MODES 1, 2, and 3*. (Unit 2)

ACTION:

- a. With one cold leg injection accumulator inoperable, except as a result of a closed isolation valve or boron concentration less than 1900 ppm, restore the inoperable accumulator to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.
- b. With one cold leg injection accumulator inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.
- c. With one accumulator inoperable due to boron concentration less than 1900 ppm and:
 - 1) The volume weighted average boron concentration of the accumulators 1900 ppm or greater, restore the inoperable accumulator to OPERABLE status within 24 hours of the low boron determination or be in at least HOT STANDBY within the next 6 hours and reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.
 - 2) The volume weighted average boron concentration of the accumulators less than 1900 ppm but greater than 1800 ppm, restore the inoperable accumulator to OPERABLE status or return the volume weighted average boron concentration of the accumulators to greater than 1900 ppm and

*Reactor Coolant System pressure above 1000 psig.

EMERGENCY CORE COOLING SYSTEMS

LIMITING CONDITION FOR OPERATION

ACTION: (Continued)

enter ACTION c.1 within 6 hours of the low boron determination or be in HOT STANDBY within the next 6 hours and reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.

- 3) The volume weighted average boron concentration of the accumulators 1900 ppm or less, return the volume weighted average boron concentration of the accumulators to greater than 1900 ppm and enter ACTION c.2 within 1 hour of the low boron determination or be in HOT STANDBY within the next 6 hours and reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each cold leg injection accumulator shall be demonstrated OPERABLE:

- a. At least once per 12 hours by:
 - 1) Verifying, by the absence of alarms, the contained borated water volume and nitrogen cover-pressure in the tanks, and
 - 2) Verifying that each cold leg injection accumulator isolation valve is open.
- b. At least once per 31 days and within 6 hours after each solution volume increase of greater than or equal to 75 gallons by verifying the boron concentration of the accumulator solution;
- c. At least once per 31 days when the Reactor Coolant System pressure is above 2000 psig by verifying that power is removed from the isolation valve operators on Valves NI54A, NI65B, NI76A, and NI88B and that the respective circuit breakers are padlocked; and
- d. At least once per 18 months by verifying that each cold leg injection accumulator isolation valve opens automatically under each of the following conditions:**
 - 1) When an actual or a simulated Reactor Coolant System pressure signal exceeds the P-11 (Pressurizer Pressure Block of Safety Injection) Setpoint, and
 - 2) Upon receipt of a Safety Injection test signal.

**This surveillance need not be performed until prior to entering HOT STANDBY following the Unit 1 refueling.

EMERGENCY CORE COOLING SYSTEMS

LIMITING CONDITION FOR OPERATION

ACTION: (Continued)

enter ACTION c.1 within 6 hours of the low boron determination or be in HOT STANDBY within the next 6 hours and reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.

- 3) The volume weighted average boron concentration of the accumulators 1800 ppm or less, return the volume weighted average boron concentration of the accumulators to greater than 1800 ppm and enter ACTION c.2 within 1 hour of the low boron determination or be in HOT STANDBY within the next 6 hours and reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each cold leg injection accumulator shall be demonstrated OPERABLE:

- a. At least once per 12 hours by:
 - 1) Verifying, by the absence of alarms, the contained borated water volume and nitrogen cover-pressure in the tanks, and
 - 2) Verifying that each cold leg injection accumulator isolation valve is open.
- b. At least once per 31 days and within 6 hours after each solution volume increase of greater than or equal to 75 gallons by verifying the boron concentration of the accumulator solution;
- c. At least once per 31 days when the Reactor Coolant System pressure is above 2000 psig by verifying that power is removed from the isolation valve operators on Valves NI54A, NI65B, NI76A, and NI88B and that the respective circuit breakers are padlocked; and
- d. At least once per 18 months by verifying that each cold leg injection accumulator isolation valve opens automatically under each of the following conditions:**
 - 1) When an actual or a simulated Reactor Coolant System pressure signal exceeds the P-11 (Pressurizer Pressure Block of Safety Injection) Setpoint, and
 - 2) Upon receipt of a Safety Injection test signal.

**This surveillance need not be performed until prior to entering HOT STANDBY following the Unit 1 refueling.

EMERGENCY CORE COOLING SYSTEMS

3/4.5.4 REFUELING WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water storage tank shall be OPERABLE with:

- a. A minimum contained borated water volume of 363,513 gallons,
- b. A boron concentration of between 2175 and 2275 ppm of boron,
- c. A minimum solution temperature of 70°F, and
- d. A maximum solution temperature of 100°F.

APPLICABILITY: MODES 1, 2, 3, and 4. (Unit 1)

ACTION:

With the refueling water storage 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 refueling water storage tank shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1) Verifying the contained borated water level in the tank, and
 - 2) Verifying the boron concentration of the water.
- b. At least once per 24 hours by verifying the refueling water storage tank temperature when the outside air temperature is less than 70°F or greater than 100°F.

EMERGENCY CORE COOLING SYSTEMS

3/4.5.4 REFUELING WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water storage tank shall be OPERABLE with:

- a. A minimum contained borated water volume of 363,513 gallons,
- b. A boron concentration of between 2000 and 2100 ppm of boron,
- c. A minimum solution temperature of 70°F, and
- d. A maximum solution temperature of 100°F.

APPLICABILITY: MODES 1, 2, 3, and 4. (Unit 2)

ACTION:

With the refueling water storage 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 refueling water storage tank shall be demonstrated OPERABLE:

- a. At least once per 7 days by:
 - 1) Verifying the contained borated water level in the tank, and
 - 2) Verifying the boron concentration of the water.
- b. At least once per 24 hours by verifying the refueling water storage tank temperature when the outside air temperature is less than 70°F or greater than 100°F.

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 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 either:

- a. A K_{eff} of 0.95 or less, or
- b. A boron concentration of greater than or equal to 2175 ppm.

APPLICABILITY: MODE 6.* (Unit 1)

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 30 gpm of a solution containing greater than or equal to 7000 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 2000 ppm, whichever is the more restrictive.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

- a. Removing or unbolting the reactor vessel head, and
- b. Withdrawal of any full-length control rod in excess of 3 feet from its fully inserted position within the reactor 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 vessel head closure bolts less than fully tensioned or with the head removed.

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 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 either:

- a. A K_{eff} of 0.95 or less, or
- b. A boron concentration of greater than or equal to 2000 ppm.

APPLICABILITY: MODE 6.* (Unit 2)

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 30 gpm of a solution containing greater than or equal to 7000 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 2000 ppm, whichever is the more restrictive.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

- a. Removing or unbolting the reactor vessel head, and
- b. Withdrawal of any full-length control rod in excess of 3 feet from its fully inserted position within the reactor 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 vessel head closure bolts less than fully tensioned or with the head removed.

REACTIVITY CONTROL SYSTEMS

BASES

BORATION SYSTEMS (Continued)

MARGIN from expected operating conditions of 1.3% $\Delta k/k$ after xenon decay and cooldown to 200°F. The maximum expected boration capability requirement occurs at EOL from full power equilibrium xenon conditions and requires 9,851 gallons of 7000 ppm borated water from the boric acid storage tanks or 57,107 gallons of 2175 ppm borated water for Unit 1 and 2000 ppm borated water for Unit 2 from the refueling water storage tank.

The Technical Specification requires 22,000 gallons of 7000 ppm borated water from the boric acid tanks to be available in Modes 1-4. This volume is based on the required volume for maintaining shutdown margin, unusable volume (to allow for a full suction pipe), instrument error, and additional margin to account for different cores and conservatism as follows:

Modes 1-4 Boric Acid Tank	
Required volume for maintaining SDM	9,851 gallons
5% Additional Margin	496 gallons
Unusable Volume (to maintain full suction pipe)	7,230 gallons
14" of water equivalent	
Vortexing (4" of water above top of suction pipe)	2,066 gallons
Instrumentation Error (Based on Total Loop Acc. for 1&2 NV5740 loops) - 2" of water equivalent	1,550 gallons
	<u>21,193 gallons</u>

This value is increased to 22,000 gallons for additional margin.

A similar approach is taken for calculating the required Refueling Water Storage Tank volume:

When the temperature of one or more cold legs drops below 285°F in Mode 4, the potential for low temperature overpressurization of the reactor vessel makes it necessary to render one charging pump INOPERABLE and at least one safety injection pump INOPERABLE. The limitation for a maximum of one centrifugal charging pump to be OPERABLE and the Surveillance Requirement to verify all charging pumps except the required OPERABLE pump to be inoperable below 285°F provides assurance that a mass addition pressure transient can be relieved by the operation of a single PORV.

Refueling Water Storage Tank Requirements For Maintaining SDM - Modes 1-4

Required Volume for Maintaining SDM	57,107 gallons
Unusable Volume (below nozzle)	13,442 gallons
Instrument Inaccuracy	11,307 gallons
Vortexing	<u>13,247 gallons</u>
	95,103 gallons

The Technical Specification Volume 363,513 gallons was determined by correcting the tank's low level setpoint (level at which makeup is added to

REACTIVITY CONTROL SYSTEMS

BASES

BORATION SYSTEMS (Continued)

tank) for instrument inaccuracy. This level provides the maximum available volume to account for shutdown margin, worst case single failure, adequate containment sump volume for transfer to recirculation, and sufficient volume above the switchover initiation level such that no operator action is required prior to ten minutes after the initiation of the accident.

With the coolant temperature below 200°F, one Boron Injection flow path is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity changes in the event the single Boron Injection flow path becomes inoperable.

The boron availability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% $\Delta k/k$ after xenon decay and cooldown from 200°F to 140°F. This condition requires either 585 gallons of 7000 ppm borated water from the boric acid storage tanks or 3500 gallons of 2175 ppm borated water for Unit 1 and 2000 ppm borated water for Unit 2 from the refueling water storage tank.

The Boric Acid Tank and Refueling Water Storage Tank volumes required in Modes 5-6 to provide necessary SDM are based on the following inputs as discussed previously:

Boric Acid Tank

Required Volume for maintaining SDM	585 gallons
Unusable Volume, Vortexing, Inst. Error	10,846 gallons
5% additional margin	<u>33 gallons</u>
	11,464 gallons

This value is increased to the Technical Specification value of 12,000 gallons for additional margin.

Refueling Water Storage Tank

Required Volume for Maintaining SDM	3,500 gallons
Water Below the Nozzle	13,442 gallons
Instrument Inaccuracy	11,307 gallons
Vortexing	<u>13,247 gallons</u>
	41,496 gallons

This value is increased to the Technical Specification value of 45,000 gallons for additional margin.

The contained water volume limits include allowance for water not available because of discharge line location and other physical characteristics.

3/4.5 EMERGENCY CORE COOLING SYSTEMS

BASES

3/4.5.1 ACCUMULATORS

The OPERABILITY of each Reactor Coolant System accumulator ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs from the cold leg injection accumulators and directly into the reactor vessel from the upper head injection accumulators in the event the Reactor Coolant System pressure falls below the pressure of the accumulators. This initial surge of water into the core provides the initial cooling mechanism during large pipe ruptures.

The limits on accumulator volume, boron concentration and pressure ensure that the assumptions used for accumulator injection in the safety analysis are met.

The allowed down time for the accumulators are variable based upon boron concentration to ensure that the reactor is shutdown following a LOCA and that any problems are corrected in a timely manner. Subcriticality is assured when boron concentration is above 1900 ppm for Unit 1 and 1800 ppm for Unit 2, so additional down time is allowed when concentration is above this value. A concentration of less than 2000 ppm for Unit 1 and 1900 ppm for Unit 2 in any single accumulator or as a volume weighted average may be indicative of a problem, such as valve leakage, but since reactor shutdown is assured, additional time is allowed to restore boron concentration in the accumulators.

The accumulator power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these accumulator isolation valves fail to meet single failure criteria, removal of power to the valves is required.

The limits for operation with an accumulator inoperable for any reason except an isolation valve closed minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional accumulator which may result in unacceptable peak cladding temperatures. If a closed isolation valve cannot be immediately opened, the full capability of one accumulator is not available and prompt action is required to place the reactor in a mode where this capability is not required.

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 2175 ppm for Unit 1 and 2000 ppm for Unit 2 or greater includes a conservative uncertainty allowance of 50 ppm boron.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Boron Dilution Mitigation System ensures that 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 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 building penetration closure and OPERABILITY of the Reactor Building Containment Purge System ensure that a release of radioactive material within containment will be restricted from leakage to the environment or filtered through the HEPA filters and activated carbon adsorbers prior to release to the atmosphere. 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. Operation of the Reactor Building Containment Purge System and the resulting iodine removal capacity are consistent with the assumption of the safety analysis. Operation of the system with the heaters operating to maintain low humidity using automatic control for at least 10 continuous hours in a 31-day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters. ANSI N510-1980 will be used as a procedural guide for surveillance testing.

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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