C-1

Changes to Technical Specifications (Catawba)

TABLE 2.2-1 (Continued)
TABLE NOTATIONS

NOTE 1: OVERTEMPERATURE ΔT

$$\Delta T \frac{(1 + \tau_1 S)}{(1 + \tau_2 S)} \left(\frac{1}{1 + \tau_3 S}\right) \leq \Delta T_0 \{K_1 - K_2 \frac{(1 + \tau_4 S)}{(1 + \tau_5 S)} [T \left(\frac{1}{1 + \tau_6 S}\right) - T'] + K_3(P - P') - f_1(\Delta I)\}$$

Where:

ΔT = Measured ΔT by Loop Narrow Range RTDs;

$\frac{1 + \tau_1 S}{1 + \tau_2 S}$ = Lead-lag compensator on measured ΔT;

τ_1, τ_2 = Time constants utilized in lead-lag compensator for ΔT, ~~τ_1 = 12 s, τ_2 = 3 s;~~ as presented in the Core Operating Limits Report;

$\frac{1}{1 + \tau_3 S}$ = Lag compensator on measured ΔT;

τ_3 = Time constant utilized in the lag compensator for ΔT, ~~τ_3 = 0~~; as presented in the Core Operating Limits Report;

ΔT_0 = Indicated ΔT at RATED THERMAL POWER;

K_1 = ~~1.1953~~ Overtemperature ΔT reactor trip setpoint as presented in the Core Operating Limits Report;

K_2 = ~~0.03163/°F~~ Overtemperature ΔT reactor trip heatup setpoint penalty coefficient as presented in the Core Operating Limits Report;

$\frac{1 + \tau_4 S}{1 + \tau_5 S}$ = The function generated by the lead-lag compensator for T_{avg} dynamic compensation;

τ_4, τ_5 = Time constants utilized in the lead-lag compensator for T_{avg}, ~~τ_4 = 22 s, τ_5 = 4 s~~; as presented in the Core Operating Limits Report;

T = Average temperature, °F;

$\frac{1}{1 + \tau_6 S}$ = Lag compensator on measured T_{avg};

τ_6 = Time constant utilized in the measured T_{avg} lag compensator, ~~τ_6 = 0~~; as presented in the Core Operating Limits Report;

TABLE 2.2-1 (Continued)
TABLE NOTATIONS (Continued)

NOTE 1: (Continued)

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

K_3 = ~~0.001414;~~ Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient as presented in the Core Operating Limits Report;

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%,~~ the "positive" and "negative" $f_1(\Delta I)$ breakpoints as presented in the Core Operating Limits Report; $f_1(\Delta I) = 0$, 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 $f_1(\Delta I)$ "negative" breakpoint presented in the Core Operating Limits Report, the ΔT Trip Setpoint shall be automatically reduced by ~~3.910% of ΔT_0;~~ the $f_1(\Delta I)$ "negative" slope presented in the Core Operating Limits Report; and

(iii) For each percent ΔI that the magnitude of $q_t - q_b$ is more positive than ~~+3.0%,~~ the $f_1(\Delta I)$ "positive" breakpoint presented in the Core Operating Limits Report, the ΔT Trip Setpoint shall be automatically reduced by ~~2.316% of ΔT_0~~ the $f_1(\Delta I)$ "positive" slope presented in the Core Operating Limits Report.

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 3: OVERPOWER ΔT

$$\Delta T \frac{(1 + \tau_1 S)}{(1 + \tau_2 S)} \left(\frac{1}{1 + \tau_3 S}\right) \leq \Delta T_0 \left\{K_4 - K_5 \left(\frac{\tau_7 S}{1 + \tau_7 S}\right)\left(\frac{1}{1 + \tau_6 S}\right) T - K_6 \left[T \left(\frac{1}{1 + \tau_6 S}\right) - T''\right] - f_2(\Delta I)\right\}$$

Where:

ΔT = As defined in Note 1,

$\frac{1 + \tau_1 S}{1 + \tau_2 S}$ = As defined in Note 1,

τ_1, τ_2 = As defined in Note 1,

$\frac{1}{1 + \tau_3 S}$ = As defined in Note 1,

τ_3 = As defined in Note 1,

ΔT_0 = As defined in Note 1,

K_4 = ~~1.0819~~ Overpower ΔT reactor trip setpoint as presented in the Core Operating Limits Report

K_5 = 0.02/°F for increasing average temperature and 0 for decreasing average temperature,

$\frac{\tau_7 S}{1 + \tau_7 S}$ = The function generated by the rate-lag controller for T_{avg} dynamic compensation,

τ_7 = Time constant utilized in the rate-lag controller for T_{avg}, ~~τ_7 = 10 s,~~ as presented in the Core Operating Limits Report

$\frac{1}{1 + \tau_6 S}$ = As defined in Note 1,

τ_6 = As defined in Note 1,

~~UNIT 1~~

TABLE 2 2-1 (Continued)
TABLE NOTATIONS (Continued)

NOTE 3: (Continued)

Overpower ΔT reactor trip heatup setpoint penalty coefficient as presented in the Core Operating Limits Report

K_6 = ~~0.001291/°F~~ for $T > 590.8°F$ and $K_6 = 0$ for $T \leq 590.8°F$,

T = As defined in Note 1,

T" = Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, $\leq 590.8°F$),

S = As defined in Note 1,

and $f_2(\Delta I)$ is a function of the indicated differences 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:

the "positive" and "negative" $f_2(\Delta I)$ breakpoints as presented in the Core Operating Limits Report

(i) for $q_t - q_b$ between ~~-35% and +35% ΔI~~; $f_2(\Delta I) = 0$, 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.

the $f_2(\Delta I)$ "negative" breakpoint presented in the Core Operating Limits Report

(ii) for each percent ΔI that the magnitude of $q_t - q_b$ is more negative than ~~-35% ΔI~~, the ΔT Trip Setpoint shall be automatically reduced by ~~7.0% of ΔT₀~~; and

the $f_2(\Delta I)$ "negative" slope presented in the Core Operating Limits Report

(iii) for each percent ΔI that magnitude of $q_t - q_b$ is more positive than ~~+35% ΔI~~, the ΔT Trip Setpoint shall be automatically reduced by ~~7.0% of ΔT₀~~.

the $f_2(\Delta I)$ "positive" breakpoint presented in the Core Operating Limits Report

NOTE 4: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 2.8%.

the $f_2(\Delta I)$ "positive" slope presented in the Core Operating Limits Report

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,~~ as presented in the Core Operating Limits Report,
2) A minimum boron concentration ~~of 7000 ppm,~~ as presented in the Core Operating Limits Report, 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~~ as presented in the Core Operating Limits Report,
2) A minimum boron concentration ~~of 2000 ppm~~ as presented in the Core Operating Limits Report, and
3) A minimum solution temperature of 70°F.

APPLICABILITY: MODES 5 and 6.

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,~~ as presented in the Core Operating Limits Report,
2) A minimum boron concentration ~~of 7000 ppm,~~ as presented in the Core Operating Limits Report, and
3) A minimum solution temperature of 65°F.

b. The refueling water storage tank with:

1) A minimum contained borated water volume ~~of at least 363,513 gallons,~~ as presented in the Core Operating Limits Report or Specification 3.5.4a, whichever is larger,
2) A minimum boron concentration ~~of 2000 ppm,~~ as presented in the Core Operating Limits Report,
3) A minimum solution temperature of 70°F, and
4) A maximum solution temperature of 100°F.

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

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.

INSTRUMENTATION

BORON DILUTION MITIGATION SYSTEM

LIMITING CONDITION FOR OPERATION

3.3.3.11 As a minimum, two trains of the Boron Dilution Mitigation System shall be OPERABLE and operating with Shutdown Margin Alarm ratios set at less than or equal to 4 times the steady-state count rate.

APPLICABILITY: MODES 3, 4, AND 5

ACTION:

(a) With one train of the Boron Dilution Mitigation System inoperable or not operating, restore the inoperable train to OPERABLE status within 48 hours, or

(1) suspend all operations involving positive reactivity changes and verify that valve NV-230 is closed and secured within the next hour, or

(2) verify two Source Range Neutron Flux Monitors are OPERABLE with Alarm Setpoints less than or equal to one-half decade (square root of 10) above the steady-state count rate and verify that the combined flowrate from both Reactor Makeup Water Pumps is less than or equal to ~~150 gpm (Mode 3 or 4) or 75 gpm (Mode 5)~~ within the next hour. the Reactor Makeup Water Pump flowrate presented in the Core Operating Limits Report.

(b) With both trains of the Boron Dilution Mitigation System inoperable or not operating, restore the inoperable trains to OPERABLE status within 12 hours, or

(1) suspend all operations involving positive reactivity changes and verify that valve NV-230 is closed and secured within the next hour, or

(2) verify two Source Range Neutron Flux Monitors are OPERABLE with Alarm Setpoints less than or equal to one-half decade (square root of 10) above the steady-state count rate and verify that the combined flow rate from both Reactor Makeup Water Pumps is less than or equal to ~~150 gpm (Mode 3 or 4) or 75 gpm (Mode 5)~~ within the next hour. the Reactor Makeup Water Pump flowrate presented in the Core Operating Limits Report.

SURVEILLANCE REQUIREMENTS

4.3.3.11.1 Each train of the Boron Dilution Mitigation System shall be demonstrated OPERABLE by performance of:

(a) A CHANNEL CHECK at least once per 12 hours,

INSTRUMENTATION

SURVEILLANCE REQUIREMENTS (Continued)

(b) An ANALOG CHANNEL OPERATIONAL TEST at least once per 31 days, and

(c) At least once per 18 months the BDMS shall be demonstrated OPERABLE by:

(1) Verifying that each automatic valve actuated by the BDMS moves to its correct position upon receipt of a trip signal, and

(2) Verifying each reactor makeup water pump stops, as designed, upon receipt of a trip signal.

4.3.3.11.2 If using the Source Range Neutron Flux Monitors to meet the requirements of Technical Specification 3.3.3.11,

(a) The monthly surveillance requirements of Table 4.3-1 for the Source Range Neutron Flux Monitors shall include verification that the Alarm Setpoint is less than or equal to one-half decade (square root of 10) above the steady-state count rate.

(b) The combined flow rate from both Reactor Makeup Water Pumps shall be verified as less than or equal to ~~150 gpm (Mode 3 or 4) or 75 gpm (Mode 5)~~ The Reactor Makeup Water Pump Flowrate presented in the Core Operating Limits Report at least once per 31 days.

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 7704 and 8004 gallons,

c. A boron concentration ~~of~~ between ~~1900 and 2100 ppm,~~ the LCO limits presented in the Core Operating Limits Report

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*.

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,~~ the lower LCO limit presented in the Core Operating Limits Report 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~~ the lower LCO limit presented in the Core Operating Limits Report and:

1) The volume weighted average boron concentration of the accumulators ~~1900 ppm~~ equal to the lower LCO limit presented in the Core Operating Limits Report 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~~ the lower LCO limit presented in the Core Operating Limits Report but greater than ~~1800 ppm,~~ the minimum required to ensure post-LOCA subcriticality presented in the Core Operating Limits Report, restore the inoperable accumulator to OPERABLE status or return the volume weighted average boron concentration of the accumulators to greater than ~~1900 ppm~~ the lower LCO limit presented in the Core Operating Limits Report and

*Reactor Coolant System pressure above 1000 psig.

EMERGENCY CORE COOLING SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

equal to the minimum required to ensure post-LOCA subcriticality presented in the Core Operating Limits Report

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.

the minimum required to ensure post-LOCA subcriticality presented in the Core Operating Limits Report

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.

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~~, the limits presented in the Core Operating Limits Report

c. A minimum solution temperature of 70°F, and

d. A maximum solution temperature of 100°F.

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

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.

REFUELING OPERATIONS

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2.1 As a minimum, two trains of the Boron Dilution Mitigation System shall be OPERABLE and operating with Shutdown Margin Alarm Ratios set at less than or equal to 4 times the steady-state count rate, each with continuous indication in the control room.

APPLICABILITY: MODE 6

ACTION:

(a) With one or both trains of the Boron Dilution Mitigation System inoperable or not operating,

(1) immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes, and verify that valve NV-230 is closed and secured within the next hour or

(2) verify that two Source Range Neutron Flux Monitors are OPERABLE and operating with Alarm Setpoints less than or equal to one-half decade (square root of 10) above the steady-state count rate, each with continuous visual indication in the control room and one with audible indication in the control room and one with audible indication in the containment and verify that the combined flowrate from both Reactor Makeup Water Pumps is less than or equal to ~~70 gpm~~ the Reactor Makeup Water Pump flowrate presented in the Core Operating Limits Report within the next hour.

(b) With both trains of the Boron Dilution Mitigation System inoperable or not operating and one of the Source Range Neutron Flux Monitors inoperable or not operating immediately suspend all operations involving core ALTERATIONS or positive reactivity changes and verify that valve NV-230 is closed and secured within the next hour.

(c) With both trains of the Boron Dilution Mitigation System inoperable or not operating and both of the Source Range Neutron Flux Monitors inoperable or not operating, determine the boron concentration of the Reactor Coolant System at least once per 12 hours and verify that valve NV-230 is closed and secured within the next hour.

SURVEILLANCE REQUIREMENT

4.9.2.1.1 Each train of the Boron Dilution Mitigation System shall be demonstrated OPERABLE by performance of:

(a) A CHANNEL CHECK at least once per 12 hours,

(b) An ANALOG CHANNEL OPERATIONAL TEST within 8 hours prior to the initial start of CORE ALTERATIONS and

(c) An ANALOG CHANNEL OPERATIONAL TEST at least once per 31 days.

SURVEILLANCE REQUIREMENTS (CONTINUED)

(d) At least once per 18 months the BDMS shall be demonstrated OPERABLE by:

(1) verifying that each automatic valve actuated by the BDMS moves to its correct position upon receipt of a trip signal, and

(2) verifying each reactor makeup water pump stops, as designed, upon receipt of a trip signal.

4.9.2.1.2 If using the Source Range Neutron Flux Monitors to meet the requirements of Technical Specification 3.9.2, each Source Range Neutron Flux Monitor shall be demonstrated OPERABLE by performance of:

(a) A CHANNEL CHECK at least once per 12 hours,

(b) An ANALOG CHANNEL OPERATIONAL TEST within 8 hours prior to the initial start of CORE ALTERATIONS or within 1 hour after declaring the BORON DILUTION MITIGATION SYSTEM inoperable, and

(c) An ANALOG CHANNEL OPERATIONAL TEST at least once per 7 days.

(d) The combined flowrate from both Reactor Makeup Water Pumps shall be verified as less than or equal to ~~70 gpm~~ at least once per 7 days.

the Reactor Makeup Water Pump flowrate presented in the Core Operating Limits Report

REACTIVITY CONTROL SYSTEMS

BASES

BORATION SYSTEMS (Continued)

To maintain shutdown margin for this condition a minimum water volume at a minimum boron concentration, as presented in the Core Operating Limits Report, is required

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 2000 ppm borated water 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:

a minimum contained water volume and boron concentration, as presented in the Core Operating Limits Report, be available

Modes 1-4 Boric Acid Tank

Required volume for maintaining SDM	presented in the Core Operating Limits Report → ~~9,851 gallons~~
~~5%~~ Additional Margin	1303 → ~~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
	~~21,193 gallons~~

~~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	presented in the Core Operating Limits Report → ~~57,107 gallons~~
Unusable Volume (below nozzle)	13,442 gallons
Instrument Inaccuracy	11,307 gallons
Vortexing	13,247 gallons
	~~95,103 gallons~~
Additional Margin	3504 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~~

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 capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% Δk/k after xenon decay and cooldown from 200°F to 140°F. To maintain shutdown margin for this condition a minimum water volume at a minimum boron concentration, as presented in the Core Operating Limits Report, is required ~~This condition requires either 585 gallons of 7000 ppm borated water~~ from the boric acid storage tanks or ~~3500 gallons of 2000 ppm borated water 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	presented in the Core Operating Limits Report ~~585 gallons~~
Unusable Volume, Vortexing, Inst. Error	10,846 gallons
~~5%~~ additional margin	569 ~~33~~ gallons
	~~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	presented in the Core Operating Limits Report ~~3,500 gallons~~
Water Below the Nozzle	13,442 gallons
Instrument Inaccuracy	11,307 gallons
Vortexing	13,247 gallons
	~~41,496 gallons~~
Additional Margin	3504 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.

BORATION SYSTEMS (Continued)

The limits on contained water volume and boron concentration of the refueling water storage tank also ensure a pH value of between ~~8 and 9~~ 7.5 and 9.5 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

The OPERABILITY of one Boron Injection System during REFUELING ensures that this system is available for reactivity control while in MODE 6.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that: (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of rod misalignment on associated accident analyses are limited. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits. Verification that the Digital Rod Position Indicator agrees with the demanded position within ± 12 steps at 24, 48, and 120 steps and fully withdrawn (≥ 225 steps) for the Control Banks and 18 and 210 steps and fully withdrawn for the Shutdown Banks provides assurances that the Digital Rod Position Indicator is operating correctly over the full range of indication. Since the Digital Rod Position System does not indicate the actual shutdown rod position between 18 steps and 210 steps, only points in the indicated ranges are picked for verification of agreement with demanded position.

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.

Insert 1 → ~~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 1800 ppm, so additional down time is allowed when concentration is above 1800 ppm. A concentration of less than 1900 ppm 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.

Insert 1

The allowed outage time for the accumulators are variable based upon boron concentration to ensure that the reactor is shut down following a LOCA and that any problems are corrected in a timely manner. The minimum boron concentration required to ensure post-LOCA subcriticality, as presented in the Core Operating Limits Report, is based on nominal accumulator volume conditions and allows additional outage time since subcriticality is assured when the boron concentration is above this value. A slightly higher boron concentration, the minimum accumulator boron concentration limit for LCO 3.5.1c presented in the Core Operating Limits Report, is based on worst case liquid mass, boron concentration and measurement errors. A concentration less than this LCO value in any single accumulator or as a volume weighted average may be indicative of a problem, such as valve leakage. Since reactor shutdown is assured if the boron concentration is above the minimum concentration to ensure post-LOCA subcriticality and the accumulator volume is greater than or equal to the nominal volume, additional time is allowed to restore boron concentration in the accumulators.

EMERGENCY CORE COOLING SYSTEMS

BASES

REFUELING WATER STORAGE TANK (Continued)

The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

The limits on contained water volume and boron concentration of the refueling water storage tank also ensure a pH value of between ~~8.0 and 9.0~~ 7.5 and 9.5 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

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

Changes to Core Operating Limits Report (Catawba 1 Cycle 7 & Catawba 2 Cycle 6)

C-22

Catawba Nuclear Station COLR

Catawba Unit 2 Cycle ~~5~~ 6

Core Operating Limits Report

November 22, 1991

Duke Power Company

Prepared by: Robert R. St. Clair

Checked by: Kevin P. Walby

Approved by: K H Clark

Catawba 2 Cycle ~~5~~ 6 Core Operating Limits Report

REVISION LOG

Revision	Effective Date	Effective Pages
Original Issue	22 November 1991	Pages 1 - 15

Catawba 2 Cycle ~~5~~ 6 Core Operating Limits Report

1.0 Core Operating Limits Report

This Core Operating Limits Report, (COLR), for Catawba Unit 2, Cycle ~~5~~ 6 has been prepared in accordance with the requirements of Technical Specification 6.9.1.9.

The Technical Specifications affected by this report are listed below:

~~3/4.1.1.3~~	~~Moderator Temperature Coefficient~~
~~3/4.1.3.5~~	~~Shutdown Rod Insertion Limit~~
~~3/4.1.3.6~~	~~Control Rod Insertion Limit~~
~~3/4.2.1~~	~~Axial Flux Difference~~
~~3/4.2.2~~	~~Heat Flux Hot Channel Factor~~
~~3/4.2.3~~	~~Reactor Coolant System Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor~~

← Replace with Insert 1

Insert 1

2.2.1	Reactor Trip System Instrumentation Setpoints
3/4.1.1.3	Moderator Temperature Coefficient
3/4.1.2.5	Borated Water Source - Shutdown
3/4.1.2.6	Borated Water Source - Operating
3/4.1.3.5	Shutdown Rod Insertion Limit
3/4.1.3.6	Control Rod Insertion Limit
3/4.2.1	Axial Flux Difference
3/4.2.2	Heat Flux Hot Channel Factor
3/4.2.3	Nuclear Enthalpy Rise Hot Channel Factor
3/4.3.3.12	Boron Dilution Mitigation System
3/4.5.1	Accumulators
3/4.5.4	Refueling Water Storage Tank
3/3.9.2	Instrumentation

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Catawba 2 Cycle ~~5~~ 6 Core Operating Limits Report

1.1 ~~2.0~~ Operating Limits

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC-approved methodologies specified in Technical Specification 6.9.1.9.

Insert 2 →

~~2.1~~ 3.0 Moderator Temperature Coefficient (Specification 3/4.1.1.3)

~~2.1.1~~ 3.0 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the limits shown in Figure 1. The BOC/ARO/HZP MTC shall be less positive that $0.7 * 10^{-4}$ ΔK/K/°F.

The EOC/ARO/RTP MTC shall be less negative that $-4.1 * 10^{-4}$ ΔK/K/°F.

~~2.1.2~~ 3.0 The MTC Surveillance Limit is:

The 300 PPM/ARO/RTP MTC should be less negative than or equal to $-3.2 * 10^{-4}$ ΔK/K/°F.

Where: BOC stands for Beginning of Cycle
ARO stands for All Rods Out
HZP stands for Hot Zero (Thermal) Power
EOC stands for End of Cycle
RTP stands for Rated Thermal Power

C.27

Insert 2

2.0 Reactor Trip System Instrumentation Setpoints (Specification 2.2.1)

2.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 = 1.1953$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.03163/°F$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001414/psi$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 = 12$ sec., $\tau_2 = 3$ sec.
Measured ΔT lag time constant	$\tau_3 = 0$ sec.
Measured reactor vessel average temperature lead/lag time constants	$\tau_4 = 22$ sec. $\tau_5 = 4$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 = 0$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 3.0% ΔI
$f_1(\Delta I)$ "negative" breakpoint	= -39.9% ΔI
$f_1(\Delta I)$ "positive" slope	= 2.316% ΔT_0 / %ΔI
$f_1(\Delta I)$ "negative" slope	= 3.910% ΔT_0 / %ΔI

Insert 2 - continued

2.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 = 1.0819$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001291/°F$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 = 12$ sec., $\tau_2 = 3$ sec.
Measured ΔT lag time constant	$\tau_3 = 0$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 = 0$ sec.
Measured reactor vessel average temperature rate-lag time constant	$\tau_7 = 10$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0% ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0% ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0% ΔT_0 / %ΔI
$f_2(\Delta I)$ "negative" slope	= 7.0% ΔT_0 / %ΔI

C.29

Catawba 2 Cycle ~~5~~ 6 Core Operating Limits Report

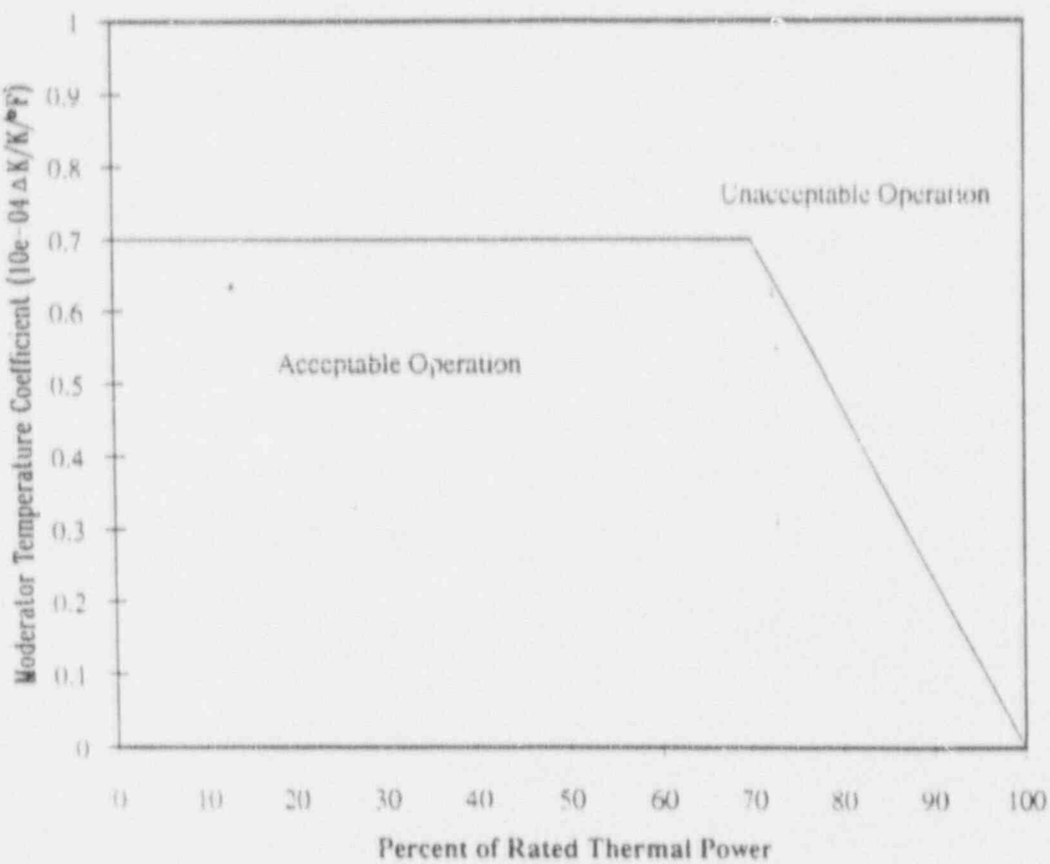

Figure 1

Moderator Temperature Coefficient Versus Power Level

Catawba 2 Cycle ~~5~~ 6 Core Operating Limits Report

Insert 3 →

~~2.2~~ 3.3 Shutdown Rod Insertion Limit (Specification 3/4.1.3.5)

~~2.2.1~~ 3.3 The shutdown rods shall be withdrawn to at least ~~226~~ 222 steps.

~~2.3~~ 3.4 Control Rod Insertion Limits (Specification 3/4.1.3.6)

~~2.3.1~~ 3.4 The control rod banks shall be limited in physical insertion as shown in Figure 2.

~~2.4~~ 3.5 Axial Flux Difference (Specification 3/4.2.1)

~~2.4.1 The AXIAL FLUX DIFFERENCE (AFD) Limits are provided in Figure 3.~~ 3.5

~~2.4.2 The target band during base load operation is not applicable for Catawba 2 Cycle 5.~~ 3.5 6

~~2.4.3 The minimum allowable power level for Base Load Operation (APL^{ND}) is not applicable for Catawba 2 Cycle 5.~~ 3.5 6

~~2.4.1~~ 3.5 The Axial Flux Difference (AFD) Limits are provided in Figure 3.

$(\text{AFD Limit})^{\text{COLR}}_{\text{negative}}$ is the negative AFD limit from Figure 3.

$(\text{AFD Limit})^{\text{COLR}}_{\text{positive}}$ is the positive AFD limit from Figure 3.

Insert 3

3.1 Borated Water Source - Shutdown (Specification 3/4.1.2.5)

3.1.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 5 & 6:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.5a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.5a	12,000 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	585 gallons
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.5b	2,000 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.5b	45,000 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	3,500 gallons

3.2 Borated Water Source - Operating (Specification 3/4.1.2.6)

3.2.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 1, 2, 3 & 4:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.6a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.6a	22,000 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	9,851 gallons

Insert 3 - continued

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.6b	2,000 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.6b	98,607 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	57,107 gallons

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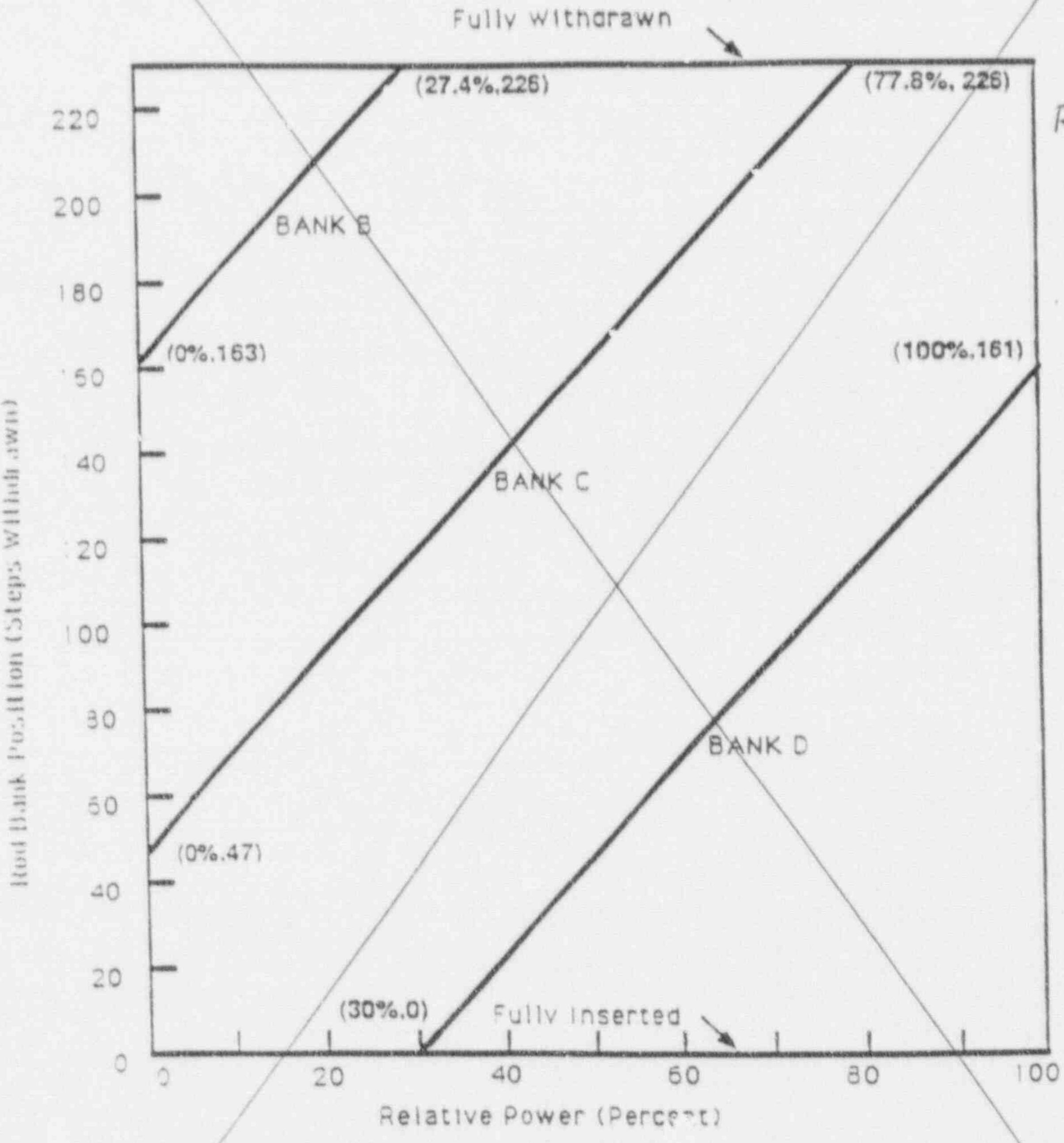
Catawba 2 Cycle 5 Core Operating Limits Report



Replace with Insert 4

Figure 2

Control Rod Bank Insertion Limits Versus Percent Rated Thermal Power

Insert 4

Catawba 2 Cycle 6 Core Operating Limits Report

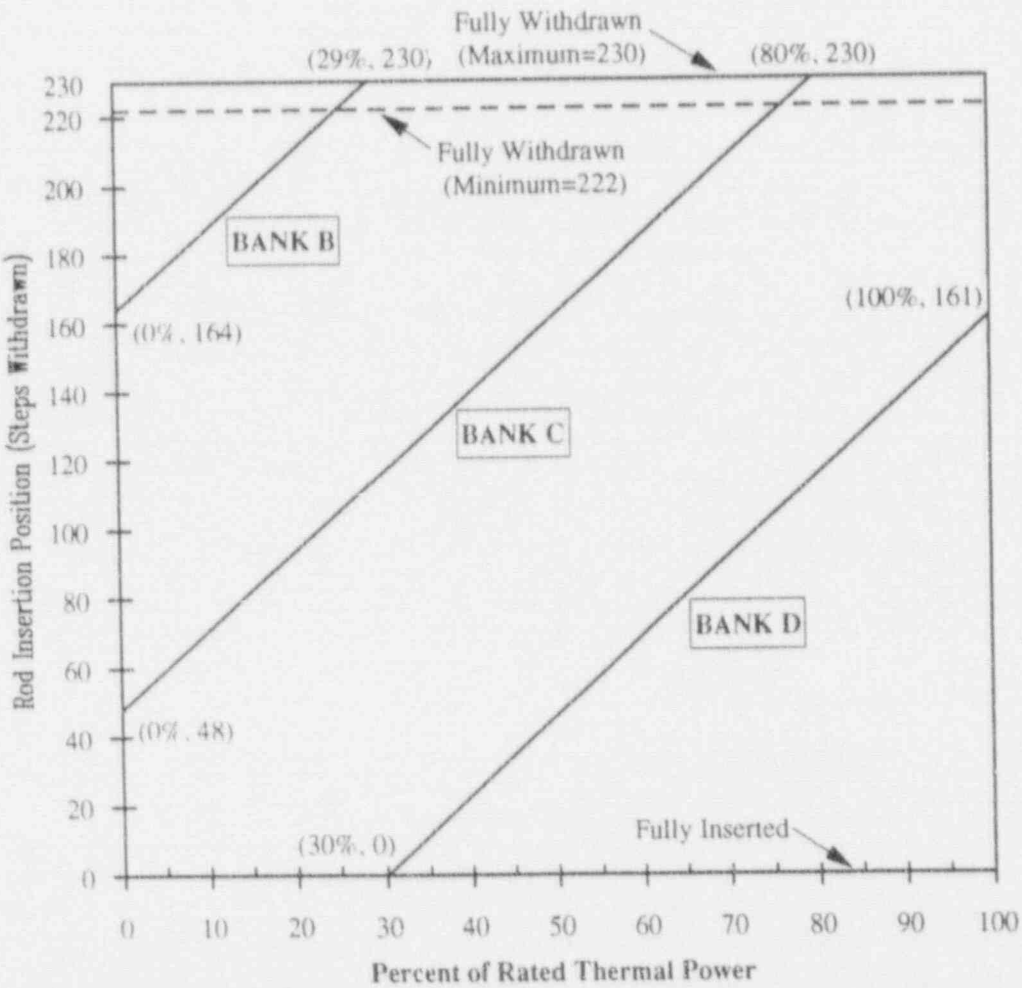


Figure 2

Control Rod Bank Insertion Limits Versus Percent of Rated Thermal Power

C-35

Catawba 2 Cycle ~~5~~ 6 Core Operating Limits Report

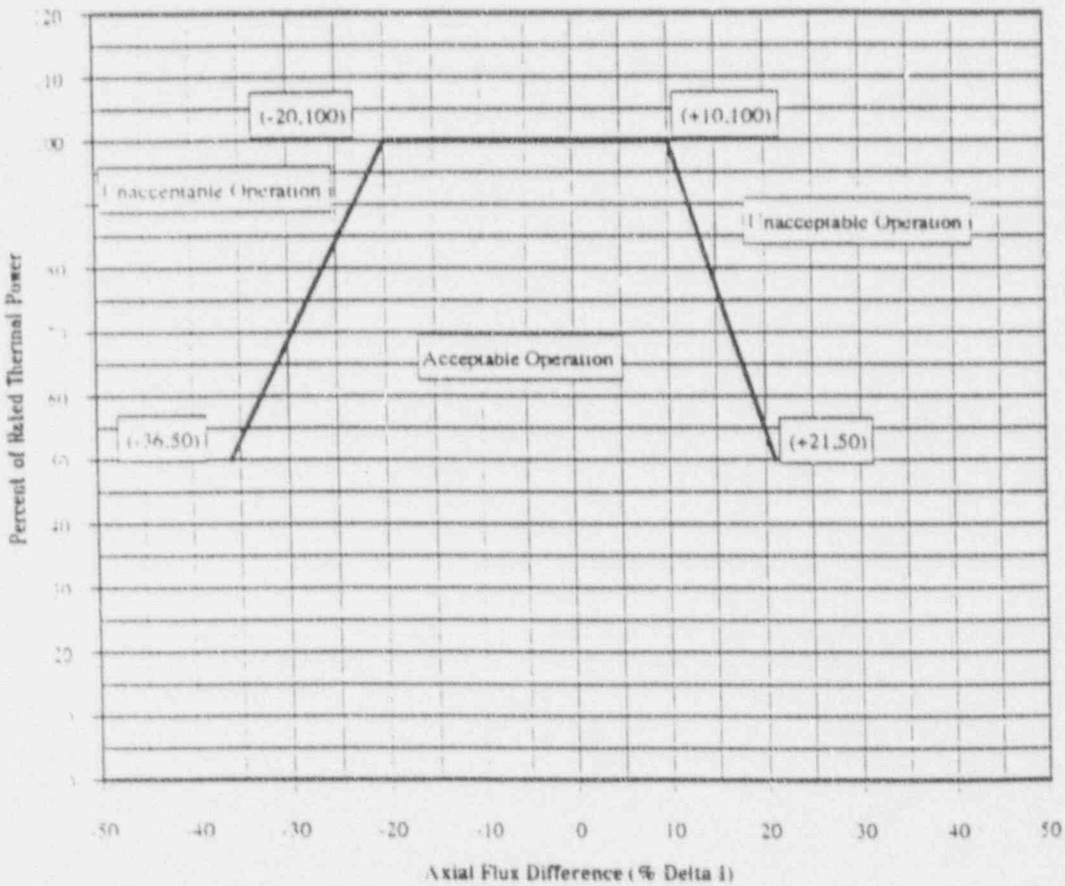


Figure 3

Percent of Rated Thermal Power Versus Axial Flux Difference Limits

2.5 Heat Flux Hot Channel Factor - $F_Q(Z)$ (Specification 3/4.2.2)

$F_Q(Z) \leq \frac{F_Q^{RTP}}{P} * K(Z)$ for $P > 0.5$

$F_Q(Z) \leq \frac{F_Q^{RTP}}{0.5} * K(Z)$ for $P \leq 0.5$

where: $P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

2.5.1 $F_Q^{RTP} = 2.32$

2.5.2 K(Z) is provided in Figure 4.

2.5.3 W(Z) values are provided in Figures 5 through 7.

2.5.4 Base load W(Z)'s are not applicable for Catawba 2 Cycle 5.

Replace with Insert 5

Insert 5

Catawba 2 Cycle 6 Core Operating Limits Report

3.6 Heat Flux Hot Channel Factor, $F_Q(X,Y,Z)$ (Specification 3/4.2.2)

3.6.1 $F_Q^{RTP} = 2.32$

3.6.2 K(Z) is provided in Figure 4 for Mark-BW fuel.

3.6.3 K(Z) is provided in Figure 5 for OFA fuel.

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.2:

3.6.4 $$[F_Q^L(X,Y,Z)]^{OP} = \frac{F_Q^D(X,Y,Z) * M_Q(X,Y,Z)}{UMT * MT * TILT}$$

where $[F_Q^L(X,Y,Z)]^{OP}$ = cycle dependent maximum allowable design peaking factor which ensures that the $F_Q(X,Y,Z)$ limit will be preserved for operation within the LCO limits. $[F_Q^L(X,Y,Z)]^{OP}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distribution for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 2 for normal operation and table 2A for power escalation testing during initial startup.

$M_Q(X,Y,Z)$ = the margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. $M_Q(X,Y,Z)$ is provided in Table 3 for normal operation and table 3A for power escalation testing during initial startup.

UMT = Measurement Uncertainty (UMT = 1.05).

MT = Engineering Hot Channel Factor (MT = 1.03).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

NOTE: $[F_Q^L(X,Y,Z)]^{OP}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

Insert 5 - continued

Catawba 2 Cycle 6 Core Operating Limits Report

3.6.5 $[F_Q^L(X,Y,Z)]^{RPS} = \dfrac{F_Q^D(X,Y,Z) * M_C(X,Y,Z)}{UMT * MT * TILT}$

where $[F_Q^L(X,Y,Z)]^{RPS}$ = cycle dependent maximum allowable design peaking factor which ensures that the centerline fuel melt limit will be preserved for all operation. $[F_Q^L(X,Y,Z)]^{RPS}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distributions for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 2 for normal operation and table 2A for power escalation testing during initial startup.

$M_C(X,Y,Z)$ = the margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 4 for normal operation and table 4A for power escalation testing during initial startup.

UMT = Measurement Uncertainty (UMT = 1.05).

MT = Engineering Hot Channel Factor (MT = 1.03).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

NOTE: $[F_Q^L(X,Y,Z)]^{RPS}$ is similar to the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA except that $M_C(X,Y,Z)$ replaces $M_Q(X,Y,Z)$.

3.6.6 KSLOPE = 0.078

where KSLOPE = Adjustment to the K_1 value from OTΔT required to compensate for each 1% that $[F_Q^L(X,Y,Z)]^{RPS}$ exceeds it limit

Catawba 2 Cycle 5 Core Operating Limits Report

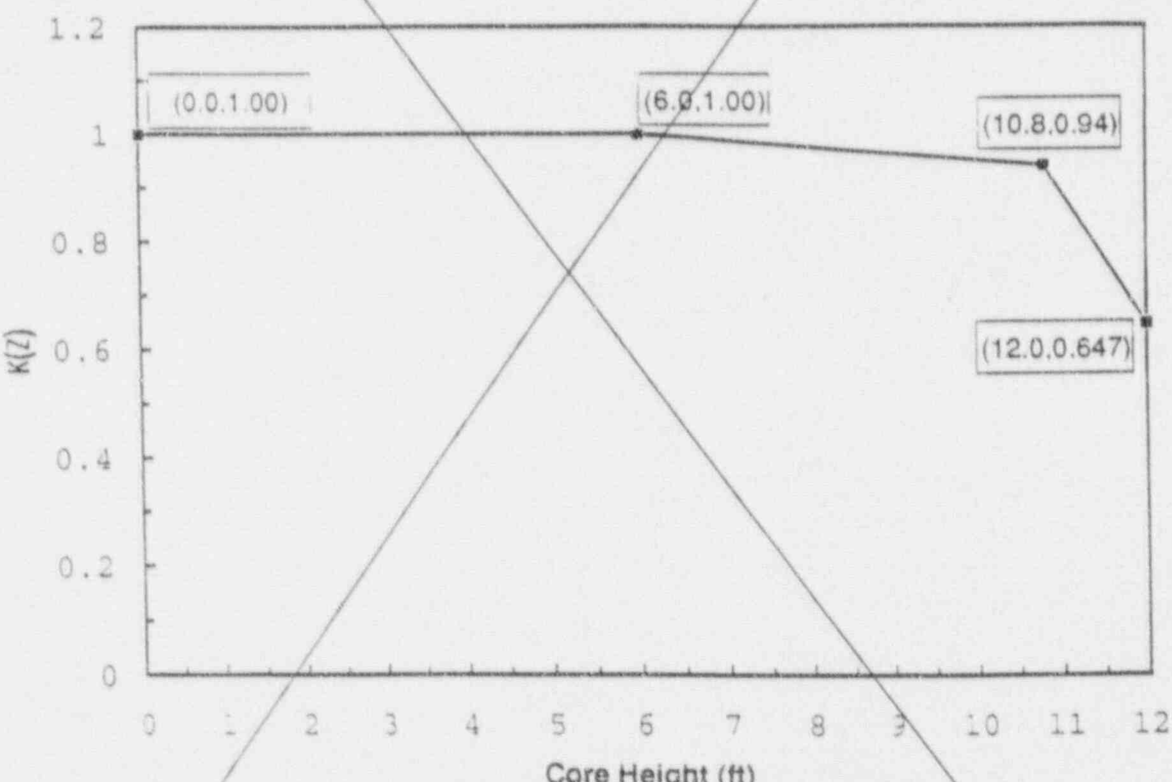


Figure 4

K(Z), Normalized $F_Q(Z)$ as a Function of Core Height

Replace with Insert 6

Insert 6

Catawba 2 Cycle 6 Core Operating Limits Report

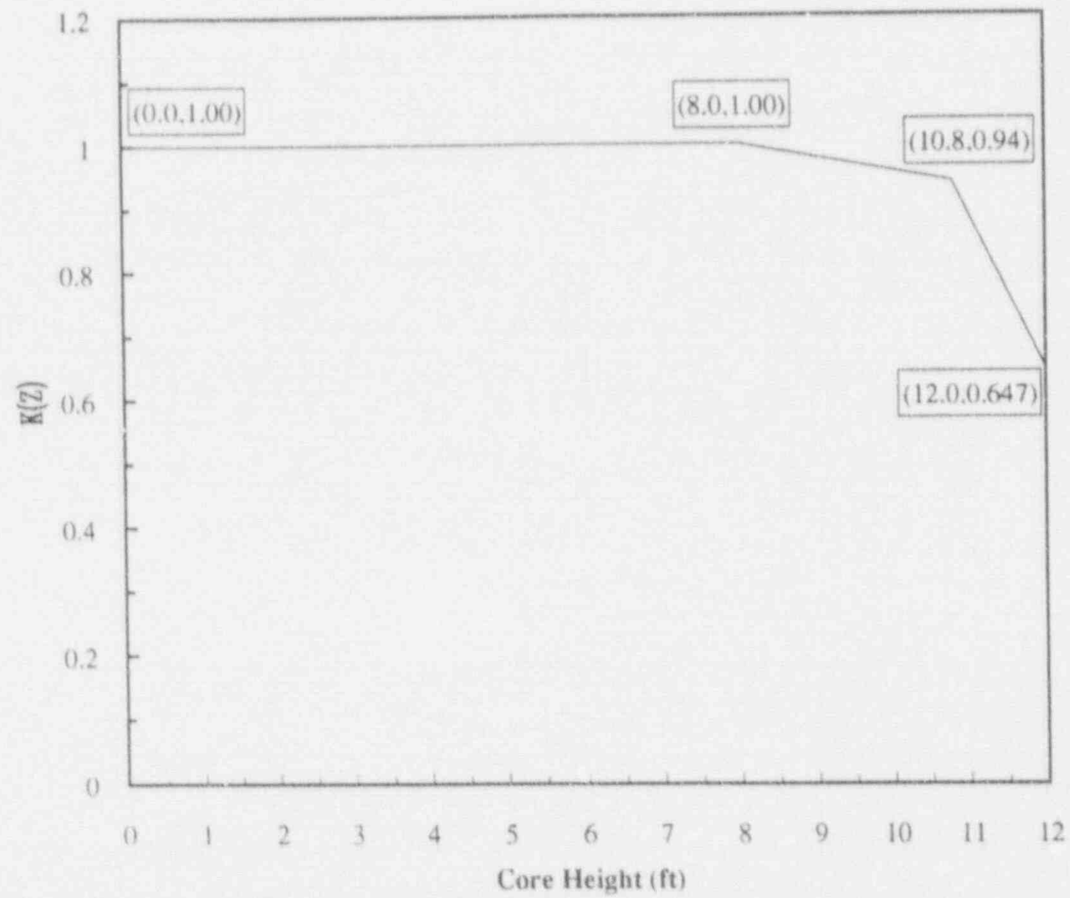


Figure 4

K(Z), Normalized $F_Q(X,Y,Z)$ as a Function of Core Height for MkBW Fuel

Insert 6 - continued

Catawba 2 Cycle 6 Core Operating Limits Report

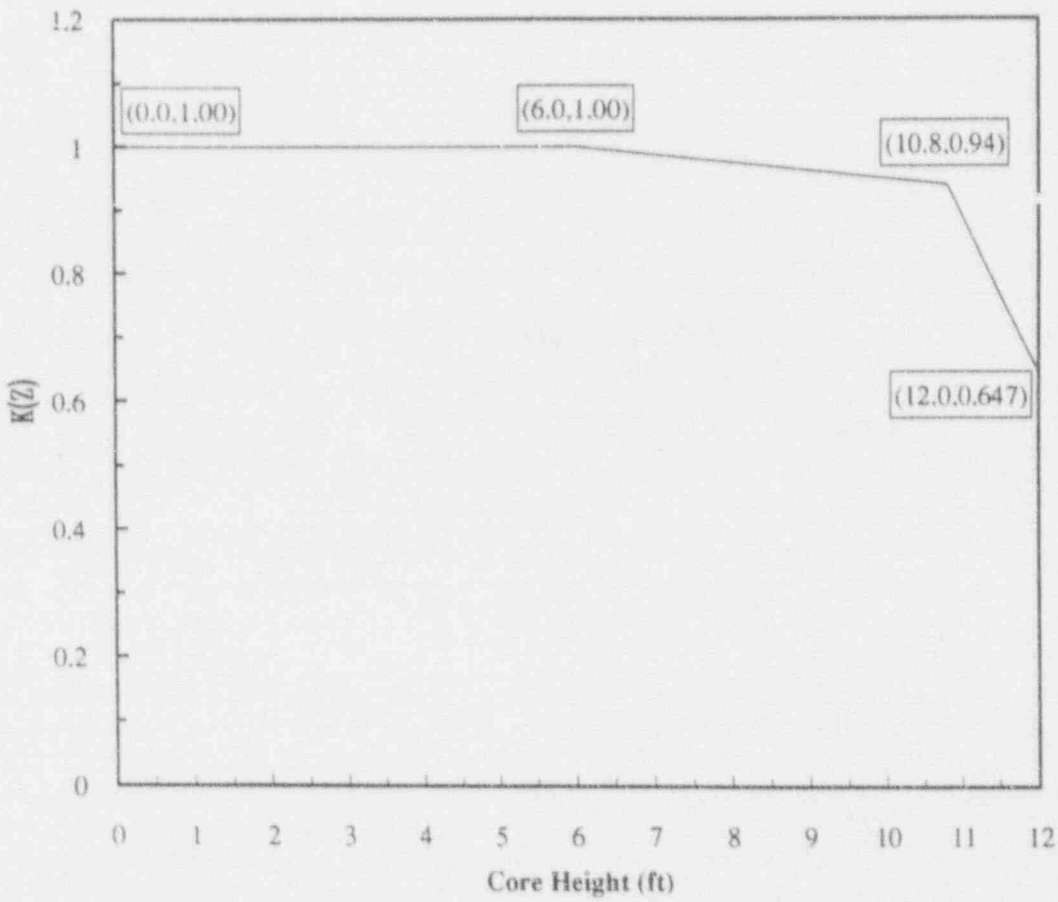


Figure 5

K(Z), Normalized $F_Q(X,Y,Z)$ as a Function of Core Height for OFA Fuel

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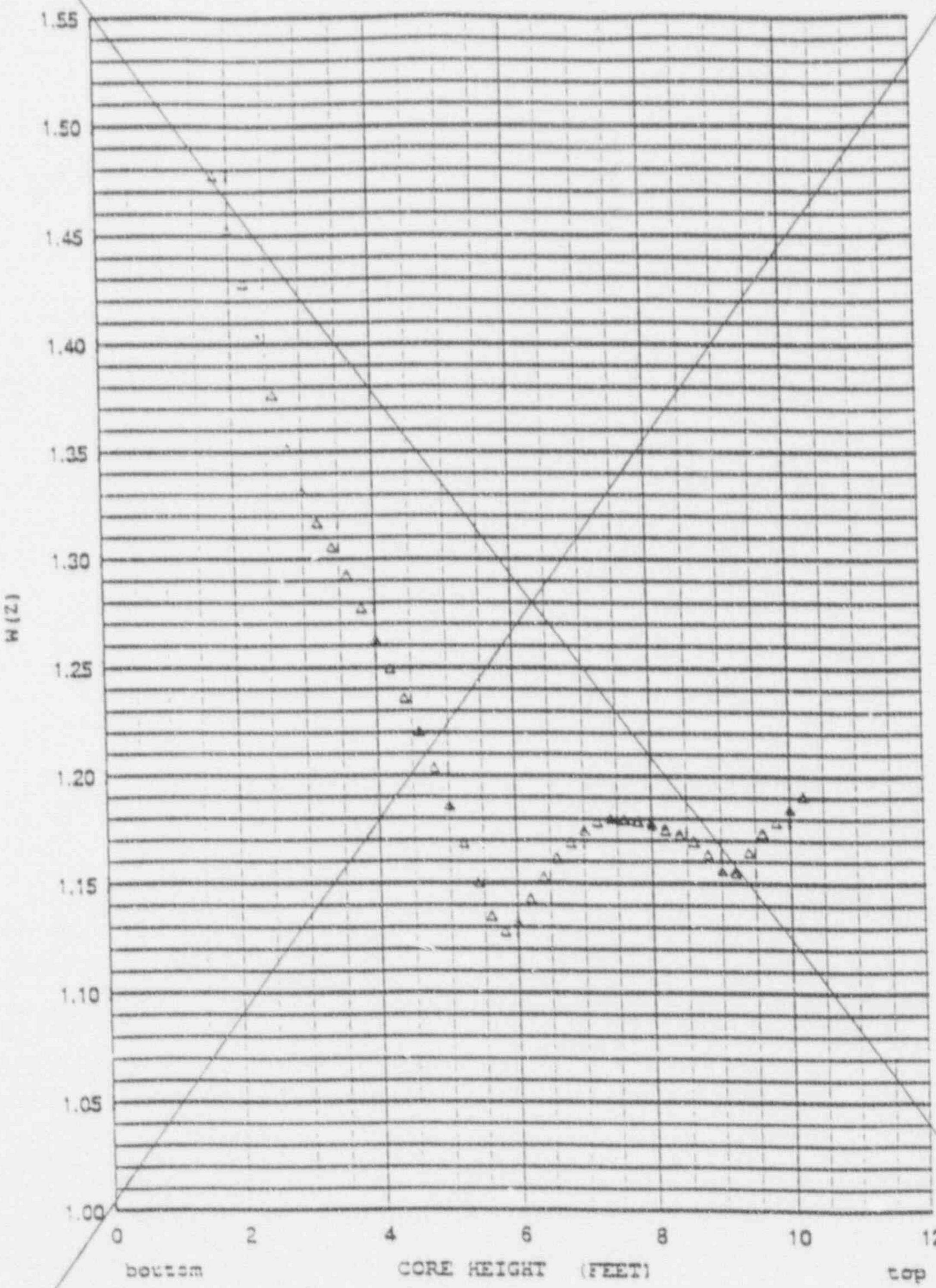
Catawba 2 Cycle 5 Core Operating Limits Report



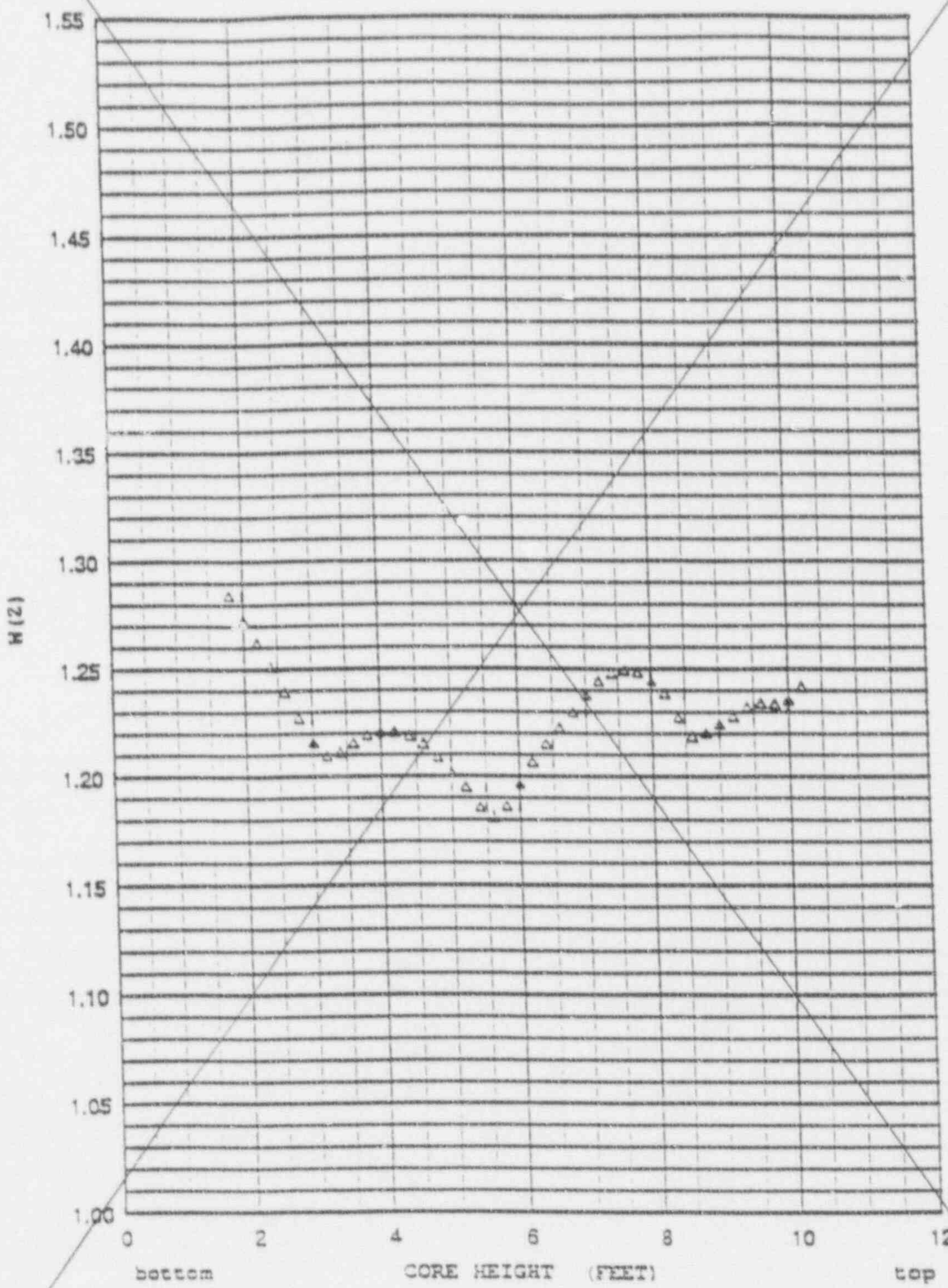
HEIGHT (FEET)	BOL W(Z)
* 0.00	1.0000
* 0.20	1.0000
* 0.40	1.0000
* 0.60	1.0000
* 0.80	1.0000
* 1.00	1.0000
* 1.20	1.0000
* 1.40	1.0000
* 1.60	1.0000
1.80	1.4776
2.00	1.4533
2.20	1.4283
2.40	1.4026
2.60	1.3766
2.80	1.3519
3.00	1.3318
3.20	1.3169
3.40	1.3055
3.60	1.2925
3.80	1.2776
4.00	1.2630
4.20	1.2496
4.40	1.2359
4.60	1.2205
4.80	1.2037
5.00	1.1863
5.20	1.1686
5.40	1.1504
5.60	1.1352
5.80	1.1282
6.00	1.1325
6.20	1.1432
6.40	1.1530
6.60	1.1617
6.80	1.1690
7.00	1.1747
7.20	1.1787
7.40	1.1804
7.60	1.1796
7.80	1.1787
8.00	1.1775
8.20	1.1747
8.40	1.1723
8.60	1.1694
8.80	1.1637
9.00	1.1565
9.20	1.1550
9.40	1.1647
9.60	1.1734
9.80	1.1787
10.00	1.1848
10.20	1.1909
* 10.40	1.0000
* 10.60	1.0000
* 10.80	1.0000
* 11.00	1.0000
* 11.20	1.0000
* 11.40	1.0000
* 11.60	1.0000
* 11.80	1.0000
* 12.00	1.0000

Figure 5
Catawba Unit 2 Cycle 5
RAOC W(Z) at 150 MWD/MTU

Delete

Top and Bottom 15% excluded as per Tech. Spec. 4.2.2.2.G

Catawba 2 Cycle 5 Core Operating Limits Report



HEIGHT (FEET)	MOL W(Z)
* 0.00	1.0000
* 0.20	1.0000
* 0.40	1.0000
* 0.60	1.0000
* 0.80	1.0000
* 1.00	1.0000
* 1.20	1.0000
* 1.40	1.0000
* 1.60	1.0000
1.80	1.2844
2.00	1.2735
2.20	1.2624
2.40	1.2512
2.60	1.2396
2.80	1.2274
3.00	1.2159
3.20	1.2097
3.40	1.2114
3.60	1.2157
3.80	1.2193
4.00	1.2209
4.20	1.2207
4.40	1.2188
4.60	1.2150
4.80	1.2091
5.00	1.2022
5.20	1.1951
5.40	1.1861
5.60	1.1812
5.80	1.1866
6.00	1.1968
6.20	1.2070
6.40	1.2153
6.60	1.2226
6.80	1.2301
7.00	1.2382
7.20	1.2444
7.40	1.2482
7.60	1.2496
7.80	1.2484
8.00	1.2448
8.20	1.238
8.40	1.227
8.60	1.218
8.80	1.220
9.00	1.224
9.20	1.228
9.40	1.232
9.60	1.234
9.80	1.233
10.00	1.235
10.20	1.241
* 10.40	1.000
* 10.60	1.000
* 10.80	1.000
* 11.00	1.000
* 11.20	1.000
* 11.40	1.000
* 11.60	1.000
* 11.80	1.000
* 12.00	1.000

Figure 6
Catawba Unit 2 Cycle 5
RAOC W(Z) at 8000 MWD/MTU

Delete

Top and Bottom 15% excluded as per Tech. Spec. 4.2.2.2.G

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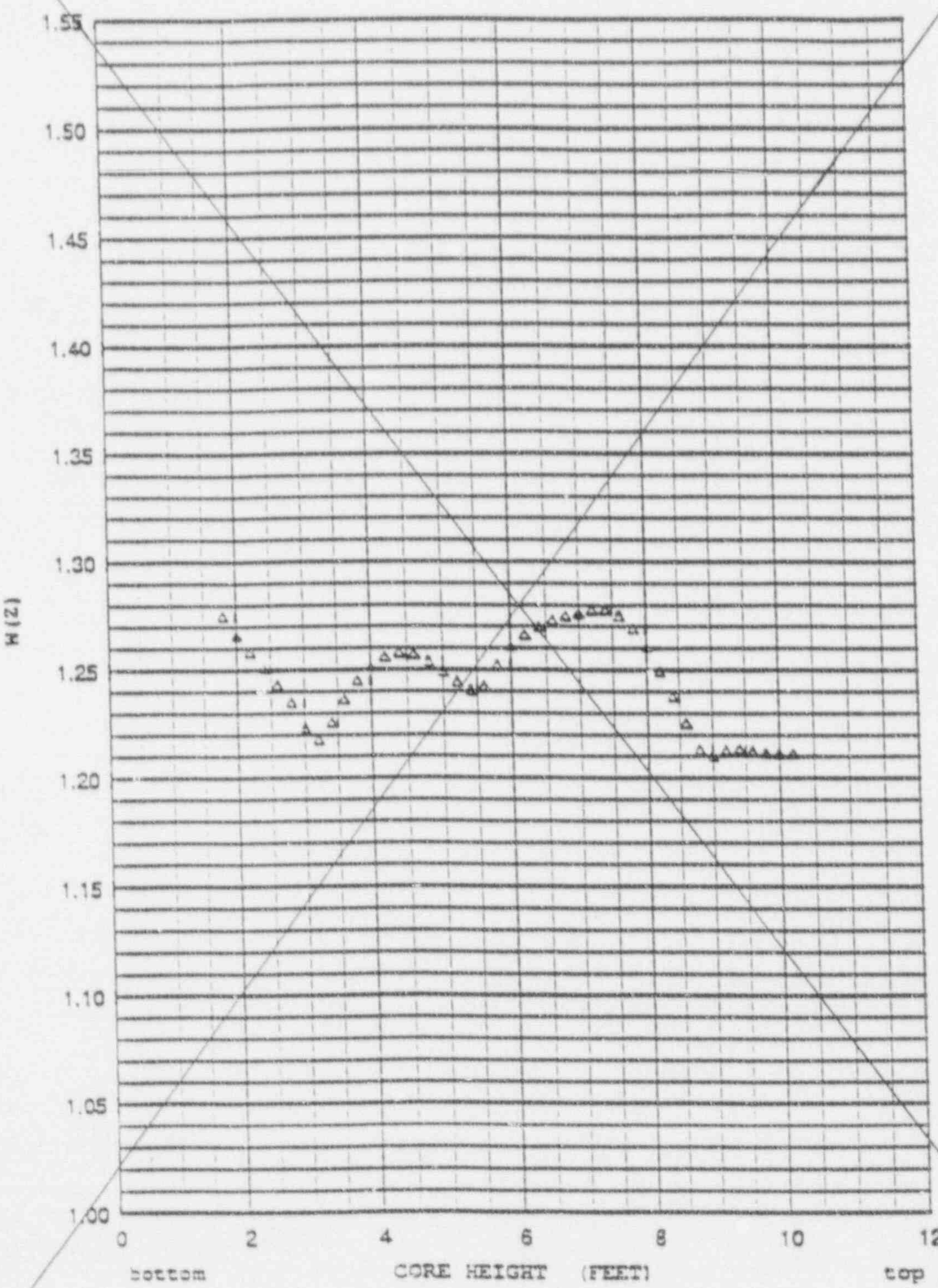
Catawba 2 Cycle 5 Core Operating Limits Report



HEIGHT (FEET)	EOL W(Z)
* 0.00	1.0000
* 0.20	1.0000
* 0.40	1.0000
* 0.60	1.0000
* 0.80	1.0000
* 1.00	1.0000
* 1.20	1.0000
* 1.40	1.0000
* 1.60	1.0000
1.80	1.2752
2.00	1.2663
2.20	1.2586
2.40	1.2509
2.60	1.2433
2.80	1.2352
3.00	1.2235
3.20	1.2177
3.40	1.2259
3.60	1.2365
3.80	1.2451
4.00	1.2517
4.20	1.2560
4.40	1.2579
4.60	1.2573
4.80	1.2540
5.00	1.2492
5.20	1.2444
5.40	1.2405
5.60	1.2423
5.80	1.2525
6.00	1.2612
6.20	1.2664
6.40	1.270
6.60	1.273
6.80	1.275
7.00	1.276
7.20	1.278
7.40	1.278
7.60	1.275
7.80	1.269
8.00	1.260
8.20	1.249
8.40	1.238
8.60	1.225
8.80	1.213
9.00	1.210
9.20	1.213
9.40	1.213
9.60	1.212
9.80	1.211
10.00	1.211
10.20	1.211
* 10.40	1.000
* 10.60	1.000
* 10.80	1.000
* 11.00	1.000
* 11.20	1.000
* 11.40	1.000
* 11.60	1.000
* 11.80	1.000
* 12.00	1.000

Figure 7
Catawba Unit 2 Cycle 5
RAOC W(Z) at 13000 MWD/MTU

Delete

Top and Bottom 15% excluded as per Tech. Spec. 4.2.2.2.G

C-45

Catawba 2 Cycle 5 Core Operating Limits Report

2.6 RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor - $F^N_{\Delta H}$
(Specification 3/4.2.3)

$$R = \frac{F^N_{\Delta H}}{F^{RTP}_{\Delta H} * (1 + MF_{\Delta H} * (1-P))}$$

$$\text{where: } P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

2.6.1 $F^{RTP}_{\Delta H} = 1.49$

2.6.2 $MF_{\Delta H} = 0.3$

2.6.3 The Acceptable Operation Region from the combination of Reactor Coolant System total flow and R is provided in Figure 8.

Replace with Insert 7

Insert 7

Catawba 2 Cycle 6 Core Operating Limits Report

3.7 Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}(X,Y,Z)$ (Specification 3/4.2.3)

The following parameters are required for core monitoring per the LCO Requirements of Specification 3/4.2.3:

3.7.1 $$[F_{\Delta H}(X,Y)]^{LCO} = MARP\ (X,Y) * \left[1.0 + \frac{1}{RRH} * (1.0 - P)\right]$$

where (MARP(X,Y)) = Catawba 2 Cycle 6 Operating Limit Maximum Allowable Radial Peaks. (MARP(X,Y)) is provided in Table 1.

$$P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.3:

3.7.2 $$[F^{L}_{\Delta H}(X,Y)]^{SURV} = \frac{F^{D}_{\Delta H}(X,Y) * M_{\Delta H}(X,Y)}{UMR * TILT}$$

where $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ = cycle dependent maximum allowable design peaking factor which ensures that the $F_{\Delta H}(X,Y)$ limit will be preserved for operation within the LCO limits. $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ includes allowances for calculational and measurement uncertainties.

$F^{D}_{\Delta H}(X,Y)$ = the design power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}(X,Y)$ is provided in Table 5 for normal operation and table 5A for power escalation testing during initial startup.

$M_{\Delta H}(X,Y)$ = the margin remaining in core location X,Y to the Operational DNB limit in the transient power distribution. $M_{\Delta H}(X,Y)$ is provided in Table 6 for normal operation and table 6A for power escalation testing during initial startup.

UMR = Uncertainty value for measured radial peaks, (UMR = 1.04).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

Insert 7 - continued

Catawba 2 Cycle 6 Core Operating Limits Report

NOTE: $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ is the parameter identified as $F^{MAX}_{\Delta H}(X,Y)$ in DPC-NE-2011PA.

3.7.3 RRH = 3.34

where RRH = Thermal Power reduction required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

3.7.4 TRH = 0.04

where TRH = Reduction in OTΔT K_1 setpoint required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

3.8 Boron Dilution Mitigation System (Specification 3/4.3.3.12)

3.8.1 Reactor Water Makeup Pump flowrate limits:

Applicable Mode	Limit
Mode 3 or 4	≤ 150 gpm
Mode 5	≤ 70 gpm

3.9 Accumulators (Specification 3/4.5.1)

3.9.1 Boron concentration limits during modes: 1, 2 and 3:

Parameter	Limits
Cold Leg Accumulator minimum boron concentration for LCO 3.5.1c	1,900 ppm
Cold Leg Accumulator maximum boron concentration for LCO 3.5.1c	2,100 ppm

Insert 7 - continued

Catawba 2 Cycle 6 Core Operating Limits Report

Minimum Cold Leg Accumulator boron concentration required to ensure post-LOCA subcriticality	1,800 ppm

3.10 Refueling Water Storage Tank (Specification 3/4.5.4)

3.10.1 Boron concentration limits during modes: 1, 2, 3 and 4:

Parameter	Limits
Refueling Water Storage Tank minimum boron concentration for LCO 3.5.4b	2,000 ppm
Refueling Water Storage Tank maximum boron concentration for LCO 3.5.4b	2,100 ppm

3.11 Instrumentation (Specification 3/4.9.2)

3.11.1 Reactor Makeup Water Pump Flowrate Limit:

Applicable Mode	Limit
Mode 6	$\leq$ 70 gpm

Insert 7 - continued

Catawba 2 Cycle 6 Core Operating Limits Report

Table 1. Maximum Allowable Radial Peaks (MARPs)

Core Height (ft)	1.1 Axial Peak MARP	1.2 Axial Peak MARP	1.3 Axial Peak MARP	1.4 Axial Peak MARP
0.12	1.5809	1.6266	1.6722	1.7113
1.2	1.5806	1.6259	1.6677	1.7085
2.4	1.5836	1.6265	1.6663	1.7025
3.6	1.5859	1.6263	1.6635	1.6960
4.8	1.5871	1.6240	1.6571	1.6751
6.0	1.5878	1.6196	1.6470	1.6303
7.2	1.5864	1.6130	1.6265	1.5848
8.4	1.5781	1.5956	1.5773	1.5327
9.6	1.5655	1.5612	1.5208	1.4815
10.8	1.5459	1.5152	1.4717	1.4292
12.0	1.5133	1.4693	1.4274	1.3878

Core Height (ft)	1.5 Axial Peak MARP	1.6 Axial Peak MARP	1.7 Axial Peak MARP	1.8 Axial Peak MARP
0.12	1.7477	1.7331	1.7054	1.6438
1.2	1.7433	1.7029	1.6789	1.6193
2.4	1.7126	1.6616	1.6433	1.5869
3.6	1.6735	1.6211	1.6011	1.5504
4.8	1.6313	1.5811	1.5622	1.5121
6.0	1.5868	1.5415	1.5238	1.4763
7.2	1.5378	1.4913	1.4766	1.4344
8.4	1.4886	1.4450	1.4296	1.3880
9.6	1.4399	1.4013	1.3882	1.3490
10.8	1.3883	1.3526	1.3433	1.3081
12.0	1.3500	1.3140	1.3078	1.2749

Core Height (ft)	1.9 Axial Peak MARP	2.1 Axial Peak MARP
0.12	1.5839	1.5401
1.2	1.5624	1.5154
2.4	1.5328	1.4801
3.6	1.5013	1.4395
4.8	1.4626	1.4030
6.0	1.4291	1.3619
7.2	1.3920	1.3271
8.4	1.3485	1.2824
9.6	1.3126	1.2501
10.8	1.2726	1.2091

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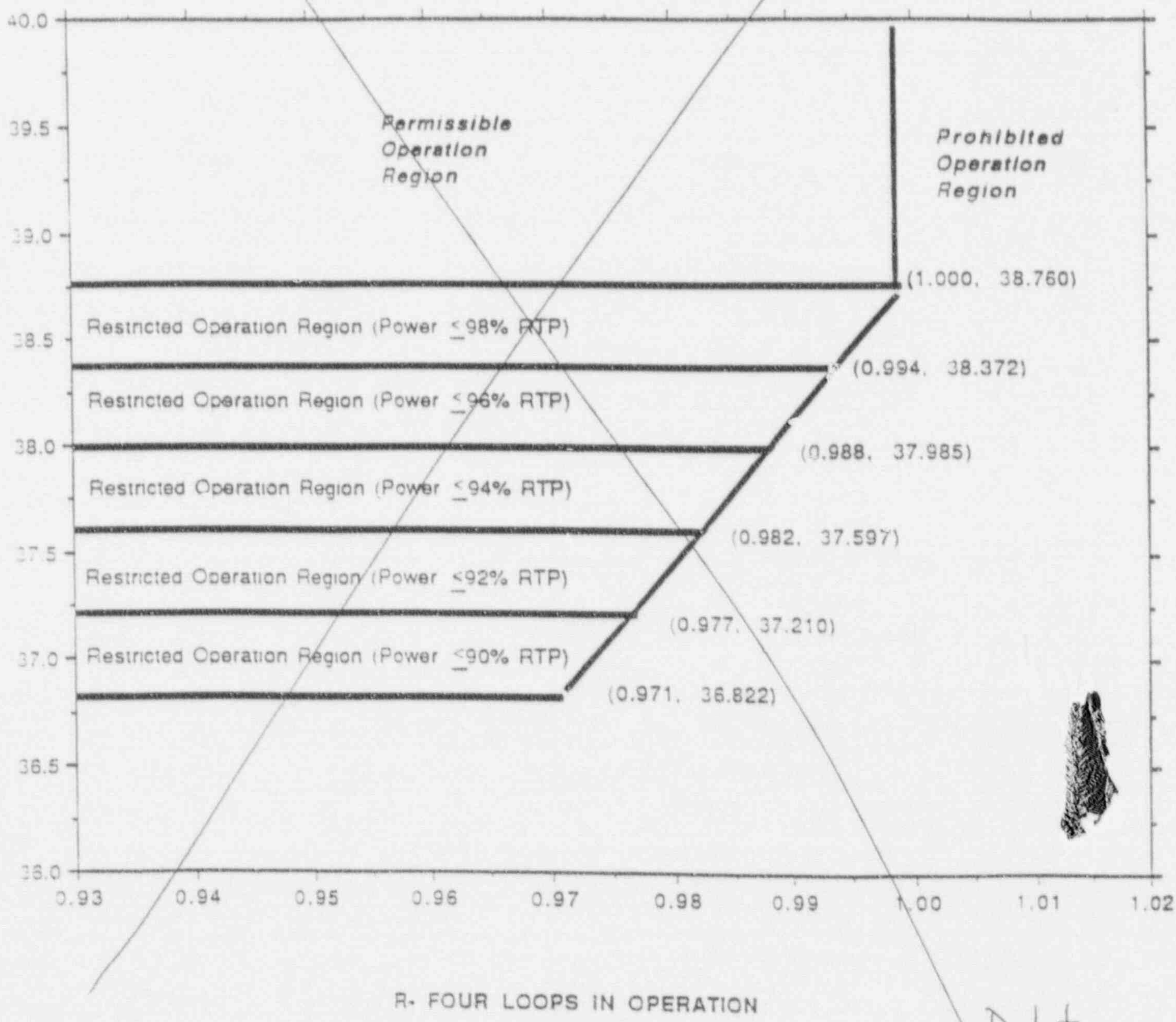
Catawba 2 Cycle 5 Core Operating Limits Report

Penalties of 0.1% for undetected feedwater venturi fouling and measurement uncertainties of 2.1% for flow and 4.0% for incore measurement of $F^N_{\Delta H}$ are included in this figure.



Delete

Figure 8
RCS Flow vs. R-Four Loops in Operation

Catawba 1 Cycle 7 Core Operating Limits Report

1.0 Core Operating Limits Report

This Core Operating Limits Report, (COLR), for Catawba, Unit 1, Cycle 7 has been prepared in accordance with the requirements of Technical Specification 6.9.1.9.

The Technical Specifications affected by this report are listed below:

~~3/4.1.1.3~~	~~Moderator Temperature Coefficient~~
~~3/4.1.3.5~~	~~Shutdown Rod Insertion Limit~~
~~3/4.1.3.6~~	~~Control Rod Insertion Limit~~
~~3/4.2.1~~	~~Axial Flux Difference~~
~~3/4.2.2~~	~~Heat Flux Hot Channel Factor~~
~~3/4.2.3~~	~~Nuclear Enthalpy Rise Hot Channel Factor~~

← Replace with Insert 1.

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Insert 1

2.2.1	Reactor Trip System Instrumentation Setpoints
3/4.1.1.3	Moderator Temperature Coefficient
3/4.1.2.5	Borated Water Source - Shutdown
3/4.1.2.6	Borated Water Source - Operating
3/4.1.3.5	Shutdown Rod Insertion Limit
3/4.1.3.6	Control Rod Insertion Limit
3/4.2.1	Axial Flux Difference
3/4.2.2	Heat Flux Hot Channel Factor
3/4.2.3	Nuclear Enthalpy Rise Hot Channel Factor
3/4.3.3.12	Boron Dilution Mitigation System
3/4.5.1	Accumulators
3/4.5.4	Refueling Water Storage Tank
3/3.9.2	Instrumentation

Catawba 1 Cycle 7 Core Operating Limits Report

1.1 ~~2.0~~ Operating Limits

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC-approved methodologies specified in Technical Specification 6.9.1.9.

Insert 2 →

~~2.1~~ 3.0 Moderator Temperature Coefficient (Specification 3/4.1.1.3)

~~2.1~~ 3.0.1 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the limits shown in Figure 1. The BOC/ARO/HZP MTC shall be less positive that $0.7 * 10^{-4}$ $\Delta K/K/°F$.

The EOC/ARO/RTP MTC shall be less negative that $-4.1 * 10^{-4}$ $\Delta K/K/°F$.

~~2.1~~ 3.0.2 The MTC Surveillance Limit is:

The 300 PPM/ARO/RTP MTC should be less negative than or equal to $-3.2 * 10^{-4}$ $\Delta K/K/°F$.

Where: BOC stands for Beginning of Cycle
ARO stands for All Rods Out
HZP stands for Hot Zero (Thermal) Power
EOC stands for End of Cycle
RTP stands for Rated Thermal Power

Insert 2

2.0 Reactor Trip System Instrumentation Setpoints (Specification 2.2.1)

2.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 = 1.1953$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.03163/°F$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001414/psi$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 = 12$ sec., $\tau_2 = 3$ sec.
Measured ΔT lag time constant	$\tau_3 = 0$ sec.
Measured reactor vessel average temperature lead/lag time constants	$\tau_4 = 22$ sec. $\tau_5 = 4$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 = 0$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 3.0% ΔI
$f_1(\Delta I)$ "negative" breakpoint	= -39.9% ΔI
$f_1(\Delta I)$ "positive" slope	= 2.316% ΔT_0 / %ΔI
$f_1(\Delta I)$ "negative" slope	= 3.910% ΔT_0 / %ΔI

Insert 2 - continued

2.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 = 1.0819$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001291/°F$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 = 12$ sec., $\tau_2 = 3$ sec.
Measured ΔT lag time constant	$\tau_3 = 0$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 = 0$ sec.
Measured reactor vessel average temperature rate-lag time constant	$\tau_7 = 10$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0% ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0% ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0% ΔT_0 / %ΔI
$f_2(\Delta I)$ "negative" slope	= 7.0% ΔT_0 / %ΔI

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Catawba 1 Cycle 7 Core Operating Limits Report

Insert 3 →

~~2.2~~ 3.3 Shutdown Rod Insertion Limit (Specification 3/4.1.3.5)

~~2.2.1~~ 3.3.1 The shutdown rods shall be withdrawn to at least 222 steps.

~~2.3~~ 3.4 Control Rod Insertion Limits (Specification 3/4.1.3.6)

~~2.3.1~~ 3.4.1 The control rod banks shall be limited to physical insertion as shown in Figure 2.

~~2.4~~ 3.5 Axial Flux Difference (Specification 3/4.2.1)

~~2.4.1~~ 3.5.1 The Axial Flux Difference (AFD) Limits are provided in Figure 3.

$(\text{AFD Limit})^{\text{COLR}}_{\text{negative}}$ is the negative AFD limit from Figure 3.

$(\text{AFD Limit})^{\text{COLR}}_{\text{positive}}$ is the positive AFD limit from Figure 3.

Insert 3

3.1 Borated Water Source - Shutdown (Specification 3/4.1.2.5)

3.1.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 5 & 6:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.5a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.5a	12,000 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	585 gallons
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.5b	2,000 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.5b	45,000 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	3,500 gallons

3.2 Borated Water Source - Operating (Specification 3/4.1.2.6)

3.2.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 1, 2, 3 & 4:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.6a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.6a	22,000 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	9,851 gallons

Insert 3 - continued

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.6b	2,000 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.6b	98,607 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	57,107 gallons

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Catawba 1 Cycle 7 Core Operating Limits Report

~~2.5~~ 3.6 Heat Flux Hot Channel Factor, $F_Q(X,Y,Z)$ (Specification 3/4.2.2)

~~2.5~~.1 3.6 $F_Q^{RTP} = 2.32$

~~2.5~~.2 3.6 K(Z) is provided in Figure 4 for Mark-BW fuel.

~~2.5~~.3 3.6 K(Z) is provided in Figure 5 for OFA fuel.

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.2:

~~2.5~~.4 3.6 $$[F_Q^L(X,Y,Z)]^{OP} = \frac{F_Q^D(X,Y,Z) * M_Q(X,Y,Z)}{UMT * MT * TILT}$$

where $[F_Q^L(X,Y,Z)]^{OP}$ = cycle dependent maximum allowable design peaking factor which ensures that the $F_Q(X,Y,Z)$ limit will be preserved for operation within the LCO limits. $[F_Q^L(X,Y,Z)]^{OP}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distribution for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 2 for normal operation and table 2A for power escalation testing during initial startup.

$M_Q(X,Y,Z)$ = the margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. $M_Q(X,Y,Z)$ is provided in Table 3 for normal operation and table 3A for power escalation testing during initial startup.

UMT = Measurement Uncertainty (UMT = 1.05).

MT = Engineering Hot Channel Factor (MT = 1.03).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

NOTE: $[F_Q^L(X,Y,Z)]^{OP}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

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Catawba 1 Cycle 7 Core Operating Limits Report

~~2.5.5~~ 3.6 $$[F_Q^L(X,Y,Z)]^{RPS} = \frac{F_Q^D(X,Y,Z) * M_C(X,Y,Z)}{UMT * MT * TILT}$$

where $[F_Q^L(X,Y,Z)]^{RPS}$ = cycle dependent maximum allowable design peaking factor which ensures that the centerline fuel melt limit will be preserved for all operation. $[F_Q^L(X,Y,Z)]^{RPS}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distributions for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 2 for normal operation and table 2A for power escalation testing during initial startup.

$M_C(X,Y,Z)$ = the margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 4 for normal operation and table 4A for power escalation testing during initial startup.

UMT = Measurement Uncertainty (UMT = 1.05).

MT = Engineering Hot Channel Factor (MT = 1.03).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

NOTE: $[F_Q^L(X,Y,Z)]^{RPS}$ is similar to the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA except that $M_C(X,Y,Z)$ replaces $M_Q(X,Y,Z)$.

~~2.5.6~~ 3.6 KSLOPE = 0.078

where KSLOPE = Adjustment to the K_1 value from OTΔT required to compensate for each 1% that $[F_Q^L(X,Y,Z)]^{RPS}$ exceeds it limit.

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~~2.6~~ 3.7 Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}(X,Y,Z)$ (Specification 3/4.2.3)

The following parameters are required for core monitoring per the LCO Requirements of Specification 3/4.2.3:

~~2.6.1~~ 3.7

$$[F_{\Delta H}(X,Y)]^{LCO} = \text{MARP}\,(X,Y) * \left[1.0 + \frac{1}{RRH} * (1.0 - P)\right]$$

where (MARP(X,Y)) = Catawba 1 Cycle 7 Operating Limit Maximum Allowable Radial Peaks. (MARP(X,Y)) is provided in Table 1.

$$P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.3:

~~2.6.2~~ 3.7

$$[F^{L}_{\Delta H}(X,Y)]^{SURV} = \frac{F^{D}_{\Delta H}(X,Y) * M_{\Delta H}(X,Y)}{UMR * TILT}$$

where $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ = cycle dependent maximum allowable design peaking factor which ensures that the $F_{\Delta H}(X,Y)$ limit will be preserved for operation within the LCO limits. $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ includes allowances for calculational and measurement uncertainties.

$F^{D}_{\Delta H}(X,Y)$ = the design power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}(X,Y)$ is provided in Table 5 for normal operation and table 5A for power escalation testing during initial startup.

$M_{\Delta H}(X,Y)$ = the margin remaining in core location X,Y to the Operational DNB limit in the transient power distribution. $M_{\Delta H}(X,Y)$ is provided in Table 6 for normal operation and table 6A for power escalation testing during initial startup.

UMR = Uncertainty value for measured radial peaks, (UMR = 1.04).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

Catawba 1 Cycle 7 Core Operating Limits Report

NOTE: $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ is the parameter identified as $F^{MAX}_{\Delta H}(X,Y)$ in DPC-NE-2011PA.

~~2.6.3~~ 3.7 RRH = 3.34

where RRH = Thermal Power reduction required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

~~2.6.4~~ 3.7 TRH = 0.04

where TRH = Reduction in OTΔT K_1 setpoint required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

Insert 4 →

Insert 4

3.8 Boron Dilution Mitigation System (Specification 3/4.3.3.12)

3.8.1 Reactor Water Makeup Pump flowrate limits:

Applicable Mode	Limit
Mode 3 or 4	≤ 150 gpm
Mode 5	≤ 70 gpm

3.9 Accumulators (Specification 3/4.5.1)

3.9.1 Boron concentration limits during modes: 1, 2 and 3:

Parameter	Limits
Cold Leg Accumulator minimum boron concentration for LCO 3.5.1c	1,900 ppm
Cold Leg Accumulator maximum boron concentration for LCO 3.5.1c	2,100 ppm
Minimum Cold Leg Accumulator boron concentration required to ensure post-LOCA subcriticality	1,800 ppm

3.10 Refueling Water Storage Tank (Specification 3/4.5.4)

3.10.1 Boron concentration limits during modes: 1, 2, 3 and 4:

Parameter	Limits
Refueling Water Storage Tank minimum boron concentration for LCO 3.5.4b	2,000 ppm
Refueling Water Storage Tank maximum boron concentration for LCO 3.5.4b	2,100 ppm

Insert 4 - continued

3.11 <u>Instrumentation (Specification 3/4.9.2)</u>

3.11.1 Reactor Makeup Water Pump Flowrate Limit:

Applicable Mode	Limit
Mode 6	$\leq$ 70 gpm

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Technical Justification
(Catawba)

Proposed Relocation of Certain Items from the Technical Specifications to the COLR

Several of the following proposed Technical Specification revisions are relocations of certain items from the Technical Specifications to the Core Operating Limits Report (COLR). The justification for these changes is, to a large extent, common to all of them. The following paragraphs describe this common justification to avoid repetition.

Technical Justification for Proposed Relocations from Technical Specifications to COLR

Catawba Facility Operating License amendment numbers 74 and 68 dated May 17, 1990 for units 1 and 2 respectively, revised the Catawba Technical Specifications to replace the values of certain cycle-specific parameter limits with a reference to the COLR, which contains the values of the limits. However, additional existing cycle-specific parameter limits in the Catawba Technical Specifications, not included in the above amendments, will have to be revised due to changes in these parameters in support of Unit 2 Cycle 6 operation and reload design. Similar limits have also changed in recent McGuire fuel cycles. In addition, McGuire Facility Operating License amendment numbers 105 and 87 dated March 15, 1990 for units 1 and 2 respectively, revised the McGuire Technical Specifications to incorporate an identical COLR methodology. Therefore, in order to simplify NRC review of identical Technical Specification revision proposals, it is proposed that the McGuire Technical Specifications be changed identically with respect to the applicable item relocations to the COLR.

In recognition of the burden on licensee and NRC resources associated with changes to Technical Specifications, the NRC issued Generic Letter 88-16 on October 4, 1988 encouraging licensees to propose changes to Technical Specifications that are consistent with the guidance provided in the enclosure to the generic letter. This enclosure provides guidance for the preparation of a license amendment request to modify Technical Specifications that have cycle-specific parameter limits. With the implementation of this alternative the NRC concluded that reload license amendments for the sole purpose of updating cycle specific parameter limits would be unnecessary. The proposed revisions described below would relocate the cycle-specific parameter limits from the Catawba Technical Specifications in accordance with the guidance provided in the enclosure to Generic Letter 88-16.

Proposed Revision to Technical Specification Table 2.2-1

It is proposed that the following Technical Specification setpoints be relocated to the Core Operating Limits Report:

- Overtemperature ΔT reactor trip setpoint, K_1
- Overtemperature ΔT reactor trip heatup setpoint penalty coefficient, K_2
- Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient, K_3
- Overpower ΔT reactor trip setpoint, K_4
- Overpower ΔT reactor trip heatup setpoint penalty coefficient, K_6
- Measured reactor vessel ΔT lead/lag time constants τ_1 and τ_2

- Measured ΔT lag time constant τ_3
- Measured reactor vessel average temperature lead/lag time constants τ_4 and τ_5
- Measured reactor vessel average temperature lag time constant τ_6
- Measured reactor vessel average temperature rate/lag time constant τ_7
- $f_1(\Delta I)$ "positive" breakpoint, i.e., the most positive imbalance (axial flux difference) at which no overtemperature ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_1(\Delta I)$ "negative" breakpoint, i.e., the most negative imbalance at which no overtemperature ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_1(\Delta I)$ "positive" slope, i.e., the rate at which an overtemperature ΔT reactor trip setpoint penalty is applied for axial power shapes skewed to the top of the core
- $f_1(\Delta I)$ "negative" slope, i.e., the rate at which an overtemperature ΔT reactor trip setpoint penalty is applied for skewed axial power shapes skewed to the bottom of the core
- $f_2(\Delta I)$ "positive" breakpoint, i.e., the most positive imbalance (axial flux difference) at which no overpower ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_2(\Delta I)$ "negative" breakpoint, i.e., the most negative imbalance at which no overpower ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_2(\Delta I)$ "positive" slope, i.e., the rate at which an overpower ΔT reactor trip setpoint penalty is applied for axial power shapes skewed to the top of the core
- $f_2(\Delta I)$ "negative" slope, i.e., the rate at which an overpower ΔT reactor trip setpoint penalty is applied for skewed axial power shapes skewed to the bottom of the core

Technical Justification

The setpoints listed above characterize the Reactor Protection System trip functions which protect the reactor core from departure from nucleate boiling (DNB) and centerline fuel melt (CFM). The $f(\Delta I)$ setpoints are calculated by the methodology described in Chapter 4 of Duke Power Company topical report DPC-NE-2011-P-A, "Nuclear Design Methodology for Operating Limits of Westinghouse Reactors"(Reference 2). This report was approved on January 24, 1990 and is listed in Section 6.9.1.9 of the Catawba Technical Specifications. Chapter 5 of Duke Power Company topical report DPC-NE-2004, "McGuire and Catawba Nuclear Stations Core Thermal-Hydraulic Methodology Using VIPRE-01", discusses the relationship of the ΔT reactor trip setpoints to the core safety limits. This report was approved on November 15, 1991.

As described in Chapter 4 of DPC-NE-2011-P-A, thermal margin calculations are performed for each fuel cycle to verify that the axial flux difference reactor trip penalty function envelopes, $f_1(\Delta I)$ and

$f_2(\Delta I)$, remain conservative. If the proposed Technical Specification revision is approved, instances in which this check fails, but for which different envelopes can be demonstrated to both 1) provide adequate protection against licensing basis accidents and 2) be satisfied by the fuel cycle design under consideration, no Technical Specification change would be necessary.

As described in Chapter 2 of Duke power Company topical report DPC-NE-3001-PA, "McGuire/Catawba Nuclear Station Multidimensional Reactor Transients and Safety Analysis Physics Parameters Methodology" (Reference 4), safety analysis physics parameters are checked each cycle to determine that the assumptions of the FSAR Chapter 15 accident analyses remain valid. If the proposed Technical Specification revision is approved, instances in which this check fails for a particular parameter, but for which a different parameter value can be demonstrated to both 1) yield an acceptable result when the applicable licensing basis accident(s) are reanalyzed and 2) be satisfied by the fuel cycle design under consideration, no Technical Specification change would be necessary. Reanalysis would be likely, in order to get an acceptable answer, to use revised "K" and "τ" values. Reanalysis in this case would also, of course, be performed according to the methodologies approved in DPC-NE-3001-PA and/or Duke Power Company topical report DPC-NE-3002-A, "McGuire/Catawba Nuclear Station FSAR Chapter 15 System Transient Analysis Methodology". DPC-NE-3001-PA and DPC-NE-3002-A were approved November 15, 1991 and are listed in Section 6.9.1.9 of the Catawba Technical Specifications.

The proposed Technical Specification change is similar to those approved on September 16, 1991 as Facility Operating License amendments 191, 191, and 188 for Oconee Units 1, 2, and 3, respectively. In these amendments the Reactor Protection System setpoints for the Flux/Flow/Imbalance and Variable Low Reactor Coolant System Pressure trip functions were relocated to the COLR. As stated in the Oconee Technical Specifications, these trip functions provide equivalent protection against fuel thermal limits, specifically DNB and CFM, as the Catawba overtemperature ΔT and overpower ΔT reactor trip functions.

Recent instances where one or more of these setpoints has been changed in a Technical Specification revision proposal include McGuire 1 Cycle 8, McGuire 2 Cycle 8, Catawba 1 Cycle 7, and Catawba 2 Cycle 5.

Proposed Revision to Minimum Boron Concentration Limits on ECCS Water Sources

It is proposed that the following minimum boron concentration limits be relocated from the Technical Specifications to the COLR:

- The cold leg accumulator minimum boron concentration limit in Technical Specification 3.5.1.c

- The Refueling Water Storage Tank (RWST) minimum boron concentration limit in Technical Specification 3.5.4.b

Technical Justification

The limits on minimum boron concentration for the accumulators and RWST are verified each cycle to ensure the safety analysis assumptions for these parameters remain valid. The minimum boron concentration limits ensure the reactor will remain subcritical during a Loss of Coolant

Accident (Reference 11, Chapter 15.6.5.2 "Post LOCA Subcriticality Evaluation"). The post LOCA subcriticality evaluation provides an available sump mixed mean boron concentration curve that must bound the required cold, post LOCA critical boron concentrations for each cycle. The critical boron concentration requirements for each cycle are determined using the methodology described in Section 9 of DPC-NF-2010A (Reference 14). In addition, the minimum boron concentration will be evaluated each cycle to ensure the solution recirculated within containment after a LOCA will be maintained at a pH value of ≤ 9.5. This pH limit minimizes hydrogen production from the corrosion of aluminum in containment and reduces the effect of caustic stress corrosion on mechnical systems and components (Reference 11, Section 6.1.1.2.2). The pH band given in the bases for Specification 3/4.5.4 in the Catawba Technical Specifications and Specification 3/4.5.5 in the McGuire Technical Specifications is revised to provide consistency between the values at both plants while meeting the NRC criteria for sump pH after a LOCA, contained in Branch Technical Position MTEB 6-1. The pH band is revised to be ≥ 7.5 and ≤ 9.5 for both plants. The ice condenser ice bed pH is maintained between 9.0 and 9.5 (Specification 3.6.5.1(a)) and is the most alkaline contributor to the containment sump pH after a LOCA, therefore, the pH will be limited by the maximum pH limit of the ice bed. The lower limit on the band is chosen such that stress corrosion cracking will not occur for an extended period following a LOCA and iodine retention in the containment sump water is enhanced. A similar Technical Specification revision was approved January 5, 1993 for Oconee Units 1, 2, and 3, Amendment Nos., 197, 197, and 194, respectively, to move these cycle-specific values to the COLR. The boron concentration value for the Oconee Core Flood Tank (CFT), which performs the same function as the Catawba Cold Leg Accumlators (CLA), was proposed to be relocated to the COLR. Also, the boron concentration value for the Oconee Borated Water Storage Tank (BWST), which performs the same function as the Catawba Refueling Water Storage Tank (RWST), was proposed to be relocated to the COLR.

Proposed Revision to Maximum Boron Concentration Limits on ECCS Water Sources

It is proposed that the following maximum boron concentration limits be relocated from the Technical Specifications to the COLR:

- The cold leg accumulator maximum boron concentration limit in Technical Specification 3.5.1.c
- The Refueling Water Storage Tank maximum boron concentration limits in Technical Specification 3.5.4.b

Technical Justification

The limits on maximum boron concentration for the accumulators and RWST are based on the minimum boron concentration limits, which are determined using the methodology in DPC-NF-2010A (Reference 14), to provide adequate plant operating space between these limits. They are also evaluated to ensure boron precipitation is precluded following a LOCA (Reference 11, Section 6.3.3). The boron precipitation analysis uses methods and assumptions described in Westinghouse letter CLC-NS-309 dated April 1, 1975 with the principal input parameters given in Table 6-99 of Reference 11. In addition, the maximum boron concentration will be evaluated each cycle to ensure the solution recirculated within containment after a LOCA will be maintained at a pH value ≥ 7.5. This pH limit minimizes the evolution of iodine and reduces the effect of chloride stress corrosion on mechnical systems and components.

Proposed Revision to Minimum Volume & Boron Concentration Limits on Borated Water Sources for Reactor Shutdown

It is proposed that the following minimum volume and boron concentration limits be relocated from the Technical Specifications to the COLR:

- The Boric Acid Storage System minimum volume and boron concentration limits in Technical Specification 3.1.2.5 & 3.1.2.6
- The Refueling Water Storage Tank minimum volume and boron concentration limits in Technical Specification 3.1.2.5 & 3.1.2.6

Technical Justification

The limits on minimum volume and boron concentration for the Boric Acid Storage System and RWST are verified each cycle to ensure the core shutdown analysis assumptions for these parameters remain valid. The minimum volume and boron concentration limits ensure that negative reactivity control is available during each mode of plant operation. The minimum volume and boron concentration requirements are based on those that will provide a 1% $\Delta k/k$ shutdown margin for temperatures less than or equal to 200 °F and 1.3% $\Delta k/k$ for temperatures greater than 200 °F at all times during a given cycle. The required boron concentrations are determined using the methodology described in Section 4 of DPC-NF-2010A (Reference 14). Further, the limits on RWST minimum volume and boron concentration help ensure the reactor will remain subcritical during a Loss of Coolant Accident (Reference 11, Chapter 15.6.5.2 "Post LOCA Subcriticality Evaluation"). In addition, the limits on RWST minimum volume and boron concentration are evaluated each cycle to ensure the solution recirculated within containment after a LOCA will be maintained at a pH value ≤ 9.5.

This pH limit minimizes hydrogen production from the corrosion of aluminum in containmont and reduces the effect of caustic stress corrosion on mechaical systems and components. The pH band given in the bases for Specification 3/4.1.2 in the Catawba and McGuire Technical Specifications is revised to provide consistency between the values at both plants while meeting the NRC criteria for sump pH after a LOCA, contained in Branch Technical Position MTEB 6-1. The pH band is revised to be ≥ 7.5 and ≤ 9.5 for both plants. The ice condenser ice bed pH is maintained between 9.0 and 9.5 (Specification 3.6.5.1(a)) and is the most alkaline contributor to the containment sump pH after a LOCA. Therefore, the pH will be limited by the maximum pH limit of the ice bed. The lower limit on the band is chosen such that stress corrosion cracking will not occur for an extended period following a LOCA and iodine retention in the containment sump water is enhanced.

The value for the RWST minimum contained borated water volume prescribed in Specification 3/4.1.2.6(b)(1) is based on the ECCS RWST volume requirements in Specification 3/4.5.4 and is a larger volume than required for reactivitity control, as shown in the bases for Specification 3/4.1.2. The minimum RWST volume reported in the COLR will be the volume required to maintain reactivity control while Specification 3/4.1.2.6(b)(1) is changed to refer to the value in Specification 3/4.5.4(a) or the COLR, whichever is larger. In addition, the bases for the ECCS RWST mimimum contained borated water volume, currently located in the reactivity control bases, is relocated to the ECCS bases. The Catawba Technical Specification bases for the allowances assumed in the Boric Acid Storage Tank and RWST minimum contained water volumes are revised for clarification. A similar Technical Specification revision was approved January 5, 1993 for Oconee Units 1, 2, and 3, Amendment Nos., 197, 197, and 194, respectively, to move these cycle-specific values to the COLR. The volume and boron concentration value for the Oconee Concentrated Boric Acid Storage Tank (CBAST), which performs the same function as the Catawba Boric Acid Tank, was relocated to the COLR. Also, the boron concentration value for the Oconee Borated Water Storage Tank (BWST), which performs the same function as the Catawba Refueling Water Storage Tank (RWST), was relocated to the COLR.

Proposed Revision to Reactor Makeup Water Pump Flowrate Limits

It is proposed that the following reactor makeup water pump flowrate limits be relocated from the Technical Specifications to the COLR:

- The reactor makeup water pump flowrate limits in Technical Specification 3.3.3.12(a)(2), 3.3.3.12(b)(2) & 4.3.3.12.2(b)

- The reactor makeup water pump flowrate limits in Technical Specification 3.9.2.1(a)(2) & 4.9.2.1.2(d)

Technical Justification

Catawba is equipped with a Boron Dilution Mitigation System which serves to detect uncontrolled dilution events in Modes 3 - 6 of plant operation. The BDMS uses two source range detectors to monitor the subcritical multiplication of the reactor core. An alarm setpoint is continually calculated as four times the lowest count rate, including compensation for background and the statistical variation in the count rate. Once the alarm setpoint is exceeded, each train of the BDMS will automatically shut off both reactor makeup water pumps, align the suction of the charging pumps to highly borated water from the Refueling Water Storage Tank, and isolate flow to the charging pumps from the Volume Control Tank. Since these functions are automatically actuated by the BDMS, no operator action is necessary to terminate the dilution event and recover the shutdown margin. In the event one or more trains of the BDMS is inoperable, the reactor makeup water pump flowrate limits ensure that the operator has sufficient time to recognize and terminate a boron dilution event prior to the loss of shutdown margin during each appropriate mode of plant operation. Each cycle, a bounding ratio of initial to critical boron concentration is established from the reload design. This ratio is used to calculate the maximum reactor makeup water pump flowrate which satisfies the operator action time acceptance criteria of the Standard Review Plan. The limits on reactor makeup water pump flowrates when the Boron Dilution Mitigation System (BDMS) is inoperable are verified each cycle to ensure the safety analysis assumptions for these parameters remain valid. When the calculated reactor makeup water flowrate is found to be less than the existing flowrate limits, the flowrate limits must be reduced such that the operator action time acceptance criteria can be met. These cycle-specific parameter limits are verified using the NRC approved methodology provided in the attachment to a Duke Power letter to the U. S. Nuclear Regulatory Commission, "... Supplementary Information Relative to Topical Report BAW-10173; Boron Dilution Analysis", dated May 15, 1991 (Reference 12) and Catawba FSAR (Reference 11) Section 15.4.6. Therefore, the cycle-specific limits have been relocated to the COLR.

Generic Letter 88-16 provides guidance for the removal of cycle-specific parameter limits from the Technical Specifications. Amendment s 74 and 68 dated May 17, 1990 for units 1 and 2 respectively, revised the Catawba Technical Specifications to replace the values of certain cycle-specific parameter limits with a reference to the Core Operating Limits Report (COLR), which contains the values of the limits. Since approval of this amendment, additional cycle specific parameters have been identified due to revisions which were necessary to support Catawba Unit 2 Cycle 6 operation and past McGuire reloads.

NO SIGNIFICANT HAZARDS EVALUATION

10 CFR 50.92 states that a proposed amendment involves no significant hazards consideration if operation in accordance with the amendment would not:

1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

3) Involve a significant reduction in a margin of safety.

This proposed amendment will not increase the probability or consequences of an accident which has been previously evaluated. The cycle specific parameters which have been identified for relocation to the COLR will be calculated using NRC approved methodology and the Technical Specifications will continue to require operation within the cycle specific parameters. For the above reasons this amendment is considered administrative, and does not increase the probability or consequences of an accident previously evaluated.

Operation in accordance with this proposed amendment will not create any failure modes not bounded by previously evaluated accidents. Therefore, this change will not create the possibility of a new or different kind of accident from any kind of accident previously evaluated.

The Technical Specifications will continue to require operation within the bounds of the cycle-specific parameter limits. The cycle-specific parameter limits will be calculated using NRC approved methodology. In addition, each future reload will require a 10 CFR 50.59 safety review to assure that operation of the unit within the cycle-specific limits will not involve a reduction in a margin of safety. Therefore, no margins of safety are affected by the relocation of cycle-specific parameter limits to the COLR.

Based on the above, Duke has concluded that there are no significant hazards considerations involved in this amendment request.

The proposed Technical Specification change has been reviewed against the criteria of 10 CFR 51.22 for environmental considerations. As shown above, the proposed change does not involve any significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor increase the individual or cumulative occupational radiation exposures. Based on this, the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement.

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Changes to the Catawba FSAR

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one of the two intermediate range channels reads above the P-6 setpoint ... and is automatically reinstated when both intermediate range channels decrease below the P-6 setpoint value. This trip is also automatically bypassed by two- out-of-four logic from the power range protection interlock (P-10). This trip function can also be reinstated below P-10 by an administrative action requiring manual actuation of two control board mounted switches. Each switch will reinstate the trip function in one of the two protection logic trains. The source range trip point is set between the P-6 setpoint (source range cutoff power level) and the maximum source range power level. The channels can be individually bypassed at the nuclear instrumentation racks to permit channel testing during plant shutdown or prior to startup. This bypass action is annunciated on the control board.

d. Power range high positive neutron flux rate trip This circuit trips the reactor when a sudden abnormal increase in nuclear power occurs in two out of four power range channels. This trip is available for rod ejection accidents of low worth from mid-power and is always active.

e. Power range high negative neutron flux rate trip This circuit trips the reactor when a sudden abnormal decrease in nuclear power occurs in two out of four power range channels. This trip provides protection against two or more dropped rods and is always active. Protection against one dropped rod is not required to prevent occurrence of DNBR per Section 15.2.2, "Loss of External Load" on page 15-33.

Figure 7-2, Sheet 3, shows the logic for all of the nuclear overpower and rate trips.

2. Core Thermal Overpower Trips

The specific trip functions generated are as follows:

a. Overtemperature ΔT trip

This trip protects the core against low DNBR and trips the reactor on coincidence as listed in Table 7-1 with one set of temperature measurements per loop. The setpoint for this trip is continuously calculated by analog circuitry for each loop by solving the following equation (for which the ~~detailed time constants are given~~ in Table 2.2-1 of the Technical Specifications):
parameter values are prescribed

$$\Delta T_{setpoint} = \Delta T_0 \left[K_1 - K_2 \left(\frac{1 + \tau_1 s}{1 + \tau_2 s} \right) \left(T_{avg} \frac{1}{1 + \tau_6} - T^{\circ}_{avg} \right) + K_3(P - 2235) - \cancel{f(\Delta\phi)} \right]$$

$f_1(\Delta\phi)$

Where:

ΔT_0	=	Indicated ΔT at rated thermal power
T_{avg}	=	Average reactor coolant temperatrue (°F)
T°_{avg}	=	Indicated T_{avg} at rated thermal power
P	=	Pressurizer pressure (psig)
K_1	=	Preset bias
K_2	=	Preset gain which compensates for effects of temperature on the DNB limits
K_3	=	Preset gain which compensates for the effect of pressure on the DNB limits
τ_1, τ_2, τ_6	=	Preset time constants
s	=	Laplace transform operator (seconds $^{-1}$)
$\cancel{f(\Delta\phi)}$ $f_1(\Delta\phi)$	=	A function of the neutron flux difference between upper and lower long ion chambers. (Refer to Figure 7-3)

A separate long ion chamber unit supplies the flux signal for each overtemperature ΔT trip channel.

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Increases in $\Delta\phi$ beyond a pre-defined deadband result in a decrease in trip setpoint. Refer to Figure 7-3.

The required one pressurizer pressure parameter per loop is obtained from separate sensors connected to three pressure taps at the top of the pressurizer. Four pressurizer pressure signals are obtained from the three taps by connecting one of the taps to two pressure transmitters. Refer to Section 7.2.2.3.3, "Pressurizer Pressure" on page 7-40 for an analysis of this arrangement.

Figure 7-2, Sheet 5, shows the logic for overtemperature T trip function.

b. Overpower ΔT trip

This trip protects against excessive power (fuel rod rating protection) and trips the reactor on coincidence as listed in Table 7-1, with one set of temperature measurements per loop. The setpoint for each channel is continuously calculated using the following equation (for which the ~~detailed time constants are given~~ in Table 2.2-1 of the Technical Specifications):

parameter values are prescribed

$$\Delta T_{setpoint} = \Delta T_0 \left[K_4 - K_5 \left(\frac{\tau_7 s}{1 + \tau_7 s} \right) \left(\frac{1}{1 + \tau_6} \right) (T_{avg}) - \left[K_6 \left(\frac{1}{1 + \tau_6} \right) T_{avg} - T^{\circ}_{avg} \right] - \cancel{f(\Delta\phi)} \right]$$

$f_2(\Delta\phi)$

Where:

ΔT_0	=	Indicated ΔT at rated thermal power
~~$f(\Delta\phi)$~~ $f_2(\Delta\phi)$	=	A function of the neutron flux difference between upper and lower long ion chamber section.
K_4	=	A preset bias
K_5	=	A constant based on the effect of rate of change of T_{avg} on overpower ΔT limits
K_6	=	A constant based on the effect of T_{avg} on overpower ΔT limits
T°_{avg}	=	Indicated T_{avg} at rated thermal power
T_{avg}	=	Average reactor coolant temperature (°F)
τ_6, τ_7	=	Preset time constant (seconds)
s	=	Laplace transform operator (seconds $^{-1}$)

The source of temperature and flux information is identical to that of the overtemperature ΔT trip and the resultant ΔT setpoint is compared to the same ΔT. Figure 7-2, Sheet 5, shows the logic for this trip function.

3. Reactor Coolant System Pressurizer Pressure and Water Level Trips

The specific trip functions generated are as follows:

a. Pressurizer low pressure trip

The purpose of this trip is to protect against low pressure which could lead to DNB. The parameter being sensed is reactor coolant pressure as measured in the pressurizer. Above P-7 the reactor is tripped when two-out-of-four pressurizer pressure measurements (compensated for rate of change) fall below preset limits. This trip is blocked below P-7 to permit startup. The trip logic and interlocks are given in Table 7-1.

The trip logic is shown on Figure 7-2, Sheet 6.

b. Pressurizer high pressure trip

The purpose of this trip is to protect the Reactor Coolant System against system overpressure.

The same sensors and transmitters used for the pressurizer low pressure trip are used for the high pressure trip except that separate bistables are used for trip. These bistables trip when

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Attachment 2

M-1

Changes to Technical Specifications (McGuire)

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION

NOTE 1: OVERTEMPERATURE ΔT

$$(\Delta T/\Delta T_0)\left(\frac{1+\tau_1 S}{1+\tau_2 S}\right)\left(\frac{1}{1+\tau_3 S}\right) \le K_1 - K_2\left(\frac{1+\tau_4 S}{1+\tau_5 S}\right)\left[T\left(\frac{1}{1+\tau_6 S}\right)-T'\right] + K_3(P-P') - f_1(\Delta I)$$

Where:

ΔT = Measured ΔT by Loop Narrow Range RTD

ΔT_o = Indicated ΔT at RATED THERMAL POWER,

$\frac{1+\tau_1 S}{1+\tau_2 S}$ = Lead-lag compensator on measured ΔT,

τ_1, τ_2 = Time constants utilized in the lead-lag controller for ΔT, ~~$\tau_1 \geq 8$ sec., $\tau_2 \leq 3$ sec.,~~ as presented in the Core Operating Limits Report,

$\frac{1}{1+\tau_3}$ = Lag compensator on measured ΔT,

τ_3 = Time constants utilized in the lag compensator for ΔT, ~~$\tau_3 \leq 2$ sec.*~~ as presented in the Core Operating Limits Report,

K_1 ~~$\leq$ 1.1958,~~ = Overtemperature ΔT reactor trip setpoint as presented in the Core Operating Limits Report,

K_2 = ~~0.03143~~ Overtemperature ΔT reactor trip heatup setpoint penalty coefficient as presented in the Core Operating Limits Report,

$\frac{1+\tau_4 S}{1+\tau_5 S}$ = The function generated by the lead-lag controller for T_{avg} dynamic compensation,

τ_4, τ_5 = Time constants utilized in the lead-lag controller for T_{avg}, ~~$\tau_4 \geq 28$ sec, $\tau_5 \leq 4$ sec.~~, as presented in the Core Operating Limits Report,

T = Average temperature, °F,

$\frac{1}{1+\tau_6 S}$ = Lag compensator on measured T_{avg},

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TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION (Continued)

NOTE 1: (Continued)

τ_6 = Time constant utilized in the measured T_{avg} lag compensator, ~~$\tau_6 \leq 2$ sec~~ as presented in the Core Operating Limits Report,

T' = $\leq$ 588.2°F Reference T_{avg} at RATED THERMAL POWER,

K_3 = ~~0.001405,~~ Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient as presented in the Core Operating Limits Report,

P = Pressurizer pressure, psig,

P' = 2235 psig (Nominal RCS operating pressure),

S = Laplace transform operator, sec^{-1},

and $f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range nuclear 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% and +7.0%ΔI;~~ the "positive" and "negative" $f_1(\Delta I)$ breakpoints as presented in the Core Operating Limits Report; $f_1(\Delta I) = 0$, 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 imbalance that the magnitude of $q_t - q_b$ is more negative than ~~-39%ΔI,~~ the $f_1(\Delta I)$ "negative" breakpoint presented in the Core Operating Limits Report, the ΔT Trip Setpoint shall be automatically reduced by ~~6.153% of ΔT_0~~ the $f_1(\Delta I)$ "negative" slope presented in the Core Operating Limits Report, and

(iii) for each percent imbalance that the magnitude of $q_t - q_b$ is more positive than ~~+7.0%ΔI,~~ the $f_1(\Delta I)$ "positive breakpoint presented in the Core Operating Limits Report, the ΔT Trip Setpoint shall be automatically reduced by ~~1.511% of ΔT_0~~ the $f_1(\Delta I)$ "positive" slope presented in the Core Operating Limits Report

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION (Continued)

NOTE 2: OVERPOWER ΔT

$$(\Delta T/\Delta T_0)\ \left(\frac{1 + \tau_1 S}{1 + \tau_2 S}\right)\left(\frac{1}{1 + \tau_3 S}\right) \leq K_4 - K_5 \left(\frac{\tau_7 S}{1 + \tau_7 S}\right)\left(\frac{1}{1 + \tau_6 S}\right) T - K_6 \left[T\left(\frac{1}{1 + \tau_6 S}\right) - T''\right] - f_2(\Delta I)$$

Where: ΔT = As defined in Note 1,

ΔT_0 = As defined in Note 1,

$\frac{1 + \tau_1 S}{1 + \tau_2 S}$ = As defined in Note 1

τ_1, τ_2 = As defined in Note 1

$\frac{1}{1 + \tau_3 S}$ = As defined in Note 1,

K_4 ~~≤ 1.0809,~~ = Overpower ΔT reactor trip setpoint as presented in the Core Operating Limits Report,

K_5 = 0.02/°F for increasing average temperature and 0 for decreasing average temperature,

$\frac{\tau_7 S}{1 + \tau_7 S}$ = The function generated by the rate-lag controller for T_{avg} dynamic compensation,

τ_7 = Time constant utilized in the rate-lag controller for T_{avg}, ~~$\tau_7 \geq 5$ sec~~, as presented in the Core Operating Limits Report,

$\frac{1}{1 + \tau_6 S}$ = As defined in Note 1,

τ_6 = As defined in Note 1,

K_6 = ~~0.001239/°F~~ Overpower ΔT reactor trip heatup setpoint penalty coefficient as presented in the Core Operating Limits Report for $T > T''$ and $K_6 = 0$ for $T \leq T''$,

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION (Continued)

T = As defined in Note 1,

T" = $\leq$ 588.2°F Reference T_{avg} at RATED THERMAL POWER,

S = As defined in Note 1, and

$f_2(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range nuclear 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 the "positive" and "negative" $f_2(\Delta I)$ breakpoints as presented in the Core Operating Limits Report ~~-35% and +35% ΔI~~; $f_2(\Delta I) = 0$, 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 imbalance that the magnitude of $q_t - q_b$ is more negative than the $f_2(\Delta I)$ "negative" breakpoint presented in the Core Operating Limits Report ~~-35% ΔI~~, the ΔT Trip Setpoint shall be automatically reduced by the $f_2(\Delta I)$ "negative" slope presented in the Core Operating Limits Report ~~7.0% of ΔT_o~~; and

(iii) for each percent imbalance that the magnitude of $q_t - q_b$ is more positive than the $f_2(\Delta I)$ "positive" breakpoint presented in the Core Operating Limits Report ~~+35% ΔI~~, the ΔT Trip Setpoint shall be automatically reduced by the $f_2(\Delta I)$ "positive" slope presented in the Core Operating Limits Report ~~7.0% of ΔT_o~~.

Note 3: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 3.6% of Rated Thermal Power.

Note 4: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 4.2% of Rated Thermal Power.

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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 and at least one associated Heat Tracing System with:

1) A minimum contained borated water volume ~~of 6132 gallons~~, as presented in the Core Operating Limits Report
2) ~~Between 7000 and 7700 ppm of boron~~, A minimum boron concentration as presented in the Core Operating Limits Report, and
3) A minimum solution temperature of 65°F.

b. The refueling water storage tank with:

1) A minimum contained borated water volume ~~of 26,000 gallons~~, as presented in the Core Operating Limits Report
2) A minimum boron concentration ~~of 2000 ppm,~~ as presented in the Core Operating Limits Report, and
3) A minimum solution temperature of 70°F.

APPLICABILITY: MODES 5 and 6.

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 RWST 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 and at least one associated Heat Tracing System with:

1) A minimum contained borated water volume ~~of 20,453 gallons~~, as presented in the Core Operating Limits Report

2) ~~Between 7000 and 7700 ppm of boron~~, and A minimum boron concentration as presented in the Core Operating Limits Report

3) A minimum solution temperature of 65°F.

b. The refueling water storage tank with:

1) A minimum contained borated water volume ~~of at least 372,100 gallons~~, as presented in the Core Operating Limits Report or Specification 3.5.5a, whichever is larger

2) ~~Between 2000 and 2100 ppm of boron~~, A minimum boron concentration as presented in the Core Operating Limits Report

3) A minimum solution temperature of 70°F, and

4) A maximum solution temperature of 100°F.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the Boric Acid Storage System inoperable and being used as one of the above required borated water sources, restore the storage 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

3.5.1.1 Each cold leg injection accumulator shall be OPERABLE with:

a. The isolation valve open,

b. A contained borated water volume of between 6870 and 7342 gallons,

c. A boron concentration ~~of~~ between ~~1900 and 2100 ppm,~~ the LCO limits presented in the Core Operating Limits Report

d. A nitrogen cover-pressure of between 585 and 639 psig, and

e. A water level and pressure channel OPERABLE.

APPLICABILITY: MODES 1, 2, and 3*.

ACTION:

the lower LCO limit presented in the Core Operating Limits Report

a. With one 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 reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.

b. With one 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 reduce Reactor Coolant System pressure to less than 1000 psig within the following 6 hours.

c. With one accumulator inoperable due to boron concentration less than the lower LCO limit presented in the Core Operating Limits Report ~~1900 ppm~~ and:

1) The volume weighted average boron concentration of the accumulators equal to the lower LCO limit presented in the Core Operating Limits Report ~~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 the lower LCO limit presented in the Core Operating Limits Report ~~1900 ppm~~ but greater than ~~1800 ppm,~~ the minimum required to ensure post-LOCA subcriticality presented in the Core Operating Limits Report restore the inoperable accumulator to OPERABLE status or return the volume weighted average boron concentration of the ~~three limiting~~ accumulators to greater than the lower LCO limit presented in the Core Operating Limits Report ~~1900 ppm~~ and 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.

*Reactor Coolant System pressure above 1000 psig.

EMERGENCY CORE COOLING SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

equal to the minimum required to ensure post-LOCA subcriticality presented in the Core Operating Limits Report

3) The volume weighted average boron concentration of the accumulators ~~1800 ppm~~ or less, return the volume weighted average boron concentration of the ~~three limiting~~ 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.

the minimum required to ensure post-LOCA subcriticality presented in the Core Operating Limits Report

SURVEILLANCE REQUIREMENTS

4.5.1.1.1 Each cold leg injection accumulator shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1) Verifying 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 1% of tank volume not resulting from normal makeup by verifying the boron concentration of the accumulator solution;

c. At least once per 31 days when the RCS pressure is above 2000 psig by verifying that power to the isolation valve operator is disconnected; and

d. At least once per 18 months by verifying proper operation of the power disconnect circuit.

4.5.1.1.2 Each cold leg injection accumulator water level and pressure channel shall be demonstrated OPERABLE:

a. At least once per 31 days by the performance of an ANALOG CHANNEL OPERATIONAL TEST, and

b. At least once per 18 months by the performance of a CHANNEL CALIBRATION.

EMERGENCY CORE COOLING SYSTEMS

3/4.5.5 REFUELING WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.5 The refueling water storage tank (RWST) shall be OPERABLE with:

a. A contained borated water volume of at least 372,100 gallons,

b. A boron concentration ~~of~~ between ~~2000 and 2100 ppm of boron~~, the limits presented in the Core Operating Limits Report

c. A minimum solution temperature of 70°F, and

d. A maximum solution temperature of 100°F.

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

ACTION:

With the RWST 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

4.5.5 The RWST shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1) Verifying the contained borated water volume in the tank, and

2) Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWST temperature when the outside air temperature is either less than 70°F or greater than 100°F.

MODERATOR TEMPERATURE COEFFICIENT (Continued)

The Surveillance Requirements for measurement of the MTC at the beginning and near the end of the fuel cycle are adequate to confirm that the MTC remains within its limits since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 551°F. This limitation is required to ensure: (1) the moderator temperature coefficient is within it analyzed temperature range, (2) the trip instrumentation is within its normal operating range, (3) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and (4) the reactor vessel is above its minimum RT_{NDT} temperature.

3/4.1.2 BORATION SYSTEMS

The Boron Injection System ensures that negative reactivity control is available during each mode of facility operation. The components required to perform this function include: (1) borated water sources, (2) charging pumps, (3) separate flow paths, (4) boric acid transfer pumps, (5) associated Heat Tracing Systems, and (6) an emergency power supply from OPERABLE diesel generators.

With the RCS average temperature above 200°F, a minimum of two boron injection flow paths are required to ensure single functional capability in the event an assumed failure renders one of the flow paths inoperable. The boration capability of either flow path is sufficient to provide a SHUTDOWN 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 16,321 gallons of 7000-ppm borated water from the boric acid storage tanks or 75,000 gallons of 2000-ppm borated water from the refueling water storage tank (RWST).~~ The minimum borated water volumes and concentrations required to maintain shutdown margin for the Boric Acid Storage System and the Refueling Water Storage Tank are presented in the Core Operating Limits Report.

Insert 1

With the RCS temperature below 200°F, one Boron Injection System 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 System becomes 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 300°F provides assurance that a mass addition pressure transient can be relieved by the operation of a single PORV.

M-12

Insert 1

The Technical Specification LCO value for the Boric Acid Storage Tank and the Refueling Water Storage Tank minimum contained water volume during Modes 1-4 is based on the the required volume to maintain shutdown margin, an allowance for unusable volume and additional margin as follows:

<u>Boric Acid Storage Tank Requirements For Maintaining SDM - Modes 1-4</u>

Required volume for maintaining SDM	presented in the COLR
Unusable volume (to maintain full suction pipe)	4,132 gallons
Additional margin	6,470 gallons

<u>Refueling Water Storage Tank Requirements For Maintaining SDM - Modes 1-4</u>

Required volume for maintaining SDM	presented in the COLR
Unusable volume (below nozzle)	16,000 gallons
Additional margin	17,893 gallons

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BORATION SYSTEMS (Continued)

The boron capability 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 2000 gallons of 7000-ppm borated water from the boric acid storage tanks or 10,000 gallons of 2000-ppm borated water from the refueling water storage tank.~~ Insert 2

The minimum borated water volumes and concentrations required to maintain shutdown margin for the Boric Acid Storage System and the Refueling Water Storage Tank are presented in the Core Operating Limits Report.

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

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between ~~8.5 and 10.5~~ 7.5 and 9.5 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

The OPERABILITY of one Boron Injection System during REFUELING ensures that this system is available for reactivity control while in MODE 6.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that: (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of rod misalignment on associated accident analyses are limited. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

The control rod insertion limit and shutdown rod insertion limits are specified in the CORE OPERATING LIMITS REPORT per specification 6.9.1.9.

The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original design criteria are met. Misalignment of a rod requires measurement of peaking factors and a restriction in THERMAL POWER. These restrictions provide assurance of fuel rod integrity during continued operation. In addition, those safety analyses affected by a misaligned rod are reevaluated to confirm that the results remain valid during future operation.

The maximum rod drop time restriction is consistent with the assumed rod drop time used in the safety analyses. Measurement with T_{avg} greater than or equal to 551°F and with all reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a Reactor trip at operating conditions.

Control rod positions and OPERABILITY of the rod position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied.

Insert 2

The Technical Specification LCO value for the Boric Acid Storage Tank and the Refueling Water Storage Tank minimum contained water volume during Modes 5 & 6 is based on the the required volume to maintain shutdown margin, an allowance for unusable volume and additional margin as follows:

Boric Acid Storage Tank Requirements For Maintaining SDM - Modes 5 & 6

Required volume for maintaining SDM	presented in the COLR
Unusable volume (to maintain full suction pipe)	4,132 gallons
Additional margin	1,415 gallons

Refueling Water Storage Tank Requirements For Maintaining SDM - Modes 5 & 6

Required volume for maintaining SDM	presented in the COLR
Unusable volume (below nozzle)	16,000 gallons
Additional margin	6,500 gallons

3/4.5 EMERGENCY CORE COOLING SYSTEMS

BASES

3/4.5.1 ACCUMULATORS

The OPERABILITY of each Reactor Coolant System (RCS) Cold Leg Accumulator ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs in the event the RCS pressure falls below the pressure of the accumulators. This initial surge of water into the core provides the initial cooling mechanism during large RCS 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.

Insert 3

~~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 1500 ppm, so additional down time is allowed when concentration is above 1500 ppm. A concentration of less than 1900 ppm 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.

~~The original licensing bases of McGuire assumes both the UHI system and the Cold Leg Accumulators function to mitigate postulated accidents. Subsequent analyses, documented in "McGuire Nuclear Station, Safety Analysis for UHI Elimination" dated September 1985, and docketed by Duke letter dated October 2, 1985, support the determination that UHI is no longer required provided the Cold Leg Accumulator volume is adjusted to be consistent with that assumed in the Safety Analysis.~~

Insert 3

The allowed outage time for the accumulators are variable based upon boron concentration to ensure that the reactor is shut down following a LOCA and that any problems are corrected in a timely manner. The minimum boron concentration required to ensure post-LOCA subcriticality, as presented in the Core Operating Limits Report, is based on nominal accumulator volume conditions and allows additional outage time since subcriticality is assured when the boron concentration is above this value. A slightly higher boron concentration, the minimum accumulator boron concentration limit for LCO 3.5.1c presented in the Core Operating Limits Report, is based on worst case liquid mass, boron concentration and measurement errors. A concentration less than this LCO value in any single accumulator or as a volume weighted average may be indicative of a problem, such as valve leakage. Since reactor shutdown is assured if the boron concentration is above the minimum concentration to ensure post-LOCA subcriticality and the accumulator volume is greater than or equal to the nominal volume, additional time is allowed to restore boron concentration in the accumulators.

REFUELING WATER STORAGE TANK (Continued)

for the most reactive control assembly. These assumptions are consistent with the LOCA analyses.

The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between ~~8.5 and 10.5~~ 7.5 and 9.5 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

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Changes to Core Operating Limits Report (McGuire 1 Cycle 8 & McGuire 2 Cycle 8)

1.0 Core Operating Limits Report

This Core Operating Limits Report, (COLR), for McGuire, Unit 1, Cycle 8 has been prepared in accordance with the requirements of Technical Specification 6.9.1.9.

The Technical Specifications affected by this report are listed below:

~~3/4.1.1.3 Moderator Temperature Coefficient~~
~~3/4.1.3.5 Shutdown Rod Insertion Limit~~
~~3/4.1.3.6 Control Rod Insertion Limit~~
~~3/4.2.1 Axial Flux Difference~~
~~3/4.2.2 Heat Flux Hot Channel Factor~~
~~3/4.2.3 Nuclear Enthalpy Rise Hot Channel Factor~~

← Replace with Insert 1

Insert 1

2.2.1	Reactor Trip System Instrumentation Setpoints
3/4.1.1.3	Moderator Temperature Coefficient
3/4.1.2.5	Borated Water Source - Shutdown
3/4.1.2.6	Borated Water Source - Operating
3/4.1.3.5	Shutdown Rod Insertion Limit
3/4.1.3.6	Control Rod Insertion Limit
3/4.2.1	Axial Flux Difference
3/4.2.2	Heat Flux Hot Channel Factor
3/4.2.3	Nuclear Enthalpy Rise Hot Channei Factor
3/4.5.1	Accumulators
3/4.5.5	Refueling Water Storage Tank

McGuire 1 Cycle 8 Core Operating Limits Report

1.1 ~~2.0~~ Operating Limits

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC-approved methodologies specified in Technical Specification 6.9.1.9.

Insert 2 →

~~2.1~~ 3.0 Moderator Temperature Coefficient (Specification 3/4.1.1.3)

~~2.1~~.1 3.0 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the limits shown in Figure 1. The BOC/ARO/HZP MTC shall be less positive that 0.7 * 10E-04 ΔK/K/ F.

The EOC/ARO/RTP MTC shall be less negative that -4.1* 10E-04 ΔK/K/ F.

~~2.1~~.2 3.0 The MTC Surveillance Limit is:

The 300 PPM/ARO/RTP MTC should be less negative than or equal to -3.2 * 10E-04 ΔK/K/ F.

Where: BOC stands for Beginning of Cycle
ARO stands for All Rods Out
HZP stands for Hot Zero (Thermal) Power
EOC stands for End of Cycle
RTP stands for Rated Thermal Power

Insert 2

2.0 Reactor Trip System Instrumentation Setpoints (Specification 2.2.1)

2.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.1958$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.03143/°F$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001405/psi$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 \geq 8$ sec., $\tau_2 \leq 3$ sec.
Measured ΔT lag time constant	$\tau_3 \leq 2$ sec.
Measured reactor vessel average temperature lead/lag time constants	$\tau_4 \geq 28$ sec. $\tau_5 \leq 4$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 \leq 2$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 7.0% ΔI
$f_1(\Delta I)$ "negative" breakpoint	= -39.0% ΔI
$f_1(\Delta I)$ "positive" slope	= 1.511% ΔT_0 / %ΔI
$f_1(\Delta I)$ "negative" slope	= 6.153% ΔT_0 / %ΔI

Insert 2 - continued

2.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 = 1.0809$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001239/°F$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 \geq 8$ sec., $\tau_2 \leq 3$ sec.
Measured ΔT lag time constant	$\tau_3 \leq 2$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 \leq 2$ sec.
Measured reactor vessel average temperature rate-lag time constant	$\tau_7 \geq 5$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0% ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0% ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0% ΔT_0 / %ΔI
$f_2(\Delta I)$ "negative" slope	= 7.0% ΔT_0 / %ΔI

McGuire 1 Cycle 8 Core Operating Limits Report

Insert 3 →

~~2.2~~ 3.3 Shutdown Rod Insertion Limit (Specification 3/4.1.3.5)

~~2.2~~.1 3.3 The shutdown rods shall be withdrawn to at least 222 steps.

~~2.3~~ 3.4 Control Rod Insertion LImits (Specification 3/4.1.3.6)

~~2.3~~.1 3.4 The control rod banks shall be limited to physical insertion as shown in Figures 2 and 2A. Figure 2 applies for ≤ 340 EFPD. Figure 2A applies for > 340 EFPD.

~~2.4~~ 3.5 Axial Flux Difference (Specification 3/4.2.1)

~~2.4~~.1 3.5 The AXIAL FLUX DIFFERENCE (AFD) Limits are provided in Figure 3.

Insert 3

3.1 Borated Water Source - Shutdown (Specification 3/4.1.2.5)

3.1.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 5 & 6:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.5a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.5a	6,132 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	585 gallons
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.5b	2,000 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.5b	26,000 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	3,500 gallons

3.2 Borated Water Source - Operating (Specification 3/4.1.2.6)

3.2.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 1, 2, 3 & 4:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.6a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.6a	20,453 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	9,851 gallons

Insert 3 - continued

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.6b	2,000 ppm
Refueling Water Storage Tank maximum boron concentration for LCO 3.1.2.6b	2,100 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.6b	91,000 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	57,107 gallons

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McGuire 1 Cycle 8 Core Operating Limits Report

~~2.5~~ 3.6 <u>Heat Flux Hot Channel Factor, $F_Q(X,Y,Z)$ (Specification 3/4.2.2)</u>

~~2.5~~.1 3.6 $F_Q^{RTP} = 2.32$

~~2.5~~.2 3.6 K(Z) is provided in Figure 4 for Mark-BW fuel.

~~2.5~~.3 3.6 K(Z) is provided in Figure 5 for OFA fuel.

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.2:

~~2.5~~.4 3.6 $[F_Q^L(X,Y,Z)]^{OP} = F_Q^D(X,Y,Z) * M_Q(X,Y,Z)/(UMT*MT*TILT)$

where $[F_Q^L(X,Y,Z)]^{OP}$ = cycle dependent maximum allowable design peaking factor which ensures that the $F_Q(X,Y,Z)$ limit will be preserved for operation within the LCO limits $[F_Q^L(X,Y,Z)]^{OP}$. $[F_Q^L(X,Y,Z)]^{OP}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distribution for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 1.

$M_Q(X,Y,Z)$ = the margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. $M_Q(X,Y,Z)$ is provided in Table 2.

NOTE: $[F_Q^L(X,Y,Z)]^{OP}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

~~2.5~~.5 3.6 $[F_Q^L(X,Y,Z)]^{RPS} = F_Q^D(X,Y,Z) * (M_C(X,Y,Z)/(UMT*MT*TILT))$

McGuire 1 Cycle 8 Core Operating Limits Report

where $[F^L_Q(X,Y,Z)]^{RPS}$ = cycle dependent maximum allowable design peaking factor which ensures that the centerline fuel melt limit will be preserved for operation within the LCO limits. $[F^L_Q(X,Y,Z)]^{RPS}$ includes allowances for calculational and measurement uncertainties.

$F^D_Q(X,Y,Z)$ = the design power distributions for F_Q. $F^D_Q(X,Y,Z)$ is provided in Table 1.

$M_C(X,Y,Z)$ = the margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 3.

UMT = Measurement Uncertainty (UMT = 1.05).

MT = Engineering Hot Channel Factor (MT = 1.03).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

NOTE: $[F^L_Q(X,Y,Z)]^{RPS}$ is the parameter identified as $F^{MAX}_Q(X,Y,Z)$ in DPC-NE-2011PA.

~~2.5~~.6 KSLOPE = 0.078
3.6

where KSLOPE = Adjustment to the K_1 value from OTΔT required to compensate for each 1% that $[F^L_Q(X,Y,Z)]^{RPS}$ exceeds it limit.

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McGuire 1Cycle 8 Core Operating Limits Report

~~2.6~~ 3.7 Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}(X,Y,Z)$ (Specification 3/4.2.3)

$[F_{\Delta H}(X,Y)]^{LCO}$ = MARP (X,Y) * [1.0 + (1/RRH) * (1.0 - P)]

~~2.6~~.1 3.7 McGuire 1 Cycle 8 Operating Limit Maximum Allowable Radial Peaks, (MARP(X,Y)), are provided in Table 4.

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.3:

$[F^{L}_{\Delta H}(X,Y)]^{SURV}$ = $F^{D}_{\Delta H}(X,Y)$ * $M_{\Delta H}(X,Y)$/(UMR * TILT), as identified in DPC-NE-2011PA.

where

UMR = Uncertainty value for measured radial peaks, (UMR = 1.04).

TILT = Factor to account for a peaking increase due to an allowable quadrant power tilt ~~(TILT = 1.02)~~. ratio of 1.02

~~2.6~~.2 3.7 $F^{D}_{\Delta H}(X,Y)$ = the design power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}(X,Y)$ is provided in Table 5.

~~2.6~~.3 3.7 $M_{\Delta H}(X,Y)$ = the margin remaining in core location X,Y to the DNB limit from the transient power distribution. $M_{\Delta H}(X,Y)$ is provided in Table 6.

~~2.6~~.4 3.7 RRH = 3.34 when $0.0 < P \leq 1.0$,

where RRH = Thermal Power reduction required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

$P = \dfrac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

~~2.6~~.5 3.7 TRH = 0.04

where TRH = Reduction in OTΔT K_1 setpoint required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

Insert 4 →

M.31

Insert 4

3.8 Accumulators (Specification 3/4.5.1)

3.8.1 Boron concentration limits during modes: 1, 2 and 3:

Parameter	Limits
Cold Leg Accumulator minimum boron concentration for LCO 3.5.1c	1,900 ppm
Cold Leg Accumulator maximum boron concentration for LCO 3.5.1c	2,100 ppm
Minimum Cold Leg Accumulator boron concentration required to ensure post-LOCA subcriticality	1,800 ppm

3.9 Refueling Water Storage Tank (Specification 3/4.5.5)

3.9.1 Boron concentration limits during modes: 1, 2, 3 and 4:

Parameter	Limits
Refueling Water Storage Tank minimum boron concentration for LCO 3.5.5b	2,000 ppm
Refueling Water Storage Tank maximum boron concentration for LCO 3.5.5b	2,100 ppm

McGuire 2 Cycle 8 Core Operating Limits Report

1.0 Core Operating Limits Report

This Core Operating Limits Report, (COLR), for McGuire, Unit 2, Cycle 8 has been prepared in accordance with the requirements of Technical Specification 6.9.1.9.

The Technical Specifications affected by this report are listed below:

~~3/4.1.1.3~~	~~Moderator Temperature Coefficient~~
~~3/4.1.3.5~~	~~Shutdown Rod Insertion Limit~~
~~3/4.1.3.6~~	~~Control Rod Insertion Limit~~
~~3/4.2.1~~	~~Axial Flux Difference~~
~~3/4.2.2~~	~~Heat Flux Hot Channel Factor~~
~~3/4.2.3~~	~~Nuclear Enthalpy Rise Hot Channel Factor~~

Replace with Insert 1

Insert 1

2.2.1	Reactor Trip System Instrumentation Setpoints
3/4.1.1.3	Moderator Temperature Coefficient
3/4.1.2.5	Borated Water Source - Shutdown
3/4.1.2.6	Borated Water Source - Operating
3/4.1.3.5	Shutdown Rod Insertion Limit
3/4.1.3.6	Control Rod Insertion Limit
3/4.2.1	Axial Flux Difference
3/4.2.2	Heat Flux Hot Channel Factor
3/4.2.3	Nuclear Enthalpy Rise Hot Channel Factor
3/4.5.1	Accumulators
3/4.5.5	Refueling Water Storage Tank

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McGuire 2 Cycle 8 Core Operating Limits Report

1.1 ~~2.0~~ Operating Limits

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC-approved methodologies specified in Technical Specification 6.9.1.9.

Insert 2 →

~~2.1~~ 3.0 Moderator Temperature Coefficient (Specification 3/4.1.1.3)

~~2.1.1~~ 3.0 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the limits shown in Figure 1. The BOC/ARO/HZP MTC shall be less positive than 0.7 * 10E-04 ΔK/K/ F.

The EOC/ARO/RTP MTC shall be less negative than -4.1* 10E-04 ΔK/K/ F.

~~2.1.2~~ 3.0 The MTC Surveillance Limit is:

The 300 PPM/ARO/RTP MTC should be less negative than or equal to -3.2 * 10E-04 ΔK/K/ F.

Where: BOC stands for Beginning of Cycle
ARO stands for All Rods Out
HZP stands for Hot Zero (Thermal) Power
EOC stands for End of Cycle
RTP stands for Rated Thermal Power

Insert 2

2.0 Reactor Trip System Instrumentation Setpoints (Specification 2.2.1)

2.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.1958$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.03143/°F$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001405/psi$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 \geq 8$ sec., $\tau_2 \leq 3$ sec.
Measured ΔT lag time constant	$\tau_3 \leq 2$ sec.
Measured reactor vessel average temperature lead/lag time constants	$\tau_4 \geq 28$ sec. $\tau_5 \leq 4$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 \leq 2$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 7.0% ΔI
$f_1(\Delta I)$ "negative" breakpoint	= -39.0% ΔI
$f_1(\Delta I)$ "positive" slope	= 1.511% ΔT_0 / %ΔI
$f_1(\Delta I)$ "negative" slope	= 6.153% ΔT_0 / %ΔI

Insert 2 - continued

2.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 = 1.0809$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001239/°F$
Measured reactor vessel ΔT lead/lag time constants	$\tau_1 \geq 8$ sec., $\tau_2 \leq 3$ sec.
Measured ΔT lag time constant	$\tau_3 \leq 2$ sec.
Measured reactor vessel average temperature lag time constant	$\tau_6 \leq 2$ sec.
Measured reactor vessel average temperature rate-lag time constant	$\tau_7 \geq 5$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0% ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0% ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0% ΔT_0 / %ΔI
$f_2(\Delta I)$ "negative" slope	= 7.0% ΔT_0 / %ΔI

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Insert 3 →

~~2.2~~ 3.3 **Shutdown Rod Insertion Limit (Specification 3/4.1.3.5)**

~~2.2~~.1 3.3 The shutdown rods shall be withdrawn to at least 222 steps.

~~2.3~~ 3.4 **Control Rod Insertion Limits (Specification 3/4.1.3.6)**

~~2.3~~.1 3.4 The control rod banks shall be limited to physical insertion as shown in Figures 2 and 2A. Figure 2 applies for ≤ 355 EFPD. Figure 2A applies for > 355 EFPD.

~~2.4~~ 3.5 **Axial Flux Difference (Specification 3/4.2.1)**

~~2.4~~.1 3.5 The AXIAL FLUX DIFFERENCE (AFD) Limits are provided in Figure 3.

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Insert 3

3.1 Borated Water Source - Shutdown (Specification 3/4.1.2.5)

3.1.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 5 & 6:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.5a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.5a	6,132 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	585 gallons
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.5b	2,000 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.5b	26,000 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	3,500 gallons

3.2 Borated Water Source - Operating (Specification 3/4.1.2.6)

3.2.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes: 1, 2, 3 & 4:

Parameter	Limit
Boric Acid Storage System minimum boron concentration for LCO 3.1.2.6a	7,000 ppm
Boric Acid Storage System minimum contained water volume for LCO 3.1.2.6a	20,453 gallons
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	9,851 gallons

Insert 3 - continued

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration for LCO 3.1.2.6b	2,000 ppm
Refueling Water Storage Tank maximum boron concentration for LCO 3.1.2.6b	2,100 ppm
Refueling Water Storage Tank minimum contained water volume for LCO 3.1.2.6b	91,000 gallons
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,000 ppm	57,107 gallons

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~~2.5~~ 3.6 <u>Heat Flux Hot Channel Factor, FQ(X,Y,Z) (Specification 3/4.2.2)</u>

~~2.5.1~~ 3.6 $F_Q^{RTP} = 2.32$

~~2.5.2~~ 3.6 K(Z) is provided in Figure 4 for Mark-BW fuel.

~~2.5.3~~ 3.6 K(Z) is provided in Figure 5 for OFA fuel.

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.2:

~~2.5.4~~ 3.6 $[F_Q^L(X,Y,Z)]^{OP} = F_Q^D(X,Y,Z) * M_Q(X,Y,Z)/(UMT*MT*TILT)$

where $[F_Q^L(X,Y,Z)]^{OP}$ = cycle dependent maximum allowable design peaking factor which ensures that the $F_Q(X,Y,Z)$ limit will be preserved for operation within the LCO limits $[F_Q^L(X,Y,Z)]^{OP}$.

$[F_Q^L(X,Y,Z)]^{OP}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distribution for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 1 for normal operating conditions and in Table 1A for power escalation during startup operations.

$M_Q(X,Y,Z)$ = the margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. $M_Q(X,Y,Z)$ is provided in Table 2 for normal operating conditions and in Table 2A for power escalation during startup operations.

NOTE: $[F_Q^L(X,Y,Z)]^{OP}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

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~~2.5.5~~ 3.6 $[F_Q^L(X,Y,Z)]^{RPS} = F_Q^D(X,Y,Z) * (M_C(X,Y,Z)/(UMT*MT*TILT))$

where $[F_Q^L(X,Y,Z)]^{RPS}$ = cycle dependent maximum allowable design peaking factor which ensures that the centerline fuel melt limit will be preserved for operation within the LCO limits. $[F_Q^L(X,Y,Z)]^{RPS}$ includes allowances for calculational and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = the design power distributions for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 1 for normal operating conditions and in Table 1A for power escalation during startup operations.

$M_C(X,Y,Z)$ = the margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 3 for normal operating conditions and in Table 3A for power escalation during startup operations.

UMT = Measurement Uncertainty (UMT = 1.05).

MT = Engineering Hot Channel Factor (MT = 1.03).

TILT = Peaking penalty that accounts for allowable quadrant power tilt ratio of 1.02.

NOTE: $[F_Q^L(X,Y,Z)]^{RPS}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

~~2.5.6~~ 3.6 KSLOPE = 0.078

where KSLOPE = Adjustment to the K_1 value from OTΔT required to compensate for each 1% that $[F_Q^L(X,Y,Z)]^{RPS}$ exceeds its limit.

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~~2.6~~ 3.7 Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}(X,Y,Z)$ (Specification 3/4.2.3)

$[F_{\Delta H}(X,Y)]^{LCO} = MARP(X,Y) * [1.0 + (1/RRH) * (1.0 - P)]$

~~2.6~~ 3.7.1 McGuire 2 Cycle 8 Operating Limit Maximum Allowable Radial Peaks, (MARP(X,Y)), are provided in Table 4.

The following parameters are required for core monitoring per the Surveillance Requirements of Specification 3/4.2.3:

$[F^{L}_{\Delta H}(X,Y)]^{SURV} = F^{D}_{\Delta H}(X,Y) * M_{\Delta H}(X,Y)/(UMR * TILT)$, as identified in DPC-NE-2011PA.

where

UMR = Uncertainty value for measured radial peaks, (UMR = 1.04).

TILT = Factor to account for a peaking increase due to an allowable quadrant power tilt ratio of 1.02 ~~(TILT = 1.02)~~.

~~2.6~~ 3.7.2 $F^{D}_{\Delta H}(X,Y)$ = the design power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}(X,Y)$ is provided in Table 5 for normal operating conditions and in Table 5A for power escalation during startup operations..

~~2.6~~ 3.7.3 $M_{\Delta H}(X,Y)$ = the margin remaining in core location X,Y to the DNB limit from the transient power distribution. $M_{\Delta H}(X,Y)$ is provided in Table 6 for normal operating conditions and in Table 6A for power escalation during startup operations..

~~2.6~~ 3.7.4 RRH = 3.34 when $0.0 < P \leq 1.0$,

where RRH = Thermal Power reduction required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

$P = \dfrac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

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~~2.6.5~~ 3.7 TRH = 0.04

where TRH = Reduction in OTΔT K_1 setpoint required to compensate for each 1% that $F_{\Delta H}(X,Y)$ exceeds its limit.

Insert 4 →

Insert 4

3.8 Accumulators (Specification 3/4.5.1)

3.8.1 Boron concentration limits during modes: 1, 2 and 3:

Parameter	Limits
Cold Leg Accumulator minimum boron concentration for LCO 3.5.1c	1,900 ppm
Cold Leg Accumulator maximum boron concentration for LCO 3.5.1c	2,100 ppm
Minimum Cold Leg Accumulator boron concentration required to ensure post-LOCA subcriticality	1,800 ppm

3.9 Refueling Water Storage Tank (Specification 3/4.5.5)

3.9.1 Boron concentration limits during modes: 1, 2, 3 and 4:

Parameter	Limits
Refueling Water Storage Tank minimum boron concentration for LCO 3.5.5b	2,000 ppm
Refueling Water Storage Tank maximum boron concentration for LCO 3.5.5b	2,100 ppm

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Changes to the McGuire FSAR

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This trip protects the core against low DNBR and trips the reactor on coincidence as listed in Table 7-1 with one set of temperature measurements per loop. The setpoint for this trip is continuously calculated by analog circuitry for each loop by solving the following equation:

$$\Delta T_{setpoint} = (K_1 - K_2 \frac{(1 + \tau_4 s)}{1 + \tau_5 s} (T \frac{1}{1 + \tau_6 s} - T°_{avg}) + K_3(P - 2235) - \cancel{f(\Delta\phi)})$$

$f_1(\Delta\phi)$

Where

ΔT =	Overtemperature ΔT (Percent of full power ΔT)
T_{avg} =	Average reactor coolant temperature (°F)
$T°_{avg}$ =	Design average reactor coolant temperature at full power (°F)
P =	Pressurizer pressure (psig)
K_1 =	Setpoint bias (Percent of full power ΔT)
K_2 =	Constant based on the effect of temperature on the DNB limits (Percent of full power ΔT/°F)
K_3 =	Constants based on the effect or pressure on the DNB limits (Percent of full power ΔT/psi)
τ_4, τ_5, τ_6 =	Time constants (sec)
s =	Laplace transform variable (sec^{-1})
$\cancel{f(\Delta\phi)}$ = $f_1(\Delta\phi)$	A function of the neutron flux difference between upper and lower long ion chambers. (Refer to Figure 7-1) (Percent of full power ΔT)

A separate long ion chamber unit supplies the flux signal for each overtemperature ΔT trip channel.

Increases in $\Delta\phi$ beyond a pre-defined deadband result in a decrease in trip setpoint. Refer to Figure 7-1.

The required one pressurizer pressure parameter per loop is obtained from separate sensors connected to three pressure taps at the top of the pressurizer. Four pressurizer pressure signals are obtained from the three taps by connecting one of the taps to two pressure transmitters. Refer to Section 7.2.2.3.3, "Pressurizer Pressure" on page 7-31 for an analysis of this arrangement.

Figure 7-1, Sheet 5, shows the logic for overtemperature ΔT trip function. A detailed functional description of the process equipment associated with this function is contained in Reference 1 on page 7-36.

b. Overpower ΔT trip

This trip protects against excessive power (fuel rod rating protection) and trips the reactor on coincidence as listed in Table 7-1, with one set of temperature measurements per loop. The setpoint for each channel is continuously calculated using the following equation:

$$\Delta T_{setpoint} = (K_4 - K_5\left(\frac{\tau_7 s}{1 + \tau_7 s}\right)\left(\frac{1}{1 + \tau_6 s}\right)T_{avg} - K_6[T_{avg}\left(\frac{1}{1 + \tau_6 s}\right) - T^1] - \cancel{f(\Delta\phi)})$$

$f_2(\Delta\phi)$

Where:

ΔT = Overpower ΔT (Percent of full power ΔT)

$\cancel{f(\Delta\phi)}$ = A function of the neutron flux difference between upper and lower long ion chamber section. (Percent of full power ΔT)

$f_2(\Delta\phi)$

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Technical Justification
(McGuire)

Proposed Relocation of Certain Items from the Technical Specifications to the COLR

Several of the following proposed Technical Specification revisions are relocations of certain items from the Technical Specifications to the Core Operating Limits Report (COLR). The justification for these changes is, to a large extent, common to all of them. The following paragraphs describe this common justification to avoid repetition.

Technical Justification for Proposed Relocations from Technical Specifications to COLR

Catawba Facility Operating License amendment numbers 74 and 68 dated May 17, 1990 for units 1 and 2 respectively, revised the Catawba Technical Specifications to replace the values of certain cycle-specific parameter limits with a reference to the COLR, which contains the values of the limits. However, additional existing cycle-specific parameter limits in the Catawba Technical Specifications, not included in the above amendments, will have to be revised due to changes in these parameters in support of Unit 2 Cycle 6 operation and reload design. Similar limits have also changed in recent McGuire fuel cycles. In addition, McGuire Facility Operating License amendment numbers 105 and 87 dated March 15, 1990 for units 1 and 2 respectively, revised the McGuire Technical Specifications to incorporate an identical COLR methodology. Therefore, in order to simplify NRC review of identical Technical Specification revision proposals, it is proposed that the McGuire Technical Specifications be changed identically with respect to the applicable item relocations to the COLR.

In recognition of the burden on licensee and NRC resources associated with changes to Technical Specifications, the NRC issued Generic Letter 88-16 on October 4, 1988 encouraging licensees to propose changes to Technical Specifications that are consistent with the guidance provided in the enclosure to the generic letter. This enclosure provides guidance for the preparation of a license amendment request to modify Technical Specifications that have cycle-specific parameter limits. With the implementation of this alternative the NRC concluded that reload license amendments for the sole purpose of updating cycle specific parameter limits would be unnecessary. The proposed revisions described below would relocate the cycle-specific parameter limits from the McGuire Technical Specifications in accordance with the guidance provided in the enclosure to Generic Letter 88-16.

Proposed Revision to Technical Specification Table 2.2-1

It is proposed that the following Technical Specification setpoints be relocated to the Core Operating Limits Report:

- Overtemperature ΔT reactor trip setpoint, K_1
- Overtemperature ΔT reactor trip heatup setpoint penalty coefficient, K_2
- Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient, K_3
- Overpower ΔT reactor trip setpoint, K_4
- Overpower ΔT reactor trip heatup setpoint penalty coefficient, K_6
- Measured reactor vessel ΔT lead/lag time constants τ_1 and τ_2

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- Measured ΔT lag time constant τ_3
- Measured reactor vessel average temperature lead/lag time constants τ_4 and τ_5
- Measured reactor vessel average temperature lag time constant τ_6
- Measured reactor vessel average temperature rate/lag time constant τ_7
- $f_1(\Delta I)$ "positive" breakpoint, i.e., the most positive imbalance (axial flux difference) at which no overtemperature ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_1(\Delta I)$ "negative" breakpoint, i.e., the most negative imbalance at which no overtemperature ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_1(\Delta I)$ "positive" slope, i.e., the rate at which an overtemperature ΔT reactor trip setpoint penalty is applied for axial power shapes skewed to the top of the core
- $f_1(\Delta I)$ "negative" slope, i.e., the rate at which an overtemperature ΔT reactor trip setpoint penalty is applied for skewed axial power shapes skewed to the bottom of the core
- $f_2(\Delta I)$ "positive" breakpoint, i.e., the most positive imbalance (axial flux difference) at which no overpower ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_2(\Delta I)$ "negative" breakpoint, i.e., the most negative imbalance at which no overpower ΔT reactor trip setpoint penalty is required due to skewed axial power shapes
- $f_2(\Delta I)$ "positive" slope, i.e., the rate at which an overpower ΔT reactor trip setpoint penalty is applied for axial power shapes skewed to the top of the core
- $f_2(\Delta I)$ "negative" slope, i.e., the rate at which an overpower ΔT reactor trip setpoint penalty is applied for skewed axial power shapes skewed to the bottom of the core

The Overpower Delta Temperature equation in Note 3 of Table 2.2-1 is changed to correct a typographical error

Technical Justification

The setpoints listed above characterize the Reactor Protection System trip functions which protect the reactor core from departure from nucleate boiling (DNB) and centerline fuel melt (CFM). The $f(\Delta I)$ setpoints are calculated by the methodology described in Chapter 4 of Duke Power Company topical report DPC-NE-2011-P-A, "Nuclear Design Methodology for Operating Limits of Westinghouse Reactors"(Reference 2). This report was approved on January 24, 1990 and is listed in Section 6.9.1.9 of the McGuire Technical Specifications. Chapter 5 of Duke Power Company topical report DPC-NE-2004, "McGuire and Catawba Nuclear Stations Core Thermal-Hydraulic Methodology Using VIPRE-01", discusses the relationship of the ΔT reactor trip setpoints to the core safety limits. This report was approved on November 15, 1991.

As described in Chapter 4 of DPC-NE-2011-P-A, thermal margin calculations are performed for each fuel cycle to verify that the axial

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flux difference reactor trip penalty function envelopes, $f_1(\Delta I)$ and $f_2(\Delta I)$, remain conservative. If the proposed Technical Specification revision is approved, instances in which this check fails, but for which different envelopes can be demonstrated to both 1) provide adequate protection against licensing basis accidents and 2) be satisfied by the fuel cycle design under consideration, no Technical Specification change would be necessary.

As described in Chapter 2 of Duke power Company topical report DPC-NE-3001-PA, "McGuire/Catawba Nuclear Station Multidimensional Reactor Transients and Safety Analysis Physics Parameters Methodology" (Reference 4), safety analysis physics parameters are checked each cycle to determine that the assumptions of the FSAR Chapter 15 accident analyses remain valid. If the proposed Technical Specification revision is approved, instances in which this check fails for a particular parameter, but for which a different parameter value can be demonstrated to both 1) yield an acceptable result when the applicable licensing basis accident(s) are reanalyzed and 2) be satisfied by the fuel cycle design under consideration, no Technical Specification change would be necessary. Reanalysis would be likely, in order to get an acceptable answer, to use revised "K" and "τ" values. Reanalysis in this case would also, of course, be performed according to the methodologies approved in DPC-NE-3001-PA and/or Duke Power Company topical report DPC-NE-3002-A, "McGuire/Catawba Nuclear Station FSAR Chapter 15 System Transient Analysis Methodology". DPC-NE-3001-PA and DPC-NE-3002-A were approved November 15, 1991 and are listed in Section 6.9.1.9 of the McGuire Technical Specifications.

The proposed Technical Specification change is similar to those approved on September 16, 1991 as Facility Operating License amendments 191, 191, and 188 for Oconee Units 1, 2, and 3, respectively. In these amendments the Reactor Protection System setpoints for the Flux/Flow/Imbalance and Variable Low Reactor Coolant System Pressure trip functions were relocated to the COLR. As stated in the Oconee Technical Specifications, these trip functions provide equivalent protection against fuel thermal limits, specifically DNB and CFM, as the McGuire overtemperature ΔT and overpower ΔT reactor trip functions.

Recent instances where one or more of these setpoints has been changed in a Technical Specification revision proposal include McGuire 1 Cycle 8, McGuire 2 Cycle 8, Catawba 1 Cycle 7, and Catawba 2 Cycle 5.

The proposed change to the OPΔT equation in Note 3 of Table 2.2-1 is a correction of a typographical error which was likely introduced during the McGuire Unit 1 and 2 Technical Specification change submittal for Amendments 131/113 dated 05/7/92. This change is administrative in nature.

<u>Proposed Revision to Minimum Boron Concentration Limits on ECCS Water Sources</u>

It is proposed that the following minimum boron concentration limits be relocated from the Technical Specifications to the COLR:

- The cold leg accumulator minimum boron concentration limit in Technical Specification 3.5.1.1.c
- The Refueling Water Storage Tank (RWST) minimum boron concentration limit in Technical Specification 3.5.5.b

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Technical Justification

The limits on minimum boron concentration for the accumulators and RWST are verified each cycle to ensure the safety analysis assumptions for these parameters remain valid. The minimum boron concentration limits ensure the reactor will remain subcritical during a Loss of Coolant Accident (Reference 13, Chapter 15.6.5.2 "Post LOCA Subcriticality Evaluation"). The post LOCA subcriticality evaluation provides an available sump mixed mean boron concentration curve that must bound the required cold, post LOCA critical boron concentrations for each cycle. The critical boron concentration requirements for each cycle are determined using the methodology described in Section 9 of DPC-NF-2010A (Reference 14). In addition, the minimum boron concentration will be evaluated each cycle to ensure the solution recirculated within containment after a LOCA will be maintained at a pH value of ≤ 9.5.

This pH limit minimizes hydrogen production from the corrosion of aluminum in containment and reduces the effect of caustic stress corrosion on mechnical systems and components. The pH band given in the bases for Specification 3/4.5.5 in the McGuire Technical Specifications and Specification 3/4.5.4 in the Catawba Technical Specifications is revised to provide consistency between the values at both plants while meeting the NRC criteria for sump pH after a LOCA, contained in Branch Technical Position MTEB 6-1. The pH band is revised to be ≥ 7.5 and ≤ 9.5 for both plants. The ice condenser ice bed pH is maintained between 9.0 and 9.5 (Specification 3.6.5.1(a)) and is the most alkaline contributor to the containment sump pH after a LOCA, therefore, the pH will be limited by the maximum pH limit of the ice bed. The lower limit on the band is chosen such that stress corrosion cracking will not occur for an extended period following a LOCA and iodine retention in the containment sump water is enhanced.

A similar Technical Specification revision was approved January 5, 1993 for Oconee Units 1, 2, and 3, Amendment Nos., 197, 197, and 194, respectively, to move these cycle-specific values to the COLR. The boron concentration value for the Oconee Core Flood Tank (CFT), which performs the same function as the McGuire Cold Leg Accumlators (CLA), was proposed to be relocated to the COLR. Also, the boron concentration value for the Oconee Borated Water Storage Tank (BWST), which performs the same function as the McGuire Refueling Water Storage Tank (RWST), was proposed to be relocated to the COLR.

Specification 3.5.1.1 Action statement c(2) was revised in the approved McGuire Unit 1 Cycle 8 reload submittal (Reference 9) to base the volume weighted average boron concentration on all four accumulators instead of just the limiting three. However, two references to the limiting three accumulators were inadvertently not removed in the Technical Specification markups for the McGuire Unit 1 Cycle 8 reload submittal (Reference 7). This revision was correctly made and approved in the Catawba Unit 1 Cycle 7 reload submittal (Reference 9). Therefore, the action statement is corrected to remove these references.

The bases for Specification 3.5.1 includes a paragraph with information regarding the UHI system which should have been removed in Amendment 82 to facility operating license NPF-9 and Amendment 63 to facility operating license NPF-17, dated May 10, 1988. Since the UHI system has

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been removed at McGuire, the information is no longer needed and is therefore deleted.

Proposed Revision to Maximum Boron Concentration Limits on ECCS Water Sources

It is proposed that the following maximum boron concentration limits be relocated from the Technical Specifications to the COLR:

- The cold leg accumulator maximum boron concentration limit in Technical Specification 3.5.1.1.c
- The Refueling Water Storage Tank maximum boron concentration limits in Technical Specification 3.5.5.b

Technical Justification

The limits on maximum boron concentration for the accumulators and RWST are based on the minimum boron concentration limits, which are determined using the methodology in DPC-NF-2010A (Reference 14), to provide adequate plant operating space between these limits. They are also evaluated to ensure boron precipitation is precluded following a LOCA (Reference 13, Section 6.3.3). The boron precipitation analysis uses methods and assumptions described in Westinghouse letter CLC-NS-309 dated April 1, 1975 with the principal input parameters given in Table 6-137 of Reference 13. In addition, the maximum boron concentration will be evaluated each cycle to ensure the solution recirculated within containment after a LOCA will be maintained at a pH value ≥ 7.5. This pH limit minimizes the evolution of iodine and reduces the effect of chloride stress corrosion on mechnical systems and components.

Proposed Revision to Minimum Volume & Boron Concentration Limits on Borated Water Sources for Reactor Shutdown

It is proposed that the following minimum volume and boron concentration limits be relocated from the Technical Specifications to the COLR:

- The Boric Acid Storage System minimum volume and boron concentration limits in Technical Specification 3.1.2.5 & 3.1.2.6
- The Refueling Water Storage Tank minimum volume and boron concentration limits in Technical Specification 3.1.2.5 & 3.1.2.6

Technical Justification

The limits on minimum volume and boron concentration for the Boric Acid Storage System and RWST are verified each cycle to ensure the core shutdown analysis assumptions for these parameters remain valid. The minimum volume and boron concentration limits ensure that negative reactivity control is available during each mode of plant operation. The minimum volume and boron concentration requirements are based on those t[illegible] provide a 1% Δk/k shutdown margin for temperatures less

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than or equal to 200 °F and 1.3% Δk/k for temperatures greater than 200 °F at all times during a given cycle. The required boron concentrations are determined using the methodology described in Section 4 of DPC-NF-2010A (Reference 14). Further, the limits on RWST minimum volume and boron concentration help ensure the reactor will remain subcritical during a Loss of Coolant Accident (Reference 13, Chapter 15.6.5.2 "Post LOCA Subcriticality Evaluation"). In addition, the limits on RWST minimum volume and boron concentration are evaluated each cycle to ensure the solution recirculated within containment after a LOCA will be maintained at a pH value ≤ 9.5.

This pH limit minimizes hydrogen production from the corrosion of aluminum in containment and reduces the effect of caustic stress corrosion on mechnical systems and components. The pH band given in the bases for Specification 3/4.1.2 in the McGuire Technical Specifications is revised to provide consistency between the values at both plants while meeting the NRC criteria for sump pH after a LOCA, contained in Branch Technical Position MTEB 6-1. The pH band is revised to be ≥ 7.5 and ≤ 9.5 for both plants. The ice condenser ice bed pH is maintained between 9.0 and 9.5 (Specification 3.6.5.1(a)) and is the most alkaline contributor to the containment sump pH after a LOCA. Therefore, the pH will be limited by the maximum pH limit of the ice bed. The lower limit on the band is chosen such that stress corrosion cracking will not occur for an extended period following a LOCA and iodine retention in the containment sump water is enhanced.

The value for the RWST minimum contained borated water volume prescribed in Specification 3/4.1.2.6(b)(1) is based on the ECCS RWST volume requirements in Specification 3/4.5.5 and is a larger volume than required for reactivitity control, as shown in the bases for Specification 3/4.1.2. The minimum RWST volume reported in the COLR will be the volume required to maintain reactivity control while Specification 3/4.1.2.6(b)(1) is changed to refer to the value in Specification 3/4.5.5(a) or the COLR, whichever is larger. In addition, the McGuire Technical Specification bases for the allowances assumed in the Boric Acid Storage Tank and RWST minimum contained water volumes are added for clarification. A similar Technical Specification revision was approved January 5, 1993 for Oconee Units 1, 2, and 3, Amendment Nos., 197, 197, and 194, respectively, to move these cycle-specific values to the COLR. The volume and boron concentration value for the Oconee Concentrated Boric Acid Storage Tank (CBAST), which performs the same function as the McGuire Boric Acid Tank, was relocated to the COLR. Also, the boron concentration value for the Oconee Borated Water Storage Tank (BWST), which performs the same function as the McGuire Refueling Water Storage Tank (RWST), was relocated to the COLR.

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References

1. BAW-10159P-A, BWCMV Correlation of Critical Heat Flux in Mixing Vane Grid Fuel Assemblies, Babcock & Wilcox, July 1990.

2. DPC-NE-2011P-A, Duke Power Company, Nuclear Design Methodology for Core Operating Limits of Westinghouse Reactors, March, 1990.

3. BAW-10174-A, Mark-BW Reload LOCA Analysis for the Catawba and McGuire Units, Babcock & Wilcox, May 1991.

4. DPC-NE-3001P, Duke Power Company, Multidimensional Reactor Transients and Safety Analysis Physics Parameters Methodology, Revision 1, November 1991.

5. DPC-NE-2004P-A, Duke Power Company, McGuire and Catawba Nuclear Stations Core Thermal-Hydraulic Methodology using VIPRE-01, December 1991.

6. WCAP-10988, Cobra-NC, Analysis for a Main Steamline Break in the Catawba Unit 1 Ice Condenser Containment, Westinghouse Nuclear Energy Systems, November 1985.

7. McGuire Nuclear Station Unit 1, Docket Number 50-369, Cycle 8 Reload Submittal, Duke Power Company, June 26,1991.

8. McGuire Nuclear Station Unit 2, Docket Number 50-370, Cycle 8 Reload Submittal, Duke Power Company, December 18,1991.

9. Catawba Nuclear Station Unit 1, Docket Numbers 50-413 and 50-414, Cycle 7 Reload Submittal, Duke Power Company, April, 13, 1992.

10. Catawba Nuclear Station Unit 1, Docket Numbers 50-413 and 50-414, Cycle 6 Reload Submittal, Duke Power Company, January 9, 1991.

11. Catawba Nuclear Station, Final Safety Analysis Report, Docket Nos. 50-413/414.

12. Duke letter to U. S Nuclear Regulatory Commission, McGuire Nuclear Station Docket Numbers 50-369 and -370 Catawba Nuclear Station Docket Numbers 50-413 and -414 Supplementary Information Relative to Topical Report BAW-10173; Boron Dilution Analysis, Duke Power Company, May 15,1991.

13. McGuire Nuclear Station, Final Safety Analysis Report, Docket Nos. 50-369/370.

14. DPC-NF-2010A, McGuire Nuclear Station/Catawba Nuclear Station Nuclear Physics Methodology for Reload Design, Duke Power Company, June 1985.

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Generic Letter 88-16 provides guidance for the removal of cycle-specific parameter limits from the Technical Specifications. Amendments 105 and 87 dated March 15, 1990 for units 1 and 2 respectively, revised the McGuire Technical Specifications to replace the values of certain cycle-specific parameter limits with a reference to the Core Operating Limits Report (COLR), which contains the values of the limits. Since approval of this amendment, additional cycle specific parameters have been identified due to revisions which were necessary to support Catawba Unit 2 Cycle 6 operation and past McGuire reloads.

NO SIGNIFICANT HAZARDS EVALUATION

10 CFR 50.92 states that a proposed amendment involves no significant hazards consideration if operation in accordance with the amendment would not:

1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

3) Involve a significant reduction in a margin of safety.

This proposed amendment will not increase the probability or consequences of an accident which has been previously evaluated. The cycle specific parameters which have been identified for relocation to the COLR will be calculated using NRC approved methodology and the Technical Specifications will continue to require operation within the cycle specific parameters. For the above reasons this amendment is considered administrative, and does not increase the probability or consequences of an accident previously evaluated.

Operation in accordance with this proposed amendment will not create any failure modes not bounded by previously evaluated accidents. Therefore, this change will not create the possibility of a new or different kind of accident from any kind of accident previously evaluated.

The Technical Specifications will continue to require operation within the bounds of the cycle-specific parameter limits. The cycle-specific parameter limits will be calculated using NRC approved methodology. In addition, each future reload will require a 10 CFR 50.59 safety review to assure that operation of the Unit within the cycle-specific limits will not involve a reduction in a margin of safety. Therefore, no margins of safety are affected by the relocation of cycle-specific parameter limits to the COLR.

Based on the above, Duke has concluded the above that there are no significant hazards considerations involved in this amendment request.

The change to Note 3 of Table 2.2-1 corrects a typographical error in the Overpower Delta Temperature equation. This change is administrative in nature, and therefore involves no significant hazards consideration.

The proposed Technical Specification change has been reviewed against the criteria of 10 CFR 51.22 for environmental considerations. As shown above, the proposed change does not involve any significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor increase the individual or cumulative occupational radiation exposures. Based on this, the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement.