Proposed

Technical Specification

Pages

3/4.2.3 MINIMUM CRITICAL POWER RATIO

LIMITING CONDITION FOR OPERATION

3.2.3 The MINIMUM CRITICAL POWER RATIO (MCPR) shall be equal to or greater than the MCPR limit shown in Figures 3.2.3-1 thru 3.2.3-1B** times the K_f shown in Figure 3.2.3-2,# with:

$$\tau = \frac{(\tau_{ave} - \tau_B)}{\tau_A - \tau_B}$$

where:

τ_A = 1.096 seconds, control rod average scram insertion time limit to notch 36 per Specification 3.1.3.3,

$$\tau_B = 0.813 + 1.65\left[\frac{N_1}{\sum_{i=1}^{n} N_i}\right]^{\frac{1}{2}} 0.018,$$

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i},$$

n = number of surveillance tests performed to date in cycle,

N_i = number of active control rods measured in the i^{th} surveillance test,

τ_i = average scram time to notch 36 of all rods measured in the i^{th} surveillance test, and

N_1 = total number of active rods measured in Specification 4.1.3.2.a.

APPLICABILITY:

OPERATIONAL CONDITION 1, when THERMAL POWER is greater than or equal to 25% of RATED THERMAL POWER.

ACTION

a. Operating in the Control Cell Core (CCC) operating mode* and MCPR less than the applicable MCPR limit shown in Figures 3.2.3-1 thru 3.2.3-1B

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*The CCC operating mode includes operation with only A2 rods, A1 shallow rods less than or equal to notch position 36, all peripheral rods inserted in the core, and rods inserted to position 46. Normal control rod operability checks, coupling checks, scram time testing, and friction testing of non-CCC control rods does not require the utilization of the more restrictive non-CCC operational mode MCPR limits. Any other operation is a non-CCC operating mode.

See INSERT for new footnotes

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** During Cycle 2, operation beyond a normal end-of-cycle core exposure with core flow increased to $\leq$105% of rated core flow and/or with Final Feedwater Temperature reduced to $\geq$370°F is permitted provided that the Moisture Separator Reheater and Turbine Bypass System are OPERABLE per Specification 3.7.9. Curves A or B of Figure 3.2.3-1B apply to these operations.

K_f = 1.0 during operation with core flow $\geq$ 100%.

LIMITING CONDITION FOR OPERATION

ACTION (Continued)

(Curve A) times the applicable K_f curve shown in Figure 3.2.3-2,** initiate corrective action within 15 minutes and restore MCPR to within the required limit within 2 hours or reduce THERMAL POWER to less than 25% of RATED THERMAL POWER within the next 4 hours.

b. Operating in the non-CCC operating mode* and MCPR less than the applicable MCPR limit shown in Figures 3.2.3-1 thru 3.2.3-1B (Curve B) times the applicable K_f curve shown in Figure 3.2.3-2,** initiate corrective action within 15 minutes and restore MCPR to within the required limit within 2 hours or reduce THERMAL POWER to less than 25% of RATED THERMAL POWER within the next 4 hours.

c. Operating in either the CCC or non-CCC operating mode with either the main turbine bypass system inoperable per Specification 3.7.9 or the moisture separator reheater inoperable, operation may continue and the provisions of Specification 3.0.4 are not applicable provided that, within one hour, MCPR is determined to be equal to or greater than the MCPR limit as shown in Figures 3.2.3-1 thru 3.2.3-1B (Curve C) by the main turbine bypass or moisture separator reheater inoperable curve times the applicable K_f shown in Figure 3.2.3-2.** ***

d. Operating in either the CCC or non-CCC operating mode with both the main turbine bypass system inoperable per Specification 3.7.9 and the moisture separator reheater inoperable, operation may continue and the provisions of Specification 3.0.4 are not applicable provided that, within one hour, MCPR is determined to be equal to or greater than the MCPR limit as shown in Figures 3.2.3-1 thru 3.2.3-1B by the main turbine bypass and moisture separator reheater inoperable curve times the applicable K_f shown in Figure 3.2.3-2.** ***

*The CCC operating mode includes operation with only A2 rods, A1 shallow rods less than or equal to notch position 36, all peripheral rods inserted in the core, and rods inserted to position 46. Normal control rod operability checks, coupling checks, scram time testing, and friction testing of non-CCC control rods does not require the utilization of the more restrictive non-CCC operational mode MCPR limits. Any other operation is a non-CCC operating mode.

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*** In addition, during Cycle 2 operation beyond normal end-of-cycle core exposure with core flow increased above rated and/or Final Feedwater Temperature reduced below normal restore core flow and Final Feedwater Temperature to within normal limits within one hour or reduce THERMAL POWER to less than 25% of RATED THERMAL POWER within the next 4 hours.

K_f = 1.0 during operation with core flow $\geq$100%.

4.2.3.1 MCPR, with:

a. t = 1.0 prior to performance of the initial scram time measurements for the cycle in accordance with Specification 4.1.3.2, or

b. t as defined in Specification 3.2.3 used to determine the limit within 72 hours of the conclusion of each scram time surveillance test required by Specification 4.1.3.2,

shall be determined to be equal to or greater than the applicable MCPR limit determined from Figures 3.2.3-1 through 3.2.3-1B and 3.2.3-2:**

a. At least once per 24 hours,

b. Within 12 hours after completion of a THERMAL POWER increase of at least 15% of RATED THERMAL POWER, and

c. Initially and at least once per 12 hours when the reactor is operating with a LIMITING CONTROL ROD PATTERN for MCPR.

d. The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 Prior to the use of Curve A and whenever Surveillance Requirement 4.2.3.1 is performed while using Curve A of Figures 3.2.3-1 through 3.2.3-1B, verify that all non-CCC control rods are fully withdrawn from the core. Non-CCC control rods are all control rods excluding A2 rods, A1 shallow rods inserted less than or equal to notch position 36, all peripheral rods, and rods inserted to position 46. Normal control rod operability checks, coupling checks, scram time testing, and friction testing of non-CCC control rods does not require the utilization of the more restrictive non-CCC operational mode MCPR limits.

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K_f = 1.0 during operation with core flow $\geq$100%.

TABLE 3.3.6-2

CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS

TRIP FUNCTION	TRIP SETPOINT	ALLOWABLE VALUE
1. ROD BLOCK MONITOR		
a. Upscale	< 0.66 W + 40% #	< 0.66 W + 43% #
b. Inoperative	NA	NA
c. Downscale	≥ 5% of RATED THERMAL POWER	≥ 3% of RATED THERMAL POWER
2. APRM		
a. Flow Biased Neutron Flux - High	< 0.58 W + 50%*	< 0.58 W + 53%*
b. Inoperative	NA	NA
c. Downscale	> 5% of RATED THERMAL POWER	≥ 3% of RATED THERMAL POWER
d. Neutron Flux - Upscale, Setdown	≤ 12% of RATED THERMAL POWER	≤ 14% of RATED THERMAL POWER
3. SOURCE RANGE MONITORS		
a. Detector not full in	NA	NA
b. Upscale	< 1.0 x 10^5 cps	< 1.6 x 10^5 cps
c. Inoperative	NA	NA
d. Downscale	≥ 3 cps**	≥ 2 cps**
4. INTERMEDIATE RANGE MONITORS		
a. Detector not full in	NA	NA
b. Upscale	< 108/125 divisions of full scale	< 110/125 divisions of full scale
c. Inoperative	NA	NA
d. Downscale	> 5/125 divisions of full scale	> 3/125 divisions of full scale
5. SCRAM DISCHARGE VOLUME		
a. Water Level-High	< 589'11½"	< 591'0"
b. Scram Trip Bypass	NA	NA
6. REACTOR COOLANT SYSTEM RECIRCULATION FLOW		
a. Upscale	< 108/125% of rated flow ##	< 111/125% of rated flow ##
b. Inoperative	NA	NA
c. Comparator	≤ 10% flow deviation	≤ 11% flow deviation
7. REACTOR MODE SWITCH SHUTDOWN POSITION	NA	NA

*The APRM rod block function is varied as a function of recirculation loop drive flow (W). The trip setting of this function must be maintained in accordance with Specification 3.2.2.

**May be reduced to ≥ 0.7 cps provided the signal-to-noise ratio is ≥ 20.

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\# The Flow Biased RBM Upscale Trip Function shall be clamped with a maximum trip setpoint of $\leq$ 106% and a maximum allowable value of $\leq$109% during Cycle 2 operation beyond normal end of cycle exposure with core flow greater than rated.

\## The Reactor Coolant System Recirculation System Upscale Rod Block trip setpoint may be increased to $\leq$110% with an allowable value of $\leq$113% to allow Cycle 2 operation beyond normal end-of-cycle core exposure with core flow increased to $\leq$105% of rated.

SURVEILLANCE REQUIREMENTS

4.4.1.1.1 Each pump discharge valve shall be demonstrated OPERABLE by cycling each valve through at least one complete cycle of full travel during each STARTUP* prior to THERMAL POWER exceeding 25% of RATED THERMAL POWER.

4.4.1.1.2 Each pump MG set scoop tube mechanical and electrical stop shall be demonstrated OPERABLE with overspeed setpoints less than or equal to 105% and 102.5%, respectively, of rated core flow, at least once per 18 months.**

4.4.1.1.3 Establish a baseline APRM and LPRM** neutron flux noise value within the regions for which monitoring is required (Specification 3.4.1.1, ACTION c) within 2 hours of entering the region for which monitoring is required unless baselining has previously been performed in the region since the last refueling outage.

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*If not performed within the previous 31 days.

**Detector levels A and C of one LPRM string per core octant plus detectors A and C of one LPRM string in the center of the core should be monitored.

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\# Each pump MG set scoop tube mechanical and electrical stop may be set with overspeed setpoints less than or equal to 107% of rated core flow to allow Cycle 2 operation beyond normal end of cycle core exposure with core flow increased up to ≤105% of rated.

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bypass system or the moisture separator reheater be inoperable as 25-percent RATED THERMAL POWER is exceeded, the MCPR check must be completed within one hour.

The evaluation of a given transient begins with the system initial parameters shown in UFSAR Table 15.0.1 that are input to a GE-core dynamic behavior transient computer program. The codes used to evaluate transients are described in GESTAR II. The principal result of this evaluation is the reduction in MCPR caused by the transient.

ADD BASES INSERT

The purpose of the K_f factor of Figure 3.2.3-2 is to define operating limits at other than rated core flow conditions. At less then 100% of rated flow the required MCPR is the product of the MCPR and the K_f factor. The K_f factors assure that the Safety Limit MCPR will not be violated during a flow increase transient resulting from a motor-generator speed control failure. The K_f factors may be applied to both manual and automatic flow control modes.

The K_f factor values shown in Figure 3.2.3-2 were developed generically and are applicable to all BWR/2, BWR/3, and BWR/4 reactors. The K_f factors were derived using the flow control line corresponding to RATED THERMAL POWER at rated core flow, although they are applicable for the extended operating region.

For the manual flow control mode, the K_f factors were calculated such that for the maximum flow rate, as limited by the pump scoop tube setpoint and the corresponding THERMAL POWER along the rated flow control line, the limiting bundle's relative power was adjusted until the MCPR changes with different core flows. The ratio of the MCPR calculated at a given point of core flow, divided by the operating limit MCPR, determines the K_f.

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Near the end of an operating cycle, the reactivity from the withdrawl of control rods can no longer maintain full RATED THERMAL POWER with other parameters at nominal or rated conditions (for example, rated core flow, nominal feedwater temperature and equilibrium xenon). The core average exposure where this occurs is considered the normal end of cycle core exposure. Operation beyond this exposure at a THERMAL POWER greater than what would otherwise be achieved can be accomplished by reducing the final feedwater temperature and/or increasing the core flow. Such operation was evaluated for Cycle 2 and is acceptable provided the restrictions of the LCO are met.