CURRENT TECHNICAL SPECIFICATIONS BASES PAGES

CYCLE 7 RELOAD

<u>Note</u>: In this attachment, changed areas are denoted by revision bars in the right margin.

3/4.2.3 MINIMUM CRITICAL POWER RATIO

The required operating limit MCPRs at steady state operating conditions as specified in Specification 3.2.3 are derived from the established fuel cladding integrity Safety Limit MCPR, and an analysis of abnormal operational transients. For any abnormal operating transient analysis evaluation with the initial condition of the reactor being at the steady state operating limit, it is required that the resulting MCPR does not decrease below the Safety Limit MCPR at any time during the transient assuming instrument trip setting given in Specification 2.2.

To assure that the fuel cladding integrity Safety Limit is not exceeded during any anticipated abnormal operational transient, the most limiting transients have been analyzed to determine which result in the largest reduction in CRITICAL POWER RATIO (CPR). The type of transients evaluated were loss of flow, increase in pressure and power, positive reactivity insertion, and coolant temperature decrease. The limiting transient yields the largest delta CPR. When added to the Safety Limit MCPR, the required operating limit MCPR of Specification 3.2.3 is obtained. The power-flow map of Figure B 3/4 2.3-1 defines the analytical basis for generation of the MCPR operating limits (References 2 and 3).

MCPR operating limits are defined as functions of flow ($MCPR_f$), and power ($MCPR_p$). The limit to be used at a given operating state is the highest of these two limits.

The purpose of the $MCPR_f$ and $MCPR_p$ is to define operating limits at other than rated core flow and power conditions for all exposures during the cycle.

The $MCPR_f$s are established to protect the core from inadvertent core flow increases such that the 99.9% MCPR limit requirement can be assured. The reference core flow increase event used to established the $MCPR_f$ is a hypothesized slow flow runout to maximum, that does not result in a scram from neutron flux overshoot exceeding the APRM neutron flux-high level (Table 2.2.1-1 item 2). The result of a single failure or single operator error during Loop Manual operation is the runout of one loop because the two recirculation loops are under independent control. With this basis, the $MCPR_f$ curve was generated from a series of steady state core thermal hydraulic calculations performed at several core power and flow conditions along the steepest flow control line. In the actual calculations a conservative highly steep generic representation of the 105% steam flow rodline flow control line has been used. Assumptions used in the original calculations of this generic flow control line were consistent with a slow flow increase transient duration of several minutes: (a) the plant heat balance was assumed to be in equilibrium, and (b) core xenon concentration

BASES

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APPLICABLE SAFETY ANALYSES (continued)

The MCPR operating limits derived from the transient analysis are dependent on the operating core flow, and power state ($MCPR_f$, and $MCPR_p$, respectively) to ensure adherence to fuel design limits during the worst transient that occurs with moderate frequency (Refs. 3, 4, and 5). Flow dependent MCPR limits are determined by steady state thermal hydraulic methods using the three dimensional BWR simulator code (Ref. 6) and the multichannel thermal hydraulic code (Ref. 7). $MCPR_f$ curves are provided based on the maximum credible flow runout transient for Loop Manual ~~and Non Loop Manual~~ operation. The result of a single failure or single operator error during Loop Manual operation is the runout of only one loop because both recirculation loops are under independent control. ~~Non Loop Manual operational modes allow simultaneous runout of both loops because a single controller regulates core flow.~~

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Power dependent MCPR limits ($MCPR_p$) are determined by the three dimensional BWR simulator code and the one dimensional transient code (Ref. 8). Due to the sensitivity of the transient response to initial core flow levels at power levels below those at which the turbine stop valve closure and turbine control valve fast closure scram trips are bypassed, high and low flow ~~MAPFAC~~ $MCPR_p$ operating limits are provided for operating between 25% RTP and the previously mentioned bypass power level.

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The MCPR satisfies Criterion 2 of the NRC Policy Statement.

LCO

The MCPR operating limits specified in the COLR are the result of the Design Basis Accident (DBA) and transient analysis. The MCPR operating limits are determined by the larger of the $MCPR_f$, ~~and~~ $MCPR_p$, limits.

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APPLICABILITY

The MCPR operating limits are primarily derived from transient analyses that are assumed to occur at high power levels. Below 25% RTP, the reactor is operating at a slow recirculation pump speed ~~with the flow control valve in its minimum position~~ and the moderator void ratio is small. Surveillance of thermal limits below 25% RTP is unnecessary due to the large inherent margin that ensures that the MCPR SL is not exceeded even if a limiting transient occurs.

C3

(continued)

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The exposure dependent MCPR limits ($MCPR_e$) are established for a set of core average exposure intervals such that operating limits for all anticipated exposures are defined. The limiting transients are analyzed at the limiting exposure for each interval. The $MCPR_e$ operating limits are established based on the largest delta CPR calculated at the limiting exposure and ensure that the MCPR safety limit will not be violated during the most limiting transient in each of the exposure intervals.

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The $MCPR_p$ limits are established for a set of exposure intervals. The limiting transients are analyzed at the limiting exposure for each interval.