SURVEILLANCE REQUIREMENTS (Continued)

e. With the maximum value of

$$\frac{F_Q^M(z)}{K(z)}$$

over the core height (z) increasing since the previous determination of $F_Q^M(z)$ either of the following actions shall be taken:

1. Increase $F_Q^M(z)$ by the appropriate penalty factor specified in the COLR and verify that this value satisfies the relationship in Specification 4.2.2.2.c, or

2. $F_Q^M(z)$ shall be measured at least once per 7 Effective Full Power Days until two successive core power distribution measurements indicate that the maximum value of

$$\frac{F_Q^M(z)}{K(z)}$$

over the core height (z) is not increasing.

f. With the relationships specified in Specification 4.2.2.2.c. above not being satisfied:

1. Calculate the maximum percent over the core height (z) that $F_Q(z)$ exceeds its limit by the following expression:

$$\left\{\left[\frac{F_Q^M(z) \times W(z)}{\frac{F_Q^{RTP}}{P} \times K(z)}\right] - 1\right\} \times 100 \text{ for } P \geq 0.5$$

$$\left\{\left[\frac{F_Q^M(z) \times W(z)}{\frac{F_Q^{RTP}}{0.5} \times K(z)}\right] - 1\right\} \times 100 \text{ for } P < 0.5$$

SURVEILLANCE REQUIREMENTS (Continued)

2. One of the following actions shall be taken:

   (a) Within 15 minutes, control the AFD to within new AFD limits which are determined by reducing the applicable AFD limits by 1% AFD for each percent $F_Q(z)$ exceeds its limits as determined in Specification 4.2.2.2.f.(1). Within 8 hours, reset the AFD alarm setpoints to these modified limits, or

   (b) Comply with the requirements of Specification 3.2.2 for $F_Q(z)$ exceeding its limit by the percent calculated above, or

   (c) Verify that the requirements of Specification 4.2.2.3 for Base Load operation are satisfied and enter Base Load operation.

g. The limits specified in Specifications 4.2.2.2.c., 4.2.2.2.e., and 4.2.2.2.f. above are not applicable in the following core plane regions:

   1. Lower core region from 0 to 10%, inclusive.
   2. Upper core region from 90 to 100%, inclusive.

4.2.2.3 Base Load operation is permitted at powers above APL^{ND} if the following conditions are satisfied:

a. Prior to entering Base Load operation, maintain THERMAL POWER above APL^{ND} and less than or equal to that allowed by Specification 4.2.2.2 for at least the previous 24 hours. Maintain Base Load operation surveillance (AFD within applicable target band about the target flux difference) during this time period. Base Load operation is then permitted providing THERMAL POWER is maintained between APL^{ND} and APL^{BL} or between APL^{ND} and 100% (whichever is most limiting) and F_Q surveillance is maintained pursuant to Specification 4.2.2.4. APL^{BL} is defined as the minimum value of:

$$APL^{BL} = \frac{F_Q^{RTP} \times K(z)}{F_Q^M(z) \times W(z)_{BL}} \times 100\%$$

over the core height (z) where: $F_Q^M(z)$ is the measured $F_Q(z)$ increased by the applicable allowances for manufacturing tolerances and measurement uncertainty as specified in the COLR. The F_Q limit is F_Q^{RTP}. $W(z)_{BL}$ is the cycle dependent function that accounts for limited power distribution transient encountered during base load operation. F_Q^{RTP}, K(z), and $W(z)_{BL}$ are specified in the CORE OPERATING LIMITS REPORT as per Specification 6.9.1.11.

over the core height (z) increasing since the previous determination of $F_Q^M(z)$ either of the following actions shall be taken:

1. Increase $F_Q^M(z)$ by the appropriate penalty factor specified in the COLR and verify that this value satisfies the relationship in Specification 4.2.2.4.c, or

2. $F_Q^M(z)$ shall be measured at least once per 7 Effective Full Power Days until 2 successive core power distribution measurements indicate that the maximum value of

$$\frac{F_Q^M(z)}{K(z)}$$

over the core height (z) is not increasing.

f. With the relationship specified in 4.2.2.4.c above not being satisfied, either of the following actions shall be taken:

1. Place core in an equilibrium condition where the limit in 4.2.2.2.c is satisfied, and remeasure $F_Q^M(z)$, or

2. Comply with the requirements of Specification 3.2.2 for $F_Q(z)$ exceeding its limit by the maximum percent calculated over the core height (z) with the following expression:

$$\left\{\left[\frac{F_Q^M(z) \times W(z)_{BL}}{\frac{F_Q^{RTP}}{P} \times K(z)}\right] - 1\right\} \times 100 \text{ for } P \geq APL^{ND}$$

g. The limits specified in 4.2.2.4.c, 4.2.2.4.e, and 4.2.2.4.f above are not applicable in the following core plane regions:

1. Lower core region 0 to 10%, inclusive.

2. Upper core region 90 to 100%, inclusive.

4.2.2.5 When $F_Q(z)$ is measured for reasons other than meeting the requirements of Specification 4.2.2.2 an overall measured $F_Q(z)$ shall be obtained:

a. From a power distribution map

1. When THERMAL POWER is ≤ 25%, but > 5% of RATED THERMAL POWER, or

2. When the Power Distribution Monitoring System (PDMS) is inoperable;

and increasing the measured $F_Q(z)$ by the applicable manufacturing and measurement uncertainties as specified in the COLR.

b. From the PDMS when THERMAL POWER is > 25% of RATED THERMAL POWER; and increasing the measured $F_Q(z)$ by the applicable manufacturing and measurement uncertainties as specified in the COLR.

HEAT FLUX HOT CHANNEL FACTOR and RCS FLOWRATE and NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

For measurements obtained using the Power Distribution Monitoring System (PDMS), the appropriate measurement uncertainty is determined using the measurement uncertainty methodology contained in WCAP-12472-P-A. The cycle and plant specific uncertainty calculation information needed to support the PDMS calculation is contained in the COLR. The PDMS will automatically calculate and apply the correct measurement uncertainty, and apply a 3% allowance for manufacturing tolerance.

The hot channel factor $F_Q^M(z)$ is measured periodically and increased by a cycle and height dependent power factor appropriate to either RAOC or Base Load operation, W(z) or $W(z)_{BL}$, to provide assurance that the limit on the hot channel factor, $F_Q(z)$ is met. W(z) accounts for the effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. $W(z)_{BL}$ accounts for the more restrictive operating limits allowed by Base Load operation which result in less severe transient values. If two most recent $F_Q(z)$ evaluations show an increase in the maximum value of $\left[\frac{F_Q^M(z)}{K(z)}\right]$ over the core height (z), it is not guaranteed that $F_Q^M(z)$ will remain within the transient limit during the following surveillance interval. Technical Specification Surveillance Requirement 4.2.2 requires that $F_Q^M(z)$ be increased by a penalty factor as specified in the COLR and compared to the transient $F_Q(z)$ limit. If there is insufficient margin, i.e., this value exceeds the limit, the $F_Q^M(z)$ must be measured once per 7 EFPD until either $F_Q^M(z)$ increased by the penalty factor is within the transient limit, or two successive power distribution measurements indicate the maximum value of $\left[\frac{F_Q^M(z)}{K(z)}\right]$ over the core height (z) has not increased. The W(z) and $W(z)_{BL}$ functions described above for normal operation are specified in the CORE OPERATING LIMITS REPORT (COLR) per Specification 6.9.1.11.

When RCS flow rate is measured, no additional allowances are necessary prior to comparison with the limits of the RCS Total Rate Versus R figure in the COLR. Measurement errors of 2.1% for RCS total flow rate, including 0.1% for feedwater venturi fouling, have been allowed for in determining the limits of RCS Total Flow Rate Versus R Figure in the COLR.

For $F_{\Delta H}^N$ measurements obtained from a full core flux map taken with the incore detector flux mapping system, a 4% measurement uncertainty allowance should be applied to the measured $F_{\Delta H}^N$ value prior to comparison with the limits of the RCS Total Flow Rate Versus R Figure in the COLR. The appropriate measurement uncertainty for $F_{\Delta H}^N$ measurements obtained using the Power Distribution Monitoring System (PDMS) is determined using the uncertainty methodology described in WCAP-12472-P-A. The cycle and plant specific uncertainty calculation information needed to support the PDMS uncertainty calculation is

HEAT FLUX HOT CHANNEL FACTOR and RCS FLOWRATE and NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

contained in the COLR. The PDMS will automatically calculate and apply the correct measurement uncertainty to the measured $F^N_{\Delta H}$ value.

The 12-hour periodic surveillance of indicated RCS flow is sufficient to detect only flow degradation which could lead to operation outside the acceptable region of operation specified on the RCS Total Flow Rate Versus R F.igure in the COLR.

3/4.2.4 QUADRANT POWER TILT RATIO

The quadrant power tilt power ratio limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during startup testing and periodically during power operation.

The limit of 1.02, at which corrective action is required, provides DNB and linear heat generation rate protection with x-y plane power tilts. A limiting tilt of 1.025 can be tolerated before the margin for uncertainty in F_Q is depleted. The limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The two hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned control rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the maximum allowed power by 3 percent for each percent of tilt in excess of 1.0.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the movable incore detectors or a core power distribution measurement are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of 4 symmetric thimbles. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, N-8.

3/4.2.5 DNB PARAMETERS

The limits on the DNB related parameters assure that each of the parameters are maintained within the normal steady state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the initial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum of DNBR in the core at or above the design limit throughout each analyzed transient. The maximum indicated T_{avg} limit of 589.2°F and the minimum indicated pressure limit of 2206 psig correspond to analytical limits of 591.4°F and 2185 psig respectively, read from control board indications.

The 12-hour periodic surveillance of these parameters through instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation.