c. Pressure Boundary LEAKAGE

Pressure Boundary LEAKAGE shall be LEAKAGE (except steam generator tube LEAKAGE) through a nonisolable fault in a Reactor Coolant System component body, pipe wall or vessel wall.

1.15 THROUGH 1.17 (DELETED)

QUADRANT POWER TILT RATIO (QPTR)

1.18 QPTR shall be the ratio of the maximum upper excore detector calibrated output to the average of the upper excore detector calibrated outputs, or the ratio of the maximum lower excore detector calibrated output to the average of the lower excore detector calibrated outputs, whichever is greater.

DOSE EQUIVALENT I-131

1.19 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (μCi/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Regulatory Guide 1.109, 1977.

STAGGERED TEST BASIS

1.20 A STAGGERED TEST BASIS shall consist of:

a. A test schedule for n systems, subsystems, trains or other designated components obtained by dividing the specified test interval into n equal subintervals;

b. The testing of one (1) system, subsystem, train or other designated component at the beginning of each subinterval.

FREQUENCY NOTATION

1.21 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.2.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR)

LIMITING CONDITION FOR OPERATION

3.2.4 The QUADRANT POWER TILT RATIO shall be less than or equal to 1.02.

APPLICABILITY: MODE 1 greater than 50 percent of RATED THERMAL POWER.[1]

ACTION: With the QPTR not within the limit:

a. Within 2 hours, reduce THERMAL POWER greater than or equal to 3 percent from RATED THERMAL POWER (RTP) for each 1 percent of QPTR greater than 1.00, and

b. Within 12 hours and once per 12 hours thereafter, perform Surveillance Requirement 4.2.4 and reduce THERMAL POWER greater than or equal to 3 percent from RTP for each 1 percent of QPTR greater than 1.00, and

c. Within 24 hours and once per 7 days thereafter, perform Surveillance Requirements 4.2.2.2 and 4.2.3.1, and

d. Prior to increasing THERMAL POWER above the limit of ACTION a or b above, re-evaluate the safety analyses and confirm the results remain valid for the duration of operation under this condition, and

e. After ACTION d above is completed and prior to increasing THERMAL POWER above the limit of ACTION a or b above, normalize the excore detectors to show a QPTR less than or equal to 1.02, and

f. After ACTION e above is completed and within 24 hours after reaching RTP or within 48 hours after increasing THERMAL POWER above the limit of ACTION a or b above, perform Surveillance Requirements 4.2.2.2 and 4.2.3.1.

g. Otherwise, reduce THERMAL POWER to less than or equal to 50 percent RTP within 4 hours.

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(1) See Special Test Exception 3.10.2.

SURVEILLANCE REQUIREMENTS

4.2.4 Verify the QPTR is within the limit:

a. By calculation[2] at least:

1) Once per 7 days with the QPTR alarm OPERABLE, and

2) Once within 12 hours and every 12 hours thereafter with the QPTR alarm inoperable.

b. Using the movable incore detectors once within 12 hours and every 12 hours thereafter.[3]

(2) With one power range high neutron flux channel input to QPTR inoperable and THERMAL POWER less than 75 percent RTP, the remaining three power range high neutron flux channels can be used for calculating the QPTR.

(3) Only required to be performed with less than four power range high neutron flux channels input to QPTR operable with THERMAL POWER greater than or equal to 75 percent RTP.

TABLE 3.3-1 (Continued)

TABLE NOTATION

(1) Trip function may be manually bypassed in this Mode above P-10.

(2) Trip function may be manually bypassed in this Mode above P-6.

(3) With the reactor trip system breakers in the closed position and the control rod drive system capable of rod withdrawal.

ACTION STATEMENTS

ACTION 1 - With the number of OPERABLE Channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 6 hours or be in at least HOT STANDBY within the next 6 hours; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1, provided the other channel is OPERABLE.

ACTION 2 - With one power range neutron flux channel inoperable,[4] perform one of the following, as applicable:

a. Power Range High Neutron Flux Channel

   1. Place the inoperable channel in trip within 6 hours and reduce THERMAL POWER to less than or equal to 75 percent RATED THERMAL POWER within the next 6 hours and perform SR 4.2.4,[5] or

   2. Place the inoperable channel in trip within 6 hours and perform SR 4.2.4,[5] or

   3. Be in MODE 3 within 12 hours.

b. All other channels

   1. Place the inoperable channel in trip within 6 hours, or

   2. Be in MODE 3 within 12 hours.

---

(4) The inoperable channel may be bypassed for up to 4 hours for surveillance testing and setpoint adjustment of other channels.

(5) Only required to be performed when the power range high neutron flux channel input to QPTR is inoperable.

TABLE 3.3-1 (Continued)

ACTION 3 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement and with the THERMAL POWER level:

a. Below P-6, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint.

b. Above P-6 but below 5 percent of RATED THERMAL POWER, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above 5 percent of RATED THERMAL POWER.

c. Above 5 percent of RATED THERMAL POWER, POWER OPERATION may continue.

ACTION 4 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement and with the THERMAL POWER level:

a. Below P-6, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint.

b. Above P-6, operation may continue.

ACTION 5 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, verify compliance with the SHUTDOWN MARGIN requirements of Specification 3.1.1.1 or Specification 3.1.1.2, as applicable within 1 hour, and at least once per 12 hours thereafter.

ACTION 6 - Not applicable.

ACTION 7 - With the number of OPERABLE channels(6) one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours, and

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of their channels per Specification 4.3.1.1.1.

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(6) An OPERABLE hot leg channel consists of: 1) three RTDs per hot leg, or 2) two RTDs per hot leg with the failed RTD disconnected and the required bias applied.

TABLE 3.3-1 (Continued)

ACTION 8 - With the number of OPERABLE channels one less than the Total Number of Channels and with the THERMAL POWER level above P-7, place the inoperable channel in the tripped condition within 6 hours; operation may continue until performance of the next required CHANNEL FUNCTIONAL TEST.

ACTION 9 - Not applicable.

ACTION 10 - Not applicable.

ACTION 11 - With less than the Minimum Number of Channels OPERABLE, operation may continue provided the inoperable channel is placed in the tripped condition within 6 hours.

ACTION 12 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in HOT STANDBY within the next 6 hours and/or open the reactor trip breakers.

ACTION 39 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 40 -

a. With one of the diverse trip features (undervoltage or shunt trip attachment) of a reactor trip breaker inoperable, restore the diverse trip feature to OPERABLE status within 48 hours or declare the breaker inoperable and be in HOT STANDBY within the next 6 hours. Neither breaker shall be bypassed while one of the diverse trip features is inoperable except for the time required for performing maintenance to restore the breaker to OPERABLE status.

b. With one reactor trip breaker inoperable as a result of something other than an inoperable diverse trip feature; be in at least HOT STANDBY within 6 hours, however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.1.1.1, provided the other channel is OPERABLE.

(next page is 3/4 3-9)

3/4.2.2 AND 3/4.2.3 HEAT FLUX AND NUCLEAR ENTHALPY HOT CHANNEL

FACTORS-$F_Q(Z)$ and FNΔH (Continued)

Fuel rod bowing reduces the value of the DNB ratio. Margin has been maintained between the DNBR value used in the safety analyses (1.33) and the design limit (1.21) to offset the rod bow penalty and other penalties which may apply.

The radial peaking factor $F_{xy}(Z)$ is measured periodically to provide assurance that the hot channel factor, $F_Q(Z)$, remains within its limits. The F_{xy} limit for RATED THERMAL POWER F_{xy}^{RTP} provided in the CORE OPERATING LIMITS REPORT was determined from expected power control maneuvers over the full range of burnup conditions in the core.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR)

BACKGROUND

The Quadrant Power Tilt Ratio limit ensures that the gross radial power distribution remains consistent with the design values used in the safety analyses. Precise radial power distribution measurements are made during startup testing, after refueling, and periodically during power operation. The QPTR is routinely determined using the power range channel input which is part of the power range nuclear instrumentation (NI). The power range channel provides a protection function and has operability requirements in LCO 3.3.1. While part of the NI channel, the power range channel input to QPTR functions independently of the power range channel in monitoring radial power distribution. For this reason, if the power range channel output is inoperable, the power range channel input to QPTR may be unaffected and capable of monitoring for the QPTR.

The power density at any point in the core must be limited so that the fuel design criteria are maintained. Together, LCO 3.2.1, "AXIAL FLUX DIFFERENCE (AFD)," LCO 3.2.4, and LCO 3.1.3.6, "Control Rod Insertion Limits," provide limits on process variables that characterize and control the three dimensional power distribution of the reactor core. Control of these variables ensures that the core operates within the design criteria and that the power distribution remains within the bounds used in the safety analyses.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

APPLICABLE SAFETY ANALYSES

This LCO precludes core power distributions that violate the following fuel design criteria:

a. During a large break loss of coolant accident, the peak cladding temperature must not exceed 2200°F in accordance with 10 CFR 50.46;

b. During a loss of forced reactor coolant flow accident, there must be at least 95 percent probability at the 95 percent confidence level (the 95/95 departure from nucleate boiling (DNB) criterion) that the hot fuel rod in the core does not experience a DNB condition;

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm in accordance with the indicated failure threshold from the TREAT results (UFSAR 14.2.6), and

d. The control rods must be capable of shutting down the reactor with a minimum required Shutdown Margin (SDM) with the highest worth control rod stuck fully withdrawn in accordance with 10 CFR 50, Appendix A, GDC 26.

The LCO limits on the AFD, the QPTR, the Heat Flux Hot Channel Factor ($F_Q(Z)$), the Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$), and control bank insertion are established to preclude core power distributions that exceed the safety analyses limits.

The QPTR limits ensure that $F^N_{\Delta H}$ and $F_Q(Z)$ remain below their limiting values by preventing an undetected change in the gross radial power distribution.

In MODE 1, the $F^N_{\Delta H}$ and $F_Q(Z)$ limits must be maintained to preclude core power distributions from exceeding design limits assumed in the safety analysis.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

LCO

The QPTR limit of 1.02, at which corrective action is required, provides a margin of protection for both the DNB ratio and linear heat generation rate contributing to excessive power peaks resulting from X-Y plane power tilts. A limiting QPTR of 1.02 can be tolerated before the margin for uncertainty in $F_Q(Z)$ and ($F^N_{\Delta H}$) is possibly challenged.

APPLICABILITY

The QPTR limit must be maintained in MODE 1 with THERMAL POWER greater than 50 percent RATED THERMAL POWER (RTP) to prevent core power distributions from exceeding the design limits.

Applicability in MODE 1 less than or equal to 50 percent RTP and in other MODES is not required because there is either insufficient stored energy in the fuel or insufficient energy being transferred to the reactor coolant to require the implementation of a QPTR limit on the distribution of core power. The QPTR limit in these conditions is, therefore, not important. Note that the $F^N_{\Delta H}$ and $F_Q(Z)$ LCOs still apply, but allow progressively higher peaking factors at 50 percent RTP or lower.

ACTION

a. With the QPTR exceeding its limit, a power level reduction of 3 percent RTP for each 1 percent by which the QPTR exceeds 1.00 is a conservative tradeoff of total core power with peak linear power. The completion time of 2 hours allows sufficient time to identify the cause and correct the tilt. Note that the power reduction itself may cause a change in the tilted condition.

b. After completion of Action a, the QPTR alarm may still be in its alarmed state. As such, any additional changes in the QPTR are detected by requiring a check of the QPTR once per 12 hours thereafter. If the QPTR continues to increase, THERMAL POWER has to be reduced accordingly. A 12 hour completion time is sufficient because any additional change in QPTR would be relatively slow.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

ACTION (Continued)

c. The peaking factors $F^N_{\Delta H}$ and $F_Q(Z)$ are of primary importance in ensuring that the power distribution remains consistent with the initial conditions used in the safety analyses. Performing surveillances on $F^N_{\Delta H}$ and $F_Q(Z)$ within the completion time of 24 hours ensures that these primary indicators of power distribution are within their respective limits. A completion time of 24 hours takes into consideration the rate at which peaking factors are likely to change, and the time required to stabilize the plant and perform a flux map. If these peaking factors are not within their limits, the actions provide an appropriate response for the abnormal condition. If the QPTR remains above its specified limit, the peaking factor surveillances are required each 7 days thereafter to evaluate $F^N_{\Delta H}$ and $F_Q(Z)$ with changes in power distribution. Relatively small changes are expected due to either burnup and xenon redistribution or correction of the cause for exceeding the QPTR limit.

d. Although $F^N_{\Delta H}$ and $F_Q(Z)$ are of primary importance as initial conditions in the safety analyses, other changes in the power distribution may occur as the QPTR limit is exceeded and may have an impact on the validity of the safety analysis. A change in the power distribution can affect such reactor parameters as bank worths and peaking factors for rod malfunction accidents. When the QPTR exceeds its limit, it does not necessarily mean a safety concern exists. It does mean that there is an indication of a change in the gross radial power distribution that requires an investigation and evaluation that is accomplished by examining the incore power distribution. Specifically, the core peaking factors and the quadrant tilt must be evaluated because they are the factors that best characterize the core power distribution. This re-evaluation is required to ensure that, before increasing THERMAL POWER to above the limit of ACTION a or b, the reactor core conditions are consistent with the assumptions in the safety analyses.

e. If the QPTR has exceeded the 1.02 limit and a re-evaluation of the safety analysis is completed and shows that safety requirements are met, the excore detectors are normalized to

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

ACTION (Continued)

show a QPTR less than or equal to 1.02 prior to increasing THERMAL POWER to above the limit of ACTION a or b. This is done to detect any subsequent significant changes in QPTR.

This action assures that the indicated QPT is not normalized until after the re-evaluation of the safety analysis has determined that core conditions at RTP are within the safety analysis assumptions (i.e., ACTION d). This is intended to prevent any ambiguity about the required sequence of actions.

f. Once the flux tilt is normalized (i.e., ACTION e is performed), it is acceptable to return to full power operation. However, as an added check that the core power distribution at RTP is consistent with the safety analysis assumptions, ACTION f requires verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their specified limits within 24 hours of reaching RTP. As an added precaution, if the core power does not reach RTP within 24 hours, but is increased slowly, then the peaking factor surveillances must be performed within 48 hours of the time when the ascent to power was begun. These completion times are intended to allow adequate time to increase THERMAL POWER to above the limit of ACTION a or b, while not permitting the core to remain with unconfirmed power distributions for extended periods of time.

This action assures that the peaking factor surveillances may only be done after the excore detectors have been normalized to show a tilt less than or equal to 1.02 (i.e., ACTION e). The intent of this is to have the peaking factor surveillances performed at operating power levels, which can only be accomplished after the excore detectors are normalized to show a tilt less than or equal to 1.02 and the core returned to power.

g. If ACTIONS a through f are not completed within their associated completion times, the unit must be brought to a MODE or condition in which the requirements do not apply. To achieve this status, THERMAL POWER must be reduced to less than 50 percent RTP within 4 hours. The allowed completion time of 4 hours is reasonable, based on operating experience regarding the amount of time required to reach the reduced power level without challenging plant systems.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

SURVEILLANCE REQUIREMENTS (SR)

SR 4.2.4.a

SR 4.2.4.a is modified by a Note that allows QPTR to be calculated with three power range high neutron flux channels that input to QPTR if THERMAL POWER is less than 75 percent RTP and one power range high neutron flux channel is inoperable.

This surveillance verifies that the QPTR, as indicated by the Nuclear Instrumentation System (NIS) channels, excore channels, is within its limits. The frequency of 7 days when the QPTR alarm is OPERABLE is acceptable because of the low probability that this alarm can remain inoperable without detection.

When the QPTR alarm is inoperable, the frequency is increased to 12 hours. This frequency is adequate to detect any relatively slow changes in QPTR, because for those causes of QPT that occur quickly (e.g., a dropped rod), there typically are other indications of abnormality that prompt a verification of core power tilt.

SR 4.2.4.b

This surveillance is modified by a Note, which states that it is required only when less than four power range high neutron flux channels input to QPTR are operable and the THERMAL POWER is greater than or equal to 75 percent RTP.

With an excore detector inoperable, tilt monitoring for a portion of the reactor core becomes degraded. Large tilts are likely detected with the remaining channels, but the capability for detection of small power tilts in some quadrants is decreased. Performing SR 4.2.4.b at a frequency of 12 hours provides an accurate alternative means for ensuring that any tilt remains within its limits.

For purposes of monitoring the QPTR when one excore detector is inoperable, the moveable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the indicated QPTR and any previous data indicating a tilt. The incore detector monitoring is performed with a full incore flux map or a partial core flux map with quarter core symmetry detailed in accordance with controlled procedures.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

SURVEILLANCE REQUIREMENTS (SR) (Continued)

The symmetric thimble flux map can be used to generate symmetric thimble "tilt." This can be compared to a reference symmetric thimble tilt, from the most recent full core flux map, to generate an incore QPTR. Therefore, the symmetric thimble flux map can be used to confirm that QPTR is within limits.

With one excore detector inoperable, the indicated tilt may be changed from the value indicated with all four channels OPERABLE. To confirm that no change in tilt has actually occurred, which might cause the QPTR limit to be exceeded, the incore results may be compared against previous flux maps either using the symmetric thimbles as described above or a complete flux map. Nominally, quadrant tilt from the surveillance should be within 2 percent of the tilt shown by the most recent flux map data.

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 DNBR greater than or equal to the design DNBR limit throughout each analyzed transient.

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. The 18 month periodic measurement of the RCS total flow rate is adequate to detect flow degradation and ensure correlation of the flow indication channels with measured flow such that the indicated percent flow will provide sufficient verification of flow rate on a 12 hour basis.

3/4.3.1 and 3/4.3.2 PROTECTIVE AND ENGINEERED SAFETY FEATURES (ESF) INSTRUMENTATION (Continued)

Below the setpoint P-11 allows the manual block of safety injection actuation on low pressurizer pressure, allows manual block of safety injection and steamline isolation on low steamline pressure (with Loop Stop Valves Open) and enabling steamline isolation on high steam pressure rate, automatically disables auto actuation of the pressurizer PORVs unless the Reactor Vessel Over Pressure Protection System is in service.

P-12 Above the setpoint P-12 automatically reinstates an arming signal to the steam dump system. Below the setpoint P-12 blocks steam dump and allows manual bypass of the steam dump block to cooldown condenser dump valves.

Table 3.3-1 Action 2 has been modified by two notes. Note (4) allows placing the inoperable channel in the bypass condition for up to 4 hours while performing: a) routine surveillance testing of other channels, and b) setpoint adjustments of other channels when required to reduce the setpoint in accordance with other technical specifications. The 4 hour time limit is justified in accordance with WCAP-10271-P-A, Supplement 2, Revision 1, June 1990. Note (5) only requires SR 4.2.4 to be performed if a Power Range High Neutron Flux channel input to QPTR becomes inoperable. Failure of a component in the Power Range High Neutron Flux channel which renders the High Neutron Flux trip function inoperable may not affect the capability to monitor QPTR. As such, determining QPTR using the movable incore detectors once per 12 hours may not be necessary.

ATTACHMENT TO LICENSE AMENDMENT NO. ____

FACILITY OPERATING LICENSE NO. NPF-73

DOCKET NO. 50-412

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

Remove	Insert
1-3	1-3
3/4 2-9	3/4 2-9
3/4 2-10	3/4 2-10
3/4 3-5	3/4 3-5
3/4 3-6	3/4 3-6
3/4 3-7	3/4 3-7
B 3/4 2-5	B 3/4 2-5
----	B 3/4 2-6
----	B 3/4 2-7
----	B 3/4 2-8
----	B 3/4 2-9
----	B 3/4 2-10
----	B 3/4 2-11
B 3/4 3-3	B 3/4 3-3

LEAKAGE

1.14 LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be Pressure Boundary LEAKAGE, or

3. Reactor Coolant System LEAKAGE through a steam generator to the secondary system.

b. Unidentified LEAKAGE

Unidentified LEAKAGE shall be all LEAKAGE (except reactor coolant pump seal water injection or leakoff) that is not Identified LEAKAGE.

c. Pressure Boundary LEAKAGE

Pressure Boundary LEAKAGE shall be LEAKAGE (except steam generator tube LEAKAGE) through a nonisolable fault in a Reactor Coolant System component body, pipe wall or vessel wall.

1.15 THROUGH 1.17 (DELETED)

QUADRANT POWER TILT RATIO (QPTR)

1.18 QPTR shall be the ratio of the maximum upper excore detector calibrated output to the average of the upper excore detector calibrated outputs, or the ratio of the maximum lower excore detector calibrated output to the average of the lower excore detector calibrated outputs, whichever is greater.

POWER DISTRIBUTION LIMITS

QUADRANT POWER TILT RATIO (QPTR)

LIMITING CONDITION FOR OPERATION

3.2.4 The QUADRANT POWER TILT RATIO shall be less than or equal to 1.02.

APPLICABILITY: MODE 1 greater than 50 percent of RATED THERMAL POWER.[1]

ACTION: With the QPTR not within the limit:

a. Within 2 hours, reduce THERMAL POWER greater than or equal to 3 percent from RATED THERMAL POWER (RTP) for each 1 percent of QPTR greater than 1.00, and

b. Within 12 hours and once per 12 hours thereafter, perform Surveillance Requirement 4.2.4 and reduce THERMAL POWER greater than or equal to 3 percent from RTP for each 1 percent of QPTR greater than 1.00, and

c. Within 24 hours and once per 7 days thereafter, perform Surveillance Requirements 4.2.2.2 and 4.2.3.1, and

d. Prior to increasing THERMAL POWER above the limit of ACTION a or b above, re-evaluate the safety analyses and confirm the results remain valid for the duration of operation under this condition, and

e. After ACTION d above is completed and prior to increasing THERMAL POWER above the limit of ACTION a or b above, normalize the excore detectors to show QPTR less than or equal to 1.02, and

f. After ACTION e above is completed and within 24 hours after reaching RTP or within 48 hours after increasing THERMAL POWER above the limit of ACTION a or b above, perform Surveillance Requirements 4.2.2.2 and 4.2.3.1.

g. Otherwise, reduce THERMAL POWER to less than or equal to 50 percent RTP within 4 hours.

---

(1) See Special Test Exception 3.10.2.

SURVEILLANCE REQUIREMENTS

4.2.4 Verify the QPTR is within the limit:

a. By calculation[2] at least:

1) Once per 7 days with the QPTR alarm OPERABLE and

2) Once within 12 hours and every 12 hours thereafter with the QPTR alarm inoperable.

b. Using the movable incore detectors once within 12 hours and every 12 hours thereafter.[3]

(2) With one power range high neutron flux channel input to QPTR inoperable and THERMAL POWER less than 75 percent RTP, the remaining three power range high neutron flux channels can be used for calculating the QPTR.

(3) Only required to be performed with less than four power range high neutron flux channels input to QPTR operable with THERMAL POWER greater than or equal to 75 percent RTP.

TABLE 3.3-1 (Continued)

TABLE NOTATION

(1) Trip function may be manually bypassed in this MODE above P-10.

(2) Trip function may be manually bypassed in this MODE above P-6.

(3) With the reactor trip system breakers in the closed position and the control rod drive system capable of rod withdrawal.

ACTION STATEMENTS

ACTION 1 - With the number of OPERABLE Channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 6 hours or be in at least HOT STANDBY within the next 6 hours; however, one channel may be bypassed for up to 4 hours for surveillance testing per Specification 4.3.1.1.1, provided the other channel is OPERABLE.

ACTION 2 - With one power range neutron flux channel inoperable,(4) perform one of the following, as applicable:

a. Power Range High Neutron Flux Channel

1. Place the inoperable channel in trip within 6 hours and reduce THERMAL POWER to less than or equal to 75 percent RATED THERMAL POWER within the next 6 hours and perform SR 4.2.4,(5) or

2. Place the inoperable channel in trip within 6 hours and perform SR 4.2.4,(5) or

3. Be in MODE 3 within 12 hours.

b. All other channels

1. Place the inoperable channel in trip within 6 hours, or

2. Be in MODE 3 within 12 hours.

---

(4) The inoperable channel may be bypassed for up to 4 hours for surveillance testing and setpoint adjustment of other channels.

(5) Only required to be performed when the power range high neutron flux channel input to QPTR is inoperable.

TABLE 3.3-1 (Continued)

ACTION 3 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement and with the THERMAL POWER level:

a. Below P-6, restore the inoperable channel to OPERABLE status prior to increaing THERMAL POWER above the P-6 setpoint.

b. Above P-6 but below 5 percent of RATED THERMAL POWER, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above 5 percent of RATED THERMAL POWER.

c. Above 5 percent of RATED THERMAL POWER, POWER OPERATION may continue.

ACTION 4 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement and with the THERMAL POWER level:

a. Below P-6, restore the inoperable channel to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint and suspend positive reactivity operations.

b. Above P-6, operation may continue.

ACTION 5 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the Reactor Trip System breakers, suspend all operations involving positive reactivity changes and verify Valve 2CHS-91 is closed and secured in position within the next hour.

ACTION 6 - This Action is not used.

ACTION 7 - With the number of OPERABLE channels[(6)] one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours, and

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.1.1.1.

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(6) An OPERABLE hot leg channel consists of: 1) three RTDs per hot leg, or 2) two RTDs per hot leg with the failed RTD disconnected and the required bias applied.

TABLE 3.3-1 (Continued)

ACTION 8 - With the number of OPERABLE channels one less than the Total Number of Channels and with the THERMAL POWER level above P-9, place the inoperable channel in the tripped condition within 6 hours; operation may continue until performance of the next required CHANNEL FUNCTIONAL TEST.

ACTION 9 - This Action is not used.

ACTION 10 - This Action is not used.

ACTION 11 - With less than the Minimum Number of Channels OPERABLE, operation may continue provided the inoperable channel is placed in the tripped condition within 6 hours.

ACTION 12 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in HOT STANDBY within the next 6 hours and/or open the reactor trip breakers.

ACTION 39 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or open the reactor trip breakers within the next hour.

ACTION 40 -

a. With one of the diverse trip features (undervoltage or shunt trip attachment) of a reactor trip breaker inoperable, restore the diverse trip feature to OPERABLE status within 48 hours or declare the breaker inoperable and be in HOT STANDBY within the next 6 hours. Neither breaker shall be bypassed while one of the diverse trip features is inoperable except for the time required for performing maintenance to restore the breaker to OPERABLE status.

b. With one reactor trip breaker inoperable as a result of something other than an inoperable diverse trip feature, be in at least HOT STANDBY within 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.1.1.1, provided the other channel is OPERABLE.

ACTION 44 - With less than the Minimum Number of Channels OPERABLE, within 1 hour determine by observation of the associated permissive annunciator window(s) that the interlock is in its required state for the existing plant condition, or apply Specification 3.0.3.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR)

BACKGROUND

The Quadrant Power Tilt Ratio limit ensures that the gross radial power distribution remains consistent with the design values used in the safety analyses. Precise radial power distribution measurements are made during startup testing, after refueling, and periodically during power operation. The QPTR is routinely determined using the power range channel input which is part of the power range nuclear instrumentation (NI). The power range channel provides a protection function and has operability requirements in LCO 3.3.1. While part of the NI channel, the power range channel input to QPTR functions independently of the power range channel in monitoring radial power distribution. For this reason, if the power range channel output is inoperable, the power range channel input to QPTR may be unaffected and capable of monitoring for the QPTR.

The power density at any point in the core must be limited so that the fuel design criteria are maintained. Together, LCO 3.2.1, "AXIAL FLUX DIFFERENCE (AFD)," LCO 3.2.4, and LCO 3.1.3.6, "Control Rod Insertion Limits," provide limits on process variables that characterize and control the three dimensional power distribution of the reactor core. Control of these variables ensures that the core operates within the design criteria and that the power distribution remains within the bounds used in the safety analyses.

APPLICABLE SAFETY ANALYSES

This LCO precludes core power distributions that violate the following fuel design criteria:

a. During a large break loss of coolant accident, the peak cladding temperature must not exceed 2200°F in accordance with 10 CFR 50.46;

b. During a loss of forced reactor coolant flow accident, there must be at least 95 percent probability at the 95 percent confidence level (the 95/95 departure from nucleate boiling (DNB) criterion) that the hot fuel rod in the core does not experience a DNB condition;

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm in accordance with the indicated failure threshold from the TREAT results (UFSAR 15.4.8), and

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

APPLICABLE SAFETY ANALYSES (Continued)

d. The control rods must be capable of shutting down the reactor with a minimum required Shutdown Margin (SDM) with the highest worth control rod stuck fully withdrawn in accordance with 10 CFR 50, Appendix A, GDC 26.

The LCO limits on the AFD, the QPTR, the Heat Flux Hot Channel Factor ($F_Q(Z)$), the Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$), and control bank insertion are established to preclude core power distributions that exceed the safety analyses limits.

The QPTR limits ensure that $F^N_{\Delta H}$ and $F_Q(Z)$ remain below their limiting values by preventing an undetected change in the gross radial power distribution.

In MODE 1, the $F^N_{\Delta H}$ and $F_Q(Z)$ limits must be maintained to preclude core power distributions from exceeding design limits assumed in the safety analysis.

LCO

The QPTR limit of 1.02, at which corrective action is required, provides a margin of protection for both the DNB ratio and linear heat generation rate contributing to excessive power peaks resulting from X-Y plane power tilts. A limiting QPTR of 1.02 can be tolerated before the margin for uncertainty in $F_Q(Z)$ and ($F^N_{\Delta H}$) is possibly challenged.

APPLICABILITY

The QPTR limit must be maintained in MODE 1 with THERMAL POWER greater than 50 percent RATED THERMAL POWER (RTP) to prevent core power distributions from exceeding the design limits.

Applicability in MODE 1 less than or equal to 50 percent RTP and in other MODES is not required because there is either insufficient stored energy in the fuel or insufficient energy being transferred to

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

APPLICABILITY (Continued)

the reactor coolant to require the implementation of a QPTR limit on the distribution of core power. The QPTR limit in these conditions is, therefore, not important. Note that the $F^N_{\Delta H}$ and $F_Q(Z)$ LCOs still apply, but allow progressively higher peaking factors at 50 percent RTP or lower.

ACTION

a. With the QPTR exceeding its limit, a power level reduction of 3 percent RTP for each 1 percent by which the QPTR exceeds 1.00 is a conservative tradeoff of total core power with peak linear power. The completion Time of 2 hours allows sufficient time to identify the cause and correct the tilt. Note that the power reduction itself may cause a change in the tilted condition.

b. After completion of ACTION a, the QPTR alarm may still be in its alarmed state. As such, any additional changes in the QPTR are detected by requiring a check of the QPTR once per 12 hours thereafter. If the QPTR continues to increase, THERMAL POWER has to be reduced accordingly. A 12 hour completion time is sufficient because any additional change in QPTR would be relatively slow.

c. The peaking factors $F^N_{\Delta H}$ and $F_Q(Z)$ are of primary importance in ensuring that the power distribution remains consistent with the initial conditions used in the safety analyses. Performing surveillances on $F^N_{\Delta H}$ and $F_Q(Z)$ within the completion time of 24 hours ensures that these primary indicators of power distribution are within their respective limits. A completion time of 24 hours takes into consideration the rate at which peaking factors are likely to change, and the time required to stabilize the plant and perform a flux map. If these peaking factors are not within their limits, the actions provide an appropriate response for the abnormal condition. If the QPTR remains above its specified limit, the peaking factor surveillances are required each 7 days thereafter to evaluate $F^N_{\Delta H}$ and $F_Q(Z)$ with changes in power distribution. Relatively small changes are expected due to either burnup and xenon redistribution or correction of the cause for exceeding the QPTR limit.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

ACTION (Continued)

d. Although $F^N_{\Delta H}$ and $F_Q(Z)$ are of primary importance as initial conditions in the safety analyses, other changes in the power distribution may occur as the QPTR limit is exceeded and may have an impact on the validity of the safety analysis. A change in the power distribution can affect such reactor parameters as bank worths and peaking factors for rod malfunction accidents. When the QPTR exceeds its limit, it does not necessarily mean a safety concern exists. It does mean that there is an indication of a change in the gross radial power distribution that requires an investigation and evaluation that is accomplished by examining the incore power distribution. Specifically, the core peaking factors and the quadrant tilt must be evaluated because they are the factors that best characterize the core power distribution. This re-evaluation is required to ensure that, before increasing THERMAL POWER to above the limit of ACTION a or b, the reactor core conditions are consistent with the assumptions in the safety analyses.

e. If the QPTR has exceeded the 1.02 limit and a re-evaluation of the safety analysis is completed and shows that safety requirements are met, the excore detectors are normalized to show a QPTR less than or equal to 1.02 prior to increasing THERMAL POWER to above the limit of ACTION a or b. This is done to detect any subsequent significant changes in QPTR.

   This action assures that the indicated QPT is not normalized until after the re-evaluation of the safety analysis has determined that core conditions at RTP are within the safety analysis assumptions (i.e., ACTION d). This is intended to prevent any ambiguity about the required sequence of actions.

f. Once the flux tilt is normalized (i.e., ACTION e is performed), it is acceptable to return to full power operation. However, as an added check that the core power distribution at RTP is consistent with the safety analysis assumptions, ACTION f requires verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their specified limits within 24 hours of reaching RTP. As an added precaution, if the core

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

ACTION (Continued)

power does not reach RTP within 24 hours, but is increased slowly, then the peaking factor surveillances must be performed within 48 hours of the time when the ascent to power was begun. These completion times are intended to allow adequate time to increase THERMAL POWER to above the limit of ACTION a or b, while not permitting the core to remain with unconfirmed power distributions for extended periods of time.

This action assures that the peaking factor surveillances may only be done after the excore detectors have been normalized to show a tilt less than or equal to 1.02 (i.e., ACTION e). The intent of this is to have the peaking factor surveillances performed at operating power levels, which can only be accomplished after the excore detectors are normalized to show a tilt less than or equal to 1.02 and the core returned to power.

g. If ACTIONS a through f are not completed within their associated completion times, the unit must be brought to a MODE or condition in which the requirements do not apply. To achieve this status, THERMAL POWER must be reduced to less than 50 percent RTP within 4 hours. The allowed completion time of 4 hours is reasonable, based on operating experience regarding the amount of time required to reach the reduced power level without challenging plant systems.

SURVEILLANCE REQUIREMENTS (SR)

SR 4.2.4.a

SR 4.2.4.a is modified by a Note that allows QPTR to be calculated with three power range high neutron flux channels that input to QPTR if THERMAL POWER is less than 75 percent RTP and one power range neutron flux channel is inoperable.

This surveillance verifies that the QPTR, as indicated by the Nuclear Instrumentation System (NIS) channels, excore channels, is within its limits. The frequency of 7 days when the QPTR alarm is OPERABLE is acceptable because of the low probability that this alarm can remain inoperable without detection.

3/4.2.4 QUADRANT POWER TILT RATIO (QPTR) (Continued)

SURVEILLANCE REQUIREMENTS (SR) (Continued)

When the QPTR alarm is inoperable, the frequency is increased to 12 hours. This frequency is adequate to detect any relatively slow changes in QPTR, because for those causes of QPT that occur quickly (e.g., a dropped rod), there typically are other indications of abnormality that prompt a verification of core power tilt.

SR 4.2.4.b

This surveillance is modified by a Note, which states that it is required only when less than four power range high neutron flux channels input to QPTR are operable and the THERMAL POWER is greater than or equal to 75 percent RTP.

With an excore detector inoperable, tilt monitoring for a portion of the reactor core becomes degraded. Large tilts are likely detected with the remaining channels, but the capability for detection of small power tilts in some quadrants is decreased. Performing SR 4.2.4.b at a frequency of 12 hours provides an accurate alternative means for ensuring that any tilt remains within its limits.

For purposes of monitoring the QPTR when one excore detector is inoperable, the moveable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the indicated QPTR and any previous data indicating a tilt. The incore detector monitoring is performed with a full incore flux map or a partial core flux map with quarter core symmetry detailed in accordance with controlled procedures.

The symmetric thimble flux map can be used to generate symmetric thimble "tilt." This can be compared to a reference symmetric thimble tilt, from the most recent full core flux map, to generate an incore QPTR. Therefore, the symmetric thimble flux map can be used to confirm that QPTR is within limits.

With one excore detector inoperable, the indicated tilt may be changed from the value indicated with all four channels OPERABLE. To confirm that no change in tilt has actually occurred, which might cause the QPTR limit to be exceeded, the incore results may be compared against previous flux maps either using the symmetric thimbles as described above or a complete flux map. Nominally, quadrant tilt from the surveillance should be within 2 percent of the tilt shown by the most recent flux map data.

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 DNBR greater than or equal to the design DNBR limit throughout each analyzed transient.

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. The 18 month periodic measurement of the RCS total flow rate is adequate to detect flow degradation and ensure correlation of the flow indication channels with measured flow such that the indicated percent flow will provide sufficient verification of flow rate on a 12 hour basis.

3/4.3.1 and 3/4.3.2 REACTOR TRIP SYSTEM AND ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (Continued)

The Engineered Safety Feature Actuation System interlocks perform the following functions:

P-4 Reactor tripped - Actuates turbine trip, closes main feedwater valves on T_{avg} below setpoint, prevents the opening of the main feedwater valves which were closed by a safety injection or high steam generator water level signal, allows safety injection block so that components can be reset or tripped.

Reactor not tripped - prevents manual block of safety injection.

P-11 Above the setpoint, P-11 automatically reinstates safety injection actuation on low pressurizer pressure, automatically blocks steamline isolation on high steam pressure rate, and enables safety injection and steamline isolation (with Loop Stop Valve Open) on low steamline pressure. Below the setpoint, P-11 allows the manual block of safety injection actuation on low pressurizer pressure, allows manual block of safety injection and steamline isolation (with Loop Stop Valve Open) on Low steamline pressure and enables steamline isolation on high steam pressure rate.

P-12 Above the setpoint, P-12 automatically reinstates an arming signal to the steam dump system. Below the setpoint P-12 blocks steam dump and allows manual bypass of the steam dump block to cooldown condenser dump valves.

Table 3.3-1 Action 2 has been modified by two notes. Note (4) allows placing the inoperable channel in the bypass condition for up to 4 hours while performing: a) routine surveillance testing of other channels, and b) setpoint adjustments of other channels when required to reduce the setpoint in accordance with other technical specifications. The 4 hour time limit is justified in accordance with WCAP-10271-P-A, Supplement 2, Revision 1, June 1990. Note (5) only requires SR 4.2.4 to be performed if a Power Range High Neutron Flux channel input to QPTR becomes inoperable. Failure of a component in the Power Range High Neutron Flux channel which renders the High Neutron Flux trip function inoperable may not affect the capability to monitor QPTR. As such, determining QPTR using the movable incore detectors once per 12 hours may not be necessary.