Industry/TSTF Standard Technical Specification Change Traveler

Allow time for stabilization after reducing power due to QPTR out of limit

Classification: 3) Improve Specifications

NUREGs Affected: ☐ 1430 ☑ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Description:

NUREG-1431, LCO 3.2.1(A and B), Fq(z), and LCO 3.2.4, Quadrant Power Tilt Ratio, are revised to provide more appropriate Actions and Surveillances.

Justification:

NUREG-1431, LCO 3.2.4, Quadrant Power Tilt Ratio, Required Actions A.1 and A.2 require that Thermal Power be reduced if QPTR is out of limit. Action A.3 requires that the peaking factors be verified within 24 hours and once per 7 days thereafter. LCO 3.2.1 (A and B), Fq(z), also requires a power reduction if Fq(z) is not within limit.

The proposed change will require the Actions A.1, A.2, A.3 and A.4 of LCO 3.2.1A and Actions A.1, A.2, and A.3 of LCO 3.2.1B to be repeated after each subsequent Fq(z) determination if Fq(z) is not within limit. This will ensure that Actions are continued until the parameter is within its limit.

The proposed change will also modify the first performance Frequency of LCO 3.2.4 to require the peaking factors to be verified within 24 hours of achieving equilibrium conditions with Thermal Power reduced by Required Action A.1. In the current Action, a significant fraction of the 24 hours could be spent waiting for the plant to stabilize at the new power level leaving insufficient time to measure and analyze the peaking factors or resulting in the peaking factors being measured when the plant is not stable yielding inaccurate information. Since the peaking factors are of the prime importance, the proposed change will allow sufficient time to obtain an accurate measurement.

It was noted that LCO 3.2.4 Action A.2 contains a redundant action to reduce Thermal Power. This is deleted and the Thermal Power limit of Required Action A.1 is revised to provide the appropriate allowance for subsequent power reductions based on subsequent determination of QPTR.

LCO 3.2.4 Required Action A.5 is revised to add a new Note stating "Required Action A.6 shall be completed if Required Action A.5 is performed." As discussed in Section 1.3 of the ITS, an ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the unit is not within the LCO Applicability. Therefore, when Required Action A.5 is completed, QPTR should be back within limit and the LCO may be exited. Adding this Note ensures that the peaking factors are verified after normalization of the excore detectors.

Additionally, LCO 3.2.4 Required Action A.5 is revised to state "Normalize excore detectors to restore QPTR to within limit." NUREG-1431, Rev. 1 Required Action A.5 originally stated, "Calibrate excore detectors to eliminate tilt." Normalization of QPTR to near 1.00 can be accomplished by the use of constants applied to indicated NIS currents. Thus, the absence of a tilt will manifest itself as QPTR = 1.00 rather than zero since quadrant power tilt is expressed as a ratio. Also, from a literal compliance standpoint, the tilt cannot be restored to exactly 1.00. Therefore, Required Action A.5 is modified to state, "Normalize excore detectors to restore QPTR to within limit."

Other wording changes were to LCO 3.2.4 made to make the description and Actions more accurate.

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Revision History

OG Revision 0 **Revision Status: Closed**

Revision Proposed by: Byron/Braidwood

12/22/98

OG Revision 0 Revision Status: Closed

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 19-Nov-96

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 19-Nov-96

TSTF Review Information

TSTF Received Date: 22-Nov-96 Date Distributed for Review:

OG Review Completed: ☐ BWOG ☑ WOG ☐ CEOG ☐ BWROG

TSTF Comments:
On hold for WOG Mini-Group Action. Replaced by WOG-95, Revision 1.

TSTF Resolution: Superceeded Date: 27-Oct-97

OG Revision 1 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Complete replacement.

Owners Group Review Information

Date Originated by OG: 27-Oct-97

Owners Group Comments
Superceded by Rev. 2

Owners Group Resolution: Superceeded Date: 20-Nov-97

OG Revision 2 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Added TSTF-109 to "until 12 hours . . ." to SR 3.2.4.2, deleted "within" in A.6, made change to A.3 Bases, added statement to A.5 Bases, made changes to A.6 "achieving equilibrium conditions at RTP", changed Note 2 to A.5 to "whenever" from "if", changed Bases A.6, revised A.6 to delete the "or" and added "not to exceed" and made one paragraph.

Owners Group Review Information

Date Originated by OG: 20-Nov-97

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 20-Nov-97

TSTF Review Information

OG Revision 2 Revision Status: Closed

TSTF Received Date: 20-Nov-97 Date Distributed for Review: 06-Jan-98

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

2/5/98 - WOG only. Approved.

TSTF Resolution: Approved Date: 05-Feb-98

NRC Review Information

NRC Received Date: 10-Mar-98

NRC Comments:

The proposed changes are unnecessary; changes to A.1 and A.2 are merely another way of presenting the same sequence of actions.
7/16/98 - Reviewer recommends rejection. Don't like the RA A.1 and A.2 rewrite. Bob Tjader to get back to Denny B by 10/5/98.
Denny B. to discuss with NRC further on 11/2/98.

Final Resolution: Superceded by Revision Final Resolution Date: 28-May-98

TSTF Revision 1 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
TSTF-241, Revision 1 developed to delete all the other WOG modified changes that were included for ease of review (TSTF-109, TSTF-110, and WOG-105) and their descriptions to provide for consistency in the way that TSTFs are developed; i.e., each TSTF stands on its own. No other changes were made.

Owners Group Review Information

Date Originated by OG: 23-Feb-98

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 23-Feb-98

TSTF Review Information

TSTF Received Date: 23-Feb-98 Date Distributed for Review: 28-May-98

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

Incorporate editorial changes from Westinghouse 6/24 meeting. Restore SR 3.2.4.2 Note and Bases back to NUREG Rev 1 wording (except for the inequality correction). Delete the sentence in description making reference to TSTFs and WOGs. Delete the "s" on limits in A.5. Restore the "or more" and delete the "is" and restore "are" and restore the "s" on channels. B3.2-48, SR 3.2.4.2. Restore the "when", restore the "or more" and restore the "s" on channels and delete the "is" and restore "are".

TSTF Resolution: Approved Date: 10-Jul-98

TSTF Revision 2 Revision Status: Closed

Revision Proposed by: WOG

TSTF Revision 2 Revision Status: Closed

Revision Description:
Minor corrections to Description, Justification and markup. Restore SR 3.2.4.2 Note and Bases back to NUREG Rev 1 wording (except for the inequality correction).

TSTF Review Information

TSTF Received Date: 10-Jul-98 Date Distributed for Review: 10-Jul-98

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 10-Jul-98

NRC Review Information

NRC Received Date: 25-Sep-98

NRC Comments:
11/12/98 - NRC comments received and incorporated in Revision 3. TSTF to provide by 11/20/98. NRC to approve by 11/30/98.

Final Resolution: Superceded by Revision Final Resolution Date: 16-Nov-98

TSTF Revision 3 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
TSTF-241 is revised based on discussions with the NRC. The Required Actions of LCO 3.2.1A and 3.2.1B were revised to require that the corrective actions be repeated after each subsequent Fq(z) measurement that is not within limit. The Bases were revised to reflect the changes to the Actions.

TSTF Review Information

TSTF Received Date: 16-Nov-98 Date Distributed for Review: 16-Nov-98

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
WOG-only Traveler. Change approved by WOG chairman.

TSTF Resolution: Approved Date: 16-Nov-98

NRC Review Information

NRC Received Date: 20-Nov-98

NRC Comments:
(No Comments)

Final Resolution: Superceded by Revision Final Resolution Date: 22-Dec-98

TSTF Revision 4 Revision Status: Active Next Action: NRC

Revision Proposed by: WOG

TSTF Revision 4 **Revision Status: Active** **Next Action: NRC**

Revision Description:
Eliminates a redundant statement from LCO 3.2.4, Required Action A.2. Required Action A.1 is applicable after each QPTR determination. As a result, the Required Action A.2 action to reduce thermal power is redundant the Required Action A.1 action.

TSTF Review Information

TSTF Received Date: 17-Dec-98 Date Distributed for Review: 17-Dec-98

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 17-Dec-98

NRC Review Information

NRC Received Date: 24-Dec-98

NRC Comments:
(No Comments)

Final Resolution: NRC Action Pending Final Resolution Date:

Incorporation Into the NUREGs

File to BBS/LAN Date: TSTF Informed Date: TSTF Approved Date:

NUREG Rev Incorporated:

Affected Technical Specifications

Action 3.2.1B	Fq(z) (Fq Methodology)
Action 3.2.1A	Fq(z) (Fxy Methodology)
Action 3.2.1B Bases	Fq(z) (Fq Methodology)
Action 3.2.1A Bases	Fq(z) (Fxy Methodology)
Action 3.2.4.A	Quadrant Power Tilt Ratio
Action 3.2.4.A Bases	Quadrant Power Tilt Ratio
SR 3.2.4.1	Quadrant Power Tilt Ratio
SR 3.2.4.1 Bases	Quadrant Power Tilt Ratio
SR 3.2.4.2	Quadrant Power Tilt Ratio
SR 3.2.4.2 Bases	Quadrant Power Tilt Ratio

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3.2 POWER DISTRIBUTION LIMITS

3.2.1A Heat Flux Hot Channel Factor ($F_Q(Z)$) (F_{xy} Methodology)

LCO 3.2.1A $F_Q(Z)$ shall be within the limits specified in the COLR.

APPLICABILITY: MODE 1.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. $F_Q(Z)$ not within limit.	A.1	Reduce THERMAL POWER ≥ 1% RTP for each 1% $F_Q(Z)$ exceeds limit.	15 minutes after each $F_Q(Z)$ determination
	AND		
	A.2	Reduce AFD acceptable operation limits by the percentage $F_Q(Z)$ exceeds limit.	4 hours
	AND		
	A.3	Reduce Power Range Neutron Flux–High trip setpoints ≥ 1% for each 1% $F_Q(Z)$ exceeds limit.	8 hours
	AND		
	A.4	Reduce Overpower ΔT trip setpoints ≥ 1% for each 1% $F_Q(Z)$ exceeds limit.	72 hours
	AND		

(continued)

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3.2 POWER DISTRIBUTION LIMITS

3.2.1B Heat Flux Hot Channel Factor ($F_Q(Z)$) (F_Q Methodology)

LCO 3.2.1B $F_Q(Z)$, as approximated by $F_Q^C(Z)$ and $F_Q^W(Z)$, shall be within the limits specified in the COLR.

APPLICABILITY: MODE 1.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. $F_Q^C(Z)$ not within limit.	A.1	Reduce THERMAL POWER ≥ 1% RTP for each 1% $F_Q^C(Z)$ exceeds limit.	15 minutes after each $F_Q^C(Z)$ determination
	AND		
	A.2	Reduce Power Range Neutron Flux–High trip setpoints ≥ 1% for each 1% $F_Q^C(Z)$ exceeds limit.	8 hours
	AND		
	A.3	Reduce Overpower ΔT trip setpoints ≥ 1% for each 1% $F_Q^C(Z)$ exceeds limit.	72 hours
	AND		
	A.4	Perform SR 3.2.1.1.	Prior to increasing THERMAL POWER above the limit of Required Action A.1

(continued)

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3.2 POWER DISTRIBUTION LIMITS

3.2.4 QUADRANT POWER TILT RATIO (QPTR)

LCO 3.2.4 The QPTR shall be ≤ 1.02.

APPLICABILITY: MODE 1 with THERMAL POWER > 50% RTP.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. QPTR not within limit.	A.1	Reduce THERMAL POWER ≥ 3% from RTP for each 1% of QPTR > 1.00.	2 hours after each QPTR determination
	AND		
	A.2	Perform SR 3.2.4.1 ~~and reduce THERMAL POWER ≥ 3% from RTP for each 1% of QPTR > 1.00.~~	Once per 12 hours after achieving equilibrium conditions from a THERMAL POWER reduction per Required Action A.1
	AND		
	A.3	Perform SR 3.2.1.1 and SR 3.2.2.1.	24 hours AND Once per 7 days thereafter
	AND		
	A.4	Reevaluate safety analyses and confirm results remain valid for duration of operation under this condition.	Prior to increasing THERMAL POWER above the limit of Required Action A.1
	AND		

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.5 ---------NOTES--------- 1. Perform Required Action A.5 only after Required Action A.4 is completed. 2. Required Action A.6 shall be completed within one hour Required Action A.5 is performed.	
	~~Calibrate excore detectors to show zero QPTR.~~ Normalize excore detectors to restore QPTR to within limit.	Prior to increasing THERMAL POWER above the limit of Required Action A.1
	AND	
	A.6 ---------NOTE--------- Perform Required Action A.6 only after Required Action A.5 is completed.	
	Perform SR 3.2.1.1 and SR 3.2.2.1.	Within 24 hours after ~~reaching~~ achieving equilibrium conditions at RTP ~~OR~~ ~~Within~~ 48 hours after increasing THERMAL POWER above the limit of Required Action A.1 not to exceed
B. Required Action and associated Completion Time not met.	B.1 Reduce THERMAL POWER to ≤ 50% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.4.1	NOTES 1. With input from one Power Range Neutron Flux channel inoperable and THERMAL POWER ≤ 75% RTP, the remaining three power range channels can be used for calculating QPTR. 2. SR 3.2.4.2 may be performed in lieu of this Surveillance if adequate Power Range Neutron Flux channel inputs are not OPERABLE.	
	Verify QPTR is within limit by calculation.	7 days AND Once within 12 hours and every 12 hours thereafter with the QPTR alarm inoperable
SR 3.2.4.2	NOTE Only required to be performed if input from one or more Power Range Neutron Flux channels are inoperable with THERMAL POWER ≥ 75% RTP.	
	Verify QPTR is within limit using the movable incore detectors.	Once within 12 hours AND 12 hours thereafter

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Insert B-A.1

The maximum allowable power level initially determined by Required Action A.1 may be affected by subsequent determinations of QPTR. Increases in QPTR would require power reduction within 2 hours of QPTR determination, if necessary to comply with the decreased maximum allowable power level. Decreases in QPTR would allow increasing the maximum allowable power level and increasing power up to this revised limit.

Insert Note 2

Note 2 states that if Required Action A.5 is performed, then Required Action A.6 shall be performed. Required Action A.5 normalizes the excore detectors to restore QPTR to within limits, which restores compliance with LCO 3.2.4. Thus, Note 2 prevents exiting the Actions prior to completing flux mapping to verify peaking factors, per Required Action A.6.

ACTIONS

A.1 (continued)

time to identify the cause and correct the tilt. Note that the power reduction itself may cause a change in the tilted condition.

INSERT B-A.1

A.2

After completion of Required Action A.1, 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, further power has to be reduced accordingly.~~ A 12 hour Completion Time is sufficient because any additional change in QPTR would be relatively slow.

A.3

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 SRs on $F^N_{\Delta H}$ and $F_Q(Z)$ within the Completion Time of 24 hours after achieving equilibrium conditions from a Thermal power reduction per Required Action A.1 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 Required Actions of these Surveillances 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.

Equilibrium conditions are achieved when the core is sufficiently stable at intended operating conditions to support flux mapping.

A.4

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

(continued)

ACTIONS

A.4 (continued)

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 Required Action A.1, the reactor core conditions are consistent with the assumptions in the safety analyses.

Normalization is accomplished in such a manner that the indicated QPTR following normalization is near 1.00.

A.5

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 ~~recalibrated to show a zero QPTR~~ prior to increasing THERMAL POWER to above the limit of Required Action A.1. This is done to detect any subsequent significant changes in QPTR.

normalized to restore QPTR to within limits

Note 1

Required Action A.5 is modified by a Note ~~sheet~~ two states that the QPT is not ~~zeroed out~~ restored to within limits until after the re-evaluation of the safety analysis has determined that core conditions at RTP are within the safety analysis assumptions (i.e., Required Action A.4). ~~This Note is~~ These Notes are intended to prevent any ambiguity about the required sequence of actions.

INSERT Note 2

A.6

Once the flux tilt is ~~zeroed out~~ (i.e., Required Action A.5 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, Required Action A.6 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

achieving equilibrium conditions at RTP.

(continued)

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BASES

ACTIONS

A.6 (continued)

equilibrium conditions at

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 Required Action A.1, while not permitting the core to remain with unconfirmed power distributions for extended periods of time.

after increasing THERMAL POWER above the limit of Required Action A.1.

Required Action A.6 is modified by a Note that states that the peaking factor surveillances may only be done after the excore detectors have been calibrated to show zero tilt (i.e., Required Action A.5). The intent of this Note is to have the peaking factor surveillances performed at operating power levels, which can only be accomplished after the excore detectors are calibrated to show zero tilt and the core returned to power.

normalized to restore QPTR to within limits

B.1

If Required Actions A.1 through A.6 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 < 50% 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 3.2.4.1

SR 3.2.4.1 is modified by two Notes. Note 1 allows QPTR to be calculated with three power range channels if THERMAL POWER is ≤ 75% RTP and the input from one Power Range Neutron Flux channel is inoperable. Note 2 allows performance of SR 3.2.4.2 in lieu of SR 3.2.4.1 if more than one input from Power Range Neutron Flux channels are inoperable.

This Surveillance verifies that the QPTR, as indicated by the Nuclear Instrumentation System (NIS) excore channels, is

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1 (continued)

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 these 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 3.2.4.2

This Surveillance is modified by a Note, which states that it is required only when the input from one or more Power Range Neutron Flux channels are inoperable and the THERMAL POWER is ≥ 75% RTP.

With an NIS power range channel 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 3.2.4.2 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 power range channel 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 two sets of four thimble locations with quarter core symmetry. The two sets of four symmetric thimbles is a set of eight unique detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, and N-8 for three and four loop cores.

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.2.4.2 (continued)

core flux map, to generate an incore QPTR. Therefore, incore monitoring of QPTR can be used to confirm that QPTR is within limits.

With one NIS channel 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 result 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% of the tilt shown by the most recent flux map data.

REFERENCES

1. 10 CFR 50.46.
2. Regulatory Guide 1.77, Rev [0], May 1974.
3. 10 CFR 50, Appendix A, GDC 26.

INSERT A1

The maximum allowable power level initially determined by Required Action A.1 may be affected by subsequent determinations of $F_Q(Z)$ and would require power reductions within 15 minutes of the $F_Q(Z)$ determination, if necessary to comply with the decreased maximum allowable power level. Decreases in $F_Q(Z)$ would allow increasing the maximum allowable power level and increasing power up to this revised limit.

INSERT A2

The maximum allowable AFD acceptable operation limit initially determined by Required Action A.2 may be affected by subsequent determinations of $F_Q(Z)$ and would require AFD acceptable operation limit reductions within 4 hours of the $F_Q(Z)$ determination, if necessary to comply with the decreased AFD acceptable operation limit. Decreases in $F_Q(Z)$ would allow increasing the AFD acceptable operation limit.

INSERT A3

The maximum allowable Power Range Neutron Flux – High trip setpoints initially determined by Required Action A.3 may be affected by subsequent determinations of $F_Q(Z)$ and would require Power Range Neutron Flux – High trip setpoint reductions within 8 hours of the $F_Q(Z)$ determination, if necessary to comply with the decreased maximum allowable Power Range Neutron Flux – High trip setpoints. Decreases in $F_Q(Z)$ would allow increasing the maximum allowable Power Range Neutron Flux – High trip setpoints.

INSERT A4

The maximum allowable Overpower ΔT trip setpoints initially determined by Required Action A.4 may be affected by subsequent determinations of $F_Q(Z)$ and would require Overpower ΔT trip setpoint reductions within 72 hours of the $F_Q(Z)$ determination, if necessary to comply with the decreased maximum allowable Overpower ΔT trip setpoints. Decreases in $F_Q(Z)$ would allow increasing the maximum Overpower ΔT trip setpoints.

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BASES

APPLICABILITY (continued)

reactor coolant to require a limit on the distribution of core power.

ACTIONS

A.1

Reducing THERMAL POWER by ≥ 1% for each 1% by which $F_Q(Z)$ exceeds its limit maintains an acceptable absolute power density. The Completion Time of 15 minutes provides an acceptable time to reduce power in an orderly manner and without allowing the plant to remain in an unacceptable condition for an extended period of time.

Insert A1

A.2

When core peaking factors are sufficiently high that LCO 3.2.3 does not permit operation at RTP, the Acceptable Operation Limits for AFD are scaled down. This percentage reduction is equal to the amount, expressed as a percentage, by which $F_Q(Z)$ exceeds its specified limit. This ensures a near constant maximum linear heat rate in units of kilowatts per foot at the acceptable operation limits. The Completion Time of 4 hours for the change in setpoints is sufficient, considering the small likelihood of a severe transient in this relatively short time period, and the preceding prompt reduction in THERMAL POWER in accordance with Required Action A.1.

Insert A2

A.3

A reduction of the Power Range Neutron-High trip setpoints by ≥ 1% for each 1% by which $F_Q(Z)$ exceeds its specified limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The Completion Time of 8 hours is sufficient, considering the small likelihood of a severe transient in this period, and the preceding prompt reduction in THERMAL POWER in accordance with Required Action A.1.

Insert A3

(continued)

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BASES

ACTIONS (continued)

A.4

Reduction in the Overpower ΔT trip setpoints by ≥ 1% for each 1% by which $F_Q(Z)$ exceeds its limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The Completion Time of 72 hours is sufficient considering the small likelihood of a severe transient in this period, and the preceding prompt reduction in THERMAL POWER in accordance with Required Action A.1.

Insert A4

A.5

Verification that $F_Q(Z)$ has been restored to within its limit by performing SR 3.2.1.1 and SR 3.2.1.2 prior to increasing THERMAL POWER above the limit imposed by Required Action A.1 ensures that core conditions during operation at higher power levels are consistent with safety analyses assumptions.

B.1

If the Required Actions of A.1 through A.4 cannot be met within their associated Completion Times, the plant must be placed in a MODE or condition in which the LCO requirements are not applicable. This is done by placing the plant in at least MODE 2 within 6 hours.

This allowed Completion Time is reasonable based on operating experience regarding the amount of time it takes to reach MODE 2 from full power operation in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

Verification that $F_Q(Z)$ is within its limit involves increasing the measured values of $F_Q(Z)$ to allow for manufacturing tolerance and measurement uncertainties and then making a comparison with the limits. These limits are provided in the COLR. Specifically, the measured value of the Heat Flux Hot Channel Factor (F_Q^M) is increased by 3% to account for fuel manufacturing tolerances and by 5% for flux

(continued)

INSERT B1

The maximum allowable power level initially determined by Required Action A.1 may be affected by subsequent determinations of $F_Q^C(Z)$ and would require power reductions within 15 minutes of the $F_Q^C(Z)$ determination, if necessary to comply with the decreased maximum allowable power level. Decreases in $F_Q^C(Z)$ would allow increasing the maximum allowable power level and increasing power up to this revised limit.

INSERT B2

The maximum allowable Power Range Neutron Flux – High trip setpoints initially determined by Required Action A.3 may be affected by subsequent determinations of $F_Q^C(Z)$ and would require Power Range Neutron Flux – High trip setpoint reductions within 8 hours of the $F_Q^C(Z)$ determination, if necessary to comply with the decreased maximum allowable Power Range Neutron Flux – High trip setpoints. Decreases in $F_Q^C(Z)$ would allow increasing the maximum allowable Power Range Neutron Flux – High trip setpoints.

INSERT B3

The maximum allowable Overpower ΔT trip setpoints initially determined by Required Action A.4 may be affected by subsequent determinations of $F_Q^C(Z)$ and would require Overpower ΔT trip setpoint reductions within 72 hours of the $F_Q^C(Z)$ determination, if necessary to comply with the decreased maximum allowable Overpower ΔT trip setpoints. Decreases in $F_Q^C(Z)$ would allow increasing the maximum Overpower ΔT trip setpoints.

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BASES

LCO (continued)

The expression for $F_Q^W(Z)$ is:

$$F_Q^W(Z) = F_Q^C(Z)\ W(Z)$$

where W(Z) is a cycle dependent function that accounts for power distribution transients encountered during normal operation. W(Z) is included in the COLR.

The $F_Q(Z)$ limits define limiting values for core power peaking that precludes peak cladding temperatures above 2200°F during either a large or small break LOCA.

This LCO requires operation within the bounds assumed in the safety analyses. Calculations are performed in the core design process to confirm that the core can be controlled in such a manner during operation that it can stay within the LOCA $F_Q(Z)$ limits. If $F_Q(Z)$ cannot be maintained within the LCO limits, reduction of the core power is required.

Violating the LCO limits for $F_Q(Z)$ produces unacceptable consequences if a design basis event occurs while $F_Q(Z)$ is outside its specified limits.

APPLICABILITY

The $F_Q(Z)$ limits must be maintained in MODE 1 to prevent core power distributions from exceeding the limits assumed in the safety analyses. Applicability 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 a limit on the distribution of core power.

ACTIONS

A.1

Reducing THERMAL POWER by ≥ 1% RTP for each 1% by which $F_Q^C(Z)$ exceeds its limit, maintains an acceptable absolute power density. $F_Q^C(Z)$ is $F_Q^W(Z)$ multiplied by a factor accounting for manufacturing tolerances and measurement uncertainties. $F_Q^W(Z)$ is the measured value of $F_Q(Z)$. The Completion Time of 15 minutes provides an acceptable time to reduce power in an orderly manner and without allowing the plant to remain in an unacceptable condition for an extended period of time.

Insert B1

(continued)

ACTIONS (continued)

A.2

A reduction of the Power Range Neutron Flux—High trip setpoints by ≥ 1% for each 1% by which $F_Q^C(Z)$ exceeds its limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The Completion Time of 8 hours is sufficient considering the small likelihood of a severe transient in this time period and the preceding prompt reduction in THERMAL POWER in accordance with Required Action A.1.

Insert B2

A.3

Reduction in the Overpower ΔT trip setpoints by ≥ 1% for each 1% by which $F_Q^C(Z)$ exceeds its limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The Completion Time of 72 hours is sufficient considering the small likelihood of a severe transient in this time period, and the preceding prompt reduction in THERMAL POWER in accordance with Required Action A.1.

Insert B3

A.4

Verification that $F_Q^C(Z)$ has been restored to within its limit, by performing SR 3.2.1.1 prior to increasing THERMAL POWER above the limit imposed by Required Action A.1, ensures that core conditions during operation at higher power levels are consistent with safety analyses assumptions.

B.1

If it is found that the maximum calculated value of $F_Q(Z)$ that can occur during normal maneuvers, $F_Q^W(Z)$, exceeds its specified limits, there exists a potential for $F_Q^C(Z)$ to become excessively high if a normal operational transient occurs. Reducing the AFD by ≥ 1% for each 1% by which $F_Q^W(Z)$ exceeds its limit within the allowed Completion Time of 2 hours, restricts the axial flux distribution such that even if a transient occurred, core peaking factors are not exceeded.

(continued)