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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Oconee Nuclear Station
Docket Numbers 50-269, 270, and 287
Technical Specification Bases (TSB) Change

Please see attached revisions to Tech Spec Bases 3.2.3,
Quadrant Power Tilt, which were implemented on December 11,
2003.

Attachment 1 contains the new TSB pages and Attachment 2
contains the markup version of the Bases pages.

If any additional information is needed, please contact
Graham Davenport, at (864-885-3044).

Very truly yours,

R. A. Jones, Vice President
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Attachment 1

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B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 QUADRANT POWER TILT (QPT)

BASES

BACKGROUND This LCO is required to limit the core power distribution based on accident initial condition criteria.

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that preserve the criteria specified in 10 CFR 50.46 (Ref. 1). Together, LCO 3.2.1, "Regulating Rod Position Limits," LCO 3.2.2, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.3, "QUADRANT POWER TILT (QPT)," provide limits on control component operation and on monitored process variables to ensure that the core operates within the $F_Q(Z)$ and $F_{\Delta H}^N$ limits. $F_Q(Z)$ is the maximum local linear power density in the core divided by the core average fuel rod linear power density, assuming nominal fuel pellet and fuel rod dimensions. Operation within the $F_Q(Z)$ limits prevents power peaks that exceed the loss of coolant accident (LOCA) limits. $F_{\Delta H}^N$ is the ratio of the integral of linear power along the fuel rod on which minimum departure from nucleate boiling ratio occurs, to the average fuel rod power. Operation within the $F_{\Delta H}^N$ limits prevents departure from nucleate boiling (DNB) during an anticipated transient.

This LCO is required to limit fuel cladding failures that breach the primary fission product barrier and release fission products to the reactor coolant in the event of a LOCA, loss of forced reactor coolant flow, or other accident requiring termination by a Reactor Protection System trip function. This LCO limits the amount of damage to the fuel cladding during an accident by maintaining the validity of the assumptions used in the safety analysis related to the initial power distribution and reactivity.

Fuel cladding failure during a postulated LOCA is limited by restricting the maximum linear heat rate (LHR) so that the peak cladding temperature does not exceed 2200°F (Ref. 1). Peak cladding temperatures > 2200°F cause severe cladding failure by oxidation due to a Zircaloy water reaction. Other criteria must also be met (e.g., maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long term cooling). However, peak cladding temperature is usually most limiting.

BASES

BACKGROUND
(continued)

Proximity to the DNB condition is expressed by the departure from nucleate boiling ratio (DNBR), defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and anticipated transients is limited to the DNBR correlation limit for the particular fuel design in use, and is accepted as an appropriate margin to DNB. The DNBR correlation limit ensures that there is at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB.

The measurement system independent limits on QPT are determined analytically by the reload safety evaluation analysis without adjustment for measurement system error and uncertainty. Operation beyond these limits could invalidate core power distribution assumptions used in the accident analysis. The error adjusted maximum allowable limits (measurement system dependent limits) for QPT are specified in the COLR.

APPLICABLE
SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation and anticipated transients. The LCOs based on power distribution (LCO 3.2.1, LCO 3.2.2, and LCO 3.2.3) preclude core power distributions that violate the following fuel design criteria:

- a. During a large break LOCA, the peak cladding temperature must not exceed 2200°F (Ref. 1).
- b. During anticipated transients, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition.

QPT is one of the process variables that characterize and control the three dimensional power distribution of the reactor core.

Fuel cladding damage could result if an anticipated transient occurs with simultaneous violation of one or more of the LCOs governing the core power distribution. Changes in the power distribution can cause increased power peaking and correspondingly increased local LHRs.

The dependence of the core power distribution on burnup, regulating rod insertion, and spatial xenon distribution is taken into account during the reload safety evaluation analysis. An allowance for QPT is accommodated in the analysis and resultant LCO limits. The increase in peaking taken for QPT is developed from a database of full core power distribution

BASES

APPLICABLE SAFETY ANALYSES
(continued)

calculations (Ref. 2). The calculations consist of simulations of many power distributions with tilt causing mechanisms (e.g., dropped or misaligned CONTROL RODS, misloaded assemblies, and burnup gradients). An increase of < 2% peak power per 1% QPT is supported by the analysis, therefore a value of 2% peak power increase per 1% QPT is used to bound peak power increases due to QPT.

Operation at the AXIAL POWER IMBALANCE or rod position limits must be interpreted as operating the core at the maximum allowable $F_{\alpha}(Z)$ or $F_{\Delta H}^N$ peaking factors for accident initial conditions with the allowed QPT present.

QPT satisfies Criterion 2 of 10 CFR 50.36 (Ref. 3).

LCO

The power distribution LCO limits have been established based on correlations between power peaking and easily measured process variables: regulating rod position, AXIAL POWER IMBALANCE, and QPT. The regulating rod position limits and the AXIAL POWER IMBALANCE boundaries contained in the COLR represent the measurement system independent limits. These are the limits at which the core power distribution either exceeds the LOCA LHR limits or causes a reduction in DNBR below the safety limit during anticipated transients with the allowable QPT present and with regulating rod position consistent with the limitations on regulating rod positions determined by the fuel cycle design and specified by LCO 3.2.1.

The allowable limits and maximum limits for QPT applicable for the full symmetrical Incore Detector System, Backup Incore Detector System, and Excore Detector System are provided; the limits are given in the COLR. The limits for the three systems are derived by adjustment of the measurement system independent QPT limits to allow for system observability and instrumentation errors.

APPLICABILITY

In MODE 1, the limits on QPT must be maintained when THERMAL POWER is > 20% RTP to prevent the core power distribution from exceeding the design limits. The minimum power level of 20% RTP is large enough to obtain meaningful QPT indications without compromising safety. Operation at or below 20% RTP with QPT up to the maximum limit specified in the COLR is acceptable because the resulting maximum LHR is not high enough to cause violation of the LOCA LHR limit ($F_{\alpha}(Z)$ limit) or the initial condition DNB allowable peaking limit ($F_{\Delta H}^N$ limit) during accidents initiated from this power level.

BASES

APPLICABILITY
(continued)

In MODE 2, the combination of QPT with maximum ALLOWABLE THERMAL POWER level does not result in LHRs sufficiently large to violate the fuel design limits, and therefore, applicability in this MODE is not required. Although not specifically addressed in the LCO, QPTs greater than the maximum limit specified in the COLR in MODE 1 with THERMAL POWER < 20% RTP are allowed for the same reason.

In MODES 3, 4, 5, and 6, this LCO is not applicable, because the reactor is not generating significant THERMAL POWER and QPT is indeterminate.

ACTIONS

A.1

The steady state limit specified in the COLR provides an allowance for QPT that may occur during normal operation. A peaking increase to accommodate QPTs up to the steady state limit is allowed by the regulating rod position limits of LCO 3.2.1 and the AXIAL POWER IMBALANCE limits of LCO 3.2.2.

The safety analysis has shown that a conservative corrective action is to reduce THERMAL POWER by 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit.

This action limits the local LHR to a value corresponding to steady state operation, thereby reducing it to a value within the assumed accident initial condition limits. The required Completion Time of 2 hours is reasonable, based on limiting the potential for xenon redistribution, the low probability of an accident occurring, and the steps required to complete the Required Action.

If QPT can be reduced to less than or equal to the steady state limit in < 2 hours, the reactor may return to normal operation without undergoing a power reduction. Significant radial xenon redistribution does not occur within this amount of time.

A.2

Power operation is allowed to continue if THERMAL POWER is reduced in accordance with Required Action A.1. The same reduction (i.e., 2% RTP or more) is also applicable to the nuclear overpower trip setpoints (flux and flux/flow imbalance), for each 1% of QPT in excess of the steady state limit.

This reduction maintains both core protection and thermal margins at the

BASES

ACTIONSA.2 (continued)

reduced THERMAL POWER level similar to that at RTP. The required Completion Time of 10 hours is reasonable based on the need to limit the potentially adverse xenon redistribution, the low probability of an accident occurring while operating out of specification, and the number of steps required to complete the Required Action.

A.3

Although the actions directed by Required Action A.1 restore margins, if the source of the QPT is not determined and corrected, it is prudent to establish increased margins. A required Completion Time of 24 hours to reduce QPT to less than the steady state limit is a reasonable time for investigation and corrective measures.

B.1

If QPT exceeds the transient limit but is equal to or less than the maximum limit due to a misaligned CONTROL ROD or APSR, then power operation is allowed to continue if the THERMAL POWER is reduced 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit. Thus, the transient limit is the upper bound within which the 2% for 1% power reduction rule may be applied, but only for QPTs caused by CONTROL ROD or APSR misalignment. The required Completion Time of 30 minutes ensures that the operator completes the THERMAL POWER reduction before significant xenon redistribution occurs.

B.2

When a misaligned CONTROL ROD or APSR occurs, a local xenon redistribution may occur. The required Completion Time of 2 hours allows the operator sufficient time to relatch or realign a CONTROL ROD or APSR, but is short enough to limit xenon redistribution so that large increases in the local LHR do not occur due to xenon redistribution resulting from the QPT.

BASES

ACTIONS
(continued)C.1

If the Required Action and associated Completion Time of Condition A or B are not met, a further power reduction is required. Power reduction to < 60% RTP provides conservative protection from increased peaking due to xenon redistribution. The required Completion Time of 2 hours is reasonable to allow the operator to reduce THERMAL POWER to < 60% of ALLOWABLE THERMAL POWER without challenging unit systems.

C.2

Reduction of the nuclear overpower trip setpoints, based on flux and flux/flow imbalance, to $\leq 65.5\%$ of ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of ALLOWABLE THERMAL POWER maintains both core protection and thermal margin at reduced power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on operating experience.

D.1

Power reduction to 60% of the ALLOWABLE THERMAL POWER is a conservative method of limiting the maximum core LHR for QPTs up to the maximum limit specified by the COLR. Although the power reduction is based on the correlation used in Required Actions A.1 and B.1, the database for a power peaking increase as a function of QPT is less extensive for tilt mechanisms other than misaligned CONTROL RODS and APSRs. Because greater uncertainty in the potential power peaking increase exists with the less extensive database, a more conservative action is taken when the tilt is caused by a mechanism other than a misaligned CONTROL ROD or APSR. The required Completion Time of 2 hours allows the operator to reduce THERMAL POWER to < 60% of the ALLOWABLE THERMAL POWER without challenging unit systems.

D.2

Reduction of the nuclear overpower trip setpoints, based on flux and flux/flow imbalance, to $\leq 65.5\%$ of the ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of the ALLOWABLE THERMAL POWER maintains both core protection and an operating margin at reduced power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on operating experience.

BASES

ACTIONS
(continued)

E.1

If the Required Action and associated Completion Time for Condition C or D are not met, then the reactor will continue in power operation with significant QPT. Either the power level has not been reduced to comply with the Required Action or the nuclear overpower trip setpoints (flux and flux/flow imbalance) have not been reduced within the required Completion Time. To preclude risk of fuel damage in any of these conditions, THERMAL POWER is reduced further. Operation at 20% RTP allows the operator to investigate the cause of the QPT and to correct it. Local LHRs with a large QPT do not violate the fuel design limits at or below 20% RTP. The required Completion Time of 4 hours is acceptable based on limiting the potential increase in local LHRs that could occur due to xenon redistribution with the QPT out of specification.

F.1

QPT in excess of the maximum limit specified in the COLR can be an indication of a severe power distribution anomaly, and a power reduction to at most 20% RTP ensures local LHRs do not exceed allowable limits while the cause is being determined and corrected.

The required Completion Time of 4 hours is reasonable to allow the operator to reduce THERMAL POWER to \leq 20% RTP without challenging unit systems.

**SURVEILLANCE
REQUIREMENTS**

QPT can be monitored by both the Incore and Excore Detector Systems. If the Incore Detector System is OPERABLE, this system shall be used for QPT monitoring. The Incore Detector System is preferred due to Excore Detector System tilts potentially being affected (i.e., normalized to zero) anytime an Excore Detector calibration is performed. Reasonable completion times exist to allow the use of the Incore Detector System for QPT monitoring. If the Incore Detector System is not OPERABLE, the Excore Detector System should be the basis for QPT monitoring. The QPT limits are derived from their corresponding measurement system independent limits by adjustment for system observability errors and instrumentation errors. Although they may be based on the same measurement system independent limit, the limits for the different systems are not identical because of differences in the errors applicable for these systems. For QPT measurements using the Incore Detector System, the Backup Incore Detector System consists of OPERABLE detectors configured as follows:

BASES

**SURVEILLANCE
REQUIREMENTS
(continued)**

- a. Two sets of four detectors shall lie in each core half. Each set of detectors shall lie in the same axial plane. The two sets in the same core half may lie in the same axial plane.
- b. Detectors in the same plane shall have quarter core radial symmetry. Figure B 3.2.3-1 (Backup Incore Detector System for QPT Measurement) depicts an example of this configuration.

The Excore Detector System consists of four detectors (one located outside each quadrant of the core). Each detector consists functionally of two six-foot uncompensated ion chambers adjacent to the top and bottom halves of the core.

SR 3.2.3.1

Checking the QPT indication every 7 days ensures that the operator can determine whether the plant computer software and Incore Detector System inputs for monitoring QPT are functioning properly, and takes into account other information and alarms available to the operator in the Control Room. This procedure allows the QPT mechanisms, such as xenon redistribution, burnup gradients, and CONTROL ROD drive mechanism malfunctions, which can cause slow development of a QPT, to be detected. Operating experience has confirmed the acceptability of a Surveillance Frequency of 7 days.

Following restoration of the QPT to within the steady state limit, operation at $\geq 95\%$ RTP may proceed provided the QPT is determined to remain within the steady state limit at the increased THERMAL POWER level. In case QPT exceeds the steady state limit for more than 24 hours or exceeds the transient limit (Condition A, B, or D), the potential for xenon redistribution is greater. Therefore, the QPT is monitored for 12 consecutive hourly intervals to determine whether the period of any oscillation due to xenon redistribution causes the QPT to exceed the steady state limit again.

REFERENCES

- 1. 10 CFR 50.46.
 - 2. BAW 10122A, "Normal Operating Controls," Rev. 1, May 1984.
 - 3. 10 CFR 50.36.
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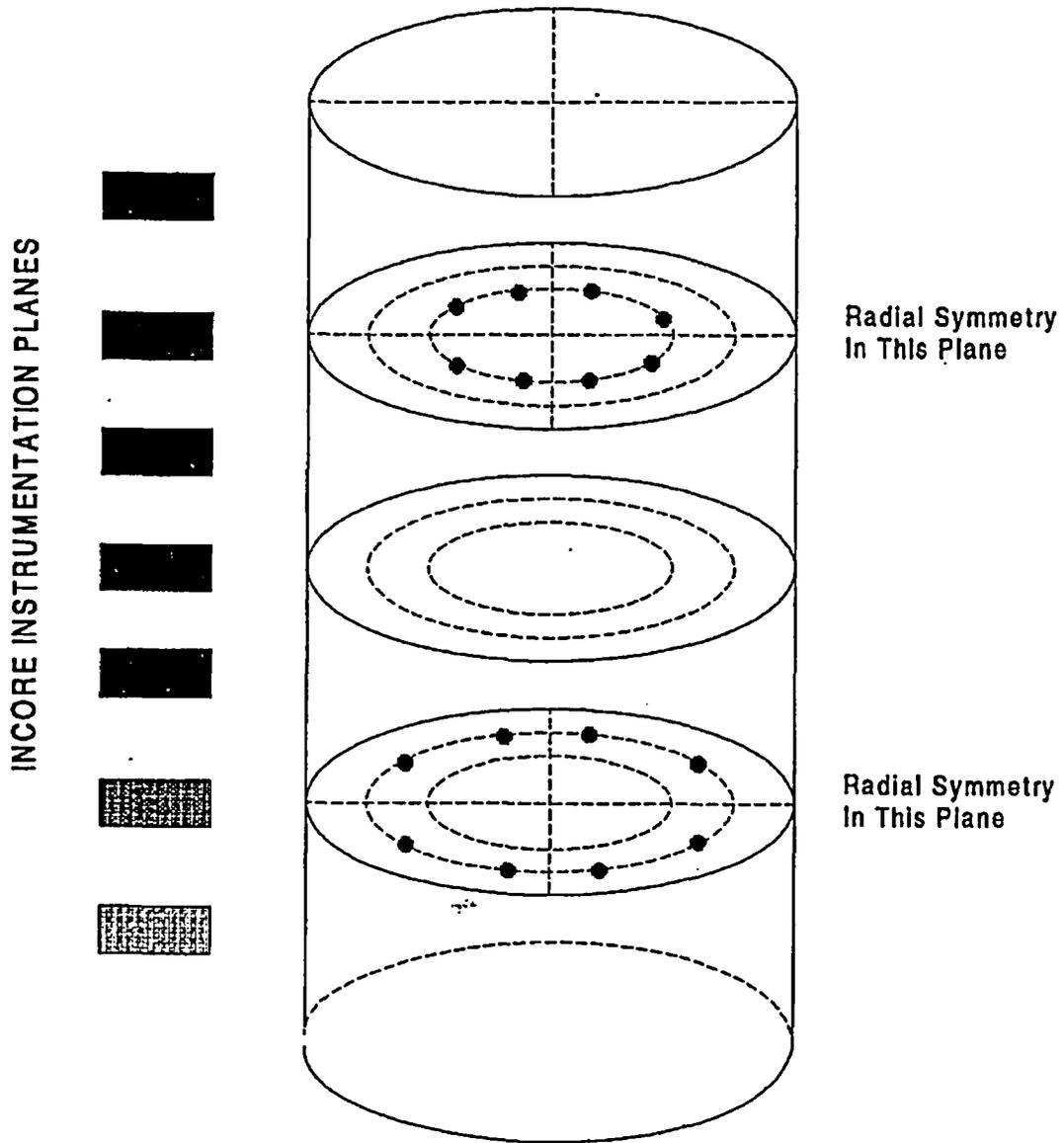


Figure B 3.2.3-1 (page 1 of 1)
Backup Incore Detector System for QUADRANT POWER TILT Measurement

Attachment 2

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 QUADRANT POWER TILT (QPT)

BASES

BACKGROUND This LCO is required to limit the core power distribution based on accident initial condition criteria.

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that preserve the criteria specified in 10 CFR 50.46 (Ref. 1). Together, LCO 3.2.1, "Regulating Rod Position Limits," LCO 3.2.2, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.3, "QUADRANT POWER TILT (QPT)," provide limits on control component operation and on monitored process variables to ensure that the core operates within the $F_Q(Z)$ and $F_{\Delta H}^N$ limits. $F_Q(Z)$ is the maximum local linear power density in the core divided by the core average fuel rod linear power density, assuming nominal fuel pellet and fuel rod dimensions. Operation within the $F_Q(Z)$ limits prevents power peaks that exceed the loss of coolant accident (LOCA) limits. $F_{\Delta H}^N$ is the ratio of the integral of linear power along the fuel rod on which minimum departure from nucleate boiling ratio occurs, to the average fuel rod power. Operation within the $F_{\Delta H}^N$ limits prevents departure from nucleate boiling (DNB) during an anticipated transient.

This LCO is required to limit fuel cladding failures that breach the primary fission product barrier and release fission products to the reactor coolant in the event of a LOCA, loss of forced reactor coolant flow, or other accident requiring termination by a Reactor Protection System trip function. This LCO limits the amount of damage to the fuel cladding during an accident by maintaining the validity of the assumptions used in the safety analysis related to the initial power distribution and reactivity.

Fuel cladding failure during a postulated LOCA is limited by restricting the maximum linear heat rate (LHR) so that the peak cladding temperature does not exceed 2200°F (Ref. 1). Peak cladding temperatures > 2200°F cause severe cladding failure by oxidation due to a Zircaloy water reaction. Other criteria must also be met (e.g., maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long term cooling). However, peak cladding temperature is usually most limiting.

BASES

BACKGROUND
(continued)

Proximity to the DNB condition is expressed by the departure from nucleate boiling ratio (DNBR), defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and anticipated transients is limited to the DNBR correlation limit for the particular fuel design in use, and is accepted as an appropriate margin to DNB. The DNBR correlation limit ensures that there is at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB.

The measurement system independent limits on QPT are determined analytically by the reload safety evaluation analysis without adjustment for measurement system error and uncertainty. Operation beyond these limits could invalidate core power distribution assumptions used in the accident analysis. The error adjusted maximum allowable limits (measurement system dependent limits) for QPT are specified in the COLR.

APPLICABLE
SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation and anticipated transients. The LCOs based on power distribution (LCO 3.2.1, LCO 3.2.2, and LCO 3.2.3) preclude core power distributions that violate the following fuel design criteria:

- a. During a large break LOCA, the peak cladding temperature must not exceed 2200°F (Ref. 1).
- b. During anticipated transients, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition.

QPT is one of the process variables that characterize and control the three dimensional power distribution of the reactor core.

Fuel cladding damage could result if an anticipated transient occurs with simultaneous violation of one or more of the LCOs governing the core power distribution. Changes in the power distribution can cause increased power peaking and correspondingly increased local LHRs.

The dependence of the core power distribution on burnup, regulating rod insertion, and spatial xenon distribution is taken into account during the reload safety evaluation analysis. An allowance for QPT is accommodated in the analysis and resultant LCO limits. The increase in peaking taken for QPT is developed from a database of full core power distribution

BASES

APPLICABLE SAFETY ANALYSES
(continued)

calculations (Ref. 2). The calculations consist of simulations of many power distributions with tilt causing mechanisms (e.g., dropped or misaligned CONTROL RODS, misloaded assemblies, and burnup gradients). An increase of < 2% peak power per 1% QPT is supported by the analysis, therefore a value of 2% peak power increase per 1% QPT is used to bound peak power increases due to QPT.

Operation at the AXIAL POWER IMBALANCE or rod position limits must be interpreted as operating the core at the maximum allowable $F_Q(Z)$ or $F_{\Delta H}^N$ peaking factors for accident initial conditions with the allowed QPT present.

QPT satisfies Criterion 2 of 10 CFR 50.36 (Ref. 3).

LCO

The power distribution LCO limits have been established based on correlations between power peaking and easily measured process variables: regulating rod position, AXIAL POWER IMBALANCE, and QPT. The regulating rod position limits and the AXIAL POWER IMBALANCE boundaries contained in the COLR represent the measurement system independent limits. These are the limits at which the core power distribution either exceeds the LOCA LHR limits or causes a reduction in DNBR below the safety limit during anticipated transients with the allowable QPT present and with regulating rod position consistent with the limitations on regulating rod positions determined by the fuel cycle design and specified by LCO 3.2.1.

The allowable limits and maximum limits for QPT applicable for the full symmetrical Incore Detector System, Backup Incore Detector System, and Excore Detector System are provided; the limits are given in the COLR. The limits for the three systems are derived by adjustment of the measurement system independent QPT limits to allow for system observability and instrumentation errors.

APPLICABILITY

In MODE 1, the limits on QPT must be maintained when THERMAL POWER is > 20% RTP to prevent the core power distribution from exceeding the design limits. The minimum power level of 20% RTP is large enough to obtain meaningful QPT indications without compromising safety. Operation at or below 20% RTP with QPT up to the maximum limit specified in the COLR is acceptable because the resulting maximum LHR is not high enough to cause violation of the LOCA LHR limit ($F_Q(Z)$ limit) or the initial condition DNB allowable peaking limit ($F_{\Delta H}^N$ limit) during accidents initiated from this power level.

BASES

APPLICABILITY
(continued)

In MODE 2, the combination of QPT with maximum ALLOWABLE THERMAL POWER level does not result in LHRs sufficiently large to violate the fuel design limits, and therefore, applicability in this MODE is not required. Although not specifically addressed in the LCO, QPTs greater than the maximum limit specified in the COLR in MODE 1 with THERMAL POWER < 20% RTP are allowed for the same reason.

In MODES 3, 4, 5, and 6, this LCO is not applicable, because the reactor is not generating significant THERMAL POWER and QPT is indeterminate.

ACTIONS

A.1

The steady state limit specified in the COLR provides an allowance for QPT that may occur during normal operation. A peaking increase to accommodate QPTs up to the steady state limit is allowed by the regulating rod position limits of LCO 3.2.1 and the AXIAL POWER IMBALANCE limits of LCO 3.2.2.

The safety analysis has shown that a conservative corrective action is to reduce THERMAL POWER by 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit.

This action limits the local LHR to a value corresponding to steady state operation, thereby reducing it to a value within the assumed accident initial condition limits. The required Completion Time of 2 hours is reasonable, based on limiting the potential for xenon redistribution, the low probability of an accident occurring, and the steps required to complete the Required Action.

If QPT can be reduced to less than or equal to the steady state limit in < 2 hours, the reactor may return to normal operation without undergoing a power reduction. Significant radial xenon redistribution does not occur within this amount of time.

A.2

Power operation is allowed to continue if THERMAL POWER is reduced in accordance with Required Action A.1. The same reduction (i.e., 2% RTP or more) is also applicable to the nuclear overpower trip setpoints (flux and flux/flow imbalance), for each 1% of QPT in excess of the steady state limit. This reduction maintains both core protection and thermal margins at the

BASES

ACTIONS

A.2 (continued)

reduced THERMAL POWER level similar to that at RTP. The required Completion Time of 10 hours is reasonable based on the need to limit the potentially adverse xenon redistribution, the low probability of an accident occurring while operating out of specification, and the number of steps required to complete the Required Action.

A.3

Although the actions directed by Required Action A.1 restore margins, if the source of the QPT is not determined and corrected, it is prudent to establish increased margins. A required Completion Time of 24 hours to reduce QPT to less than the steady state limit is a reasonable time for investigation and corrective measures.

B.1

If QPT exceeds the transient limit but is equal to or less than the maximum limit due to a misaligned CONTROL ROD or APSR, then power operation is allowed to continue if the THERMAL POWER is reduced 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit. Thus, the transient limit is the upper bound within which the 2% for 1% power reduction rule may be applied, but only for QPTs caused by CONTROL ROD or APSR misalignment. The required Completion Time of 30 minutes ensures that the operator completes the THERMAL POWER reduction before significant xenon redistribution occurs.

B.2

When a misaligned CONTROL ROD or APSR occurs, a local xenon redistribution may occur. The required Completion Time of 2 hours allows the operator sufficient time to relatch or realign a CONTROL ROD or APSR, but is short enough to limit xenon redistribution so that large increases in the local LHR do not occur due to xenon redistribution resulting from the QPT.

BASES

ACTIONS
(continued)

C.1

If the Required Action and associated Completion Time of Condition A or B are not met, a further power reduction is required. Power reduction to < 60% RTP provides conservative protection from increased peaking due to xenon redistribution. The required Completion Time of 2 hours is reasonable to allow the operator to reduce THERMAL POWER to < 60% of ALLOWABLE THERMAL POWER without challenging unit systems.

C.2

Reduction of the nuclear overpower trip setpoints, based on flux and flux/flow imbalance, to $\leq 65.5\%$ of ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of ALLOWABLE THERMAL POWER maintains both core protection and thermal margin at reduced power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on operating experience.

D.1

Power reduction to 60% of the ALLOWABLE THERMAL POWER is a conservative method of limiting the maximum core LHR for QPTs up to the maximum limit specified by the COLR. Although the power reduction is based on the correlation used in Required Actions A.1 and B.1, the database for a power peaking increase as a function of QPT is less extensive for tilt mechanisms other than misaligned CONTROL RODS and APSRs. Because greater uncertainty in the potential power peaking increase exists with the less extensive database, a more conservative action is taken when the tilt is caused by a mechanism other than a misaligned CONTROL ROD or APSR. The required Completion Time of 2 hours allows the operator to reduce THERMAL POWER to < 60% of the ALLOWABLE THERMAL POWER without challenging unit systems.

D.2

Reduction of the nuclear overpower trip setpoints, based on flux and flux/flow imbalance, to $\leq 65.5\%$ of the ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of the ALLOWABLE THERMAL POWER maintains both core protection and an operating margin at reduced power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on operating experience.

BASES

ACTIONS
(continued)

E.1

If the Required Action and associated Completion Time for Condition C or D are not met, then the reactor will continue in power operation with significant QPT. Either the power level has not been reduced to comply with the Required Action or the nuclear overpower trip setpoints (flux and flux/flow imbalance) have not been reduced within the required Completion Time. To preclude risk of fuel damage in any of these conditions, THERMAL POWER is reduced further. Operation at 20% RTP allows the operator to investigate the cause of the QPT and to correct it. Local LHRs with a large QPT do not violate the fuel design limits at or below 20% RTP. The required Completion Time of 4 hours is acceptable based on limiting the potential increase in local LHRs that could occur due to xenon redistribution with the QPT out of specification.

F.1

QPT in excess of the maximum limit specified in the COLR can be an indication of a severe power distribution anomaly, and a power reduction to at most 20% RTP ensures local LHRs do not exceed allowable limits while the cause is being determined and corrected.

The required Completion Time of 4 hours is reasonable to allow the operator to reduce THERMAL POWER to $\leq 20\%$ RTP without challenging unit systems.

**SURVEILLANCE
REQUIREMENTS**

QPT can be monitored by both the Incore and Excore Detector Systems. **If the Incore Detector System is OPERABLE, this system shall be used for QPT monitoring. The Incore Detector System is preferred due to Excore Detector System tilts potentially being affected (i.e., normalized to zero) anytime an Excore Detector calibration is performed. Reasonable completion times exist to allow the use of the Incore Detector System for QPT monitoring. If the Incore Detector System is not OPERABLE, the Excore Detector System should be the basis for QPT monitoring.** The QPT limits are derived from their corresponding measurement system independent limits by adjustment for system observability errors and instrumentation errors. Although they may be based on the same measurement system independent limit, the limits for the different systems are not identical because of differences in the errors applicable for these systems. For QPT measurements using the Incore Detector System, the Backup Incore Detector System consists of OPERABLE detectors configured as follows:

BASES

BASES

**SURVEILLANCE
REQUIREMENTS
(continued)**

- a. Two sets of four detectors shall lie in each core half. Each set of detectors shall lie in the same axial plane. The two sets in the same core half may lie in the same axial plane.
- b. Detectors in the same plane shall have quarter core radial symmetry. Figure B 3.2.3-1 (Backup Incore Detector System for QPT Measurement) depicts an example of this configuration.

The Excore Detector System consists of four detectors (one located outside each quadrant of the core). Each detector consists functionally of two six-foot uncompensated ion chambers adjacent to the top and bottom halves of the core.

SR 3.2.3.1

Checking the QPT indication every 7 days ensures that the operator can determine whether the plant computer software and Incore Detector System inputs for monitoring QPT are functioning properly, and takes into account other information and alarms available to the operator in the Control Room. This procedure allows the QPT mechanisms, such as xenon redistribution, burnup gradients, and CONTROL ROD drive mechanism malfunctions, which can cause slow development of a QPT, to be detected. Operating experience has confirmed the acceptability of a Surveillance Frequency of 7 days.

Following restoration of the QPT to within the steady state limit, operation at $\geq 95\%$ RTP may proceed provided the QPT is determined to remain within the steady state limit at the increased THERMAL POWER level. In case QPT exceeds the steady state limit for more than 24 hours or exceeds the transient limit (Condition A, B, or D), the potential for xenon redistribution is greater. Therefore, the QPT is monitored for 12 consecutive hourly intervals to determine whether the period of any oscillation due to xenon redistribution causes the QPT to exceed the steady state limit again.

REFERENCES

- 1. 10 CFR 50.46.
 - 2. BAW 10122A, "Normal Operating Controls," Rev. 1, May 1984.
 - 3. 10 CFR 50.36.
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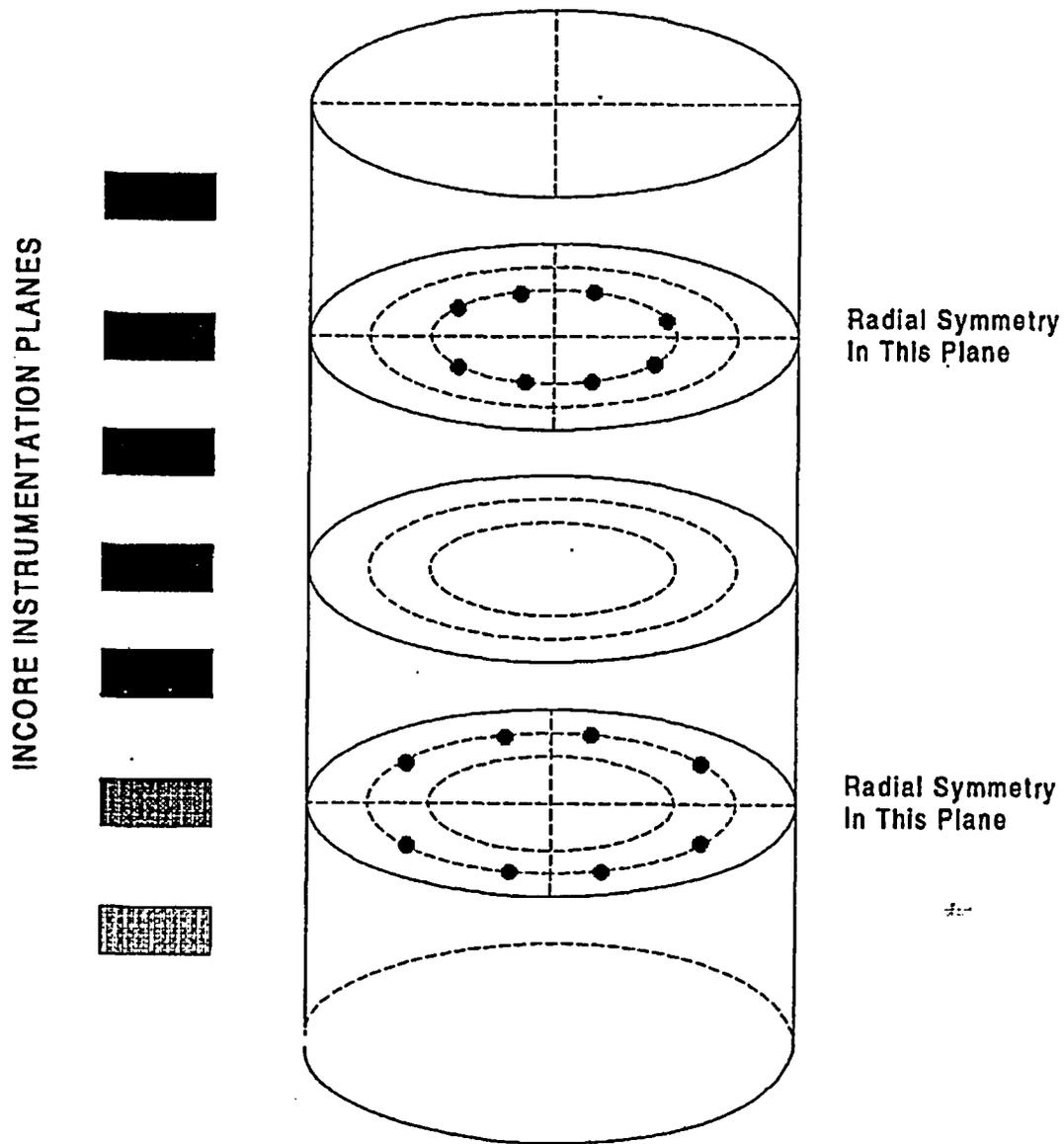


Figure B 3.2.3-1 (page 1 of 1)
Backup Incore Detector System for QUADRANT POWER TILT Measurement