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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 3.2.1, Regulating Rod Position Limits, were implemented on October 30, 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 Larry E. Nicholson, at (864-885-3292).

Very truly yours,

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Attachment 1

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.1 Regulating Rod Position Limits

BASES

BACKGROUND

The position limits of the regulating rods are initial condition assumptions used in all safety analyses that assume rod withdrawal or insertion upon reactor trip. The position limits directly affect the core power distributions, the worth of a potential ejected rod, the assumptions of SDM, and the reactivity insertion rate during withdrawals and insertions.

The applicable criteria for these reactivity and power distribution design requirements are described in ONS Design Criteria (Ref. 1), and in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors" (Ref. 2).

Limits on regulating rod position have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are not violated.

The regulating rod groups operate with a predetermined amount of position overlap, in order to approximate a linear relation between rod worth and rod position (integral rod worth). To achieve this approximately linear relationship, the regulating rod groups are withdrawn and operated in a predetermined sequence. The integrated control system controls reactivity by moving the regulating rod groups in sequence within analyzed ranges. The group sequence and overlap limits are specified in the COLR.

The regulating rods are used for precise reactivity control of the reactor. The positions of the regulating rods are normally controlled automatically by the integrated control system but can also be controlled manually. They are capable of rapid reactivity changes compared with borating or diluting the Reactor Coolant System (RCS).

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that ensure that the criteria specified in 10 CFR 50.46 (Ref. 2) are not violated. 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 $F^N_{\Delta H}$ limits. $F_Q(Z)$ is the maximum local linear power density in

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BACKGROUND (continued)

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 would exceed the loss of coolant accident (LOCA) limits. $F^N_{\Delta H}$ 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 $F^N_{\Delta H}$ limits prevents departure from nucleate boiling (DNB) during an anticipated transient. In addition to the $F_Q(Z)$ and $F^N_{\Delta H}$ limits, certain reactivity limits are met by regulating rod position limits. The regulating rod position limits also restrict the ejected CONTROL ROD worth to the values assumed in the safety analysis and support the minimum required SDM in MODES 1 and 2.

This LCO is required to minimize fuel cladding failures that breach the primary fission product barrier and release fission products into the reactor coolant in the event of a LOCA, loss of flow accident, ejected rod accident, or other postulated accidents or transients requiring termination by a Reactor Protection System trip function.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation or anticipated transients. The LCOs governing regulating rod position, AXIAL POWER IMBALANCE, and QPT 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. 2).

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.

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. 3).

d. The CONTROL RODS must be capable of shutting down the reactor with a minimum required SDM which assumes the highest worth CONTROL ROD stuck fully withdrawn.

Fuel cladding damage could result if an anticipated transient occurs with the simultaneous violation of one or more of the LCOs limiting the regulating rod position, the AXIAL POWER IMBALANCE, and the QPT. This potential for fuel cladding damage exists because changes in the power distribution can cause increased power peaking and correspondingly increased local linear heat rates (LHRs).

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APPLICABLE SAFETY ANALYSES (continued)

The SDM requirement is met by limiting the regulating and safety rod position limits such that sufficient insertable reactivity is available in the rods to shut down the reactor to hot zero power with a reactivity margin that assumes that the maximum worth rod remains fully withdrawn upon trip (Ref. 4). Operation at the SDM based regulating rod position limit ensures that the maximum ejected rod worth is less than that assumed in the analyses.

Operation at the regulating rod position limits may cause the local core power to approach the maximum linear heat generation rate or peaking factor with the allowed QPT present.

The regulating rod and safety rod position limits ensure that the safety analysis assumptions for SDM, ejected rod worth, and power distribution peaking factors remain valid (Refs. 3 and 4).

The regulating rod position limits LCO satisfies Criterion 2 of 10 CFR 50.36 (Ref. 5).

LCO

The limits on regulating rod group sequence, overlap, and position as defined in the COLR, must be maintained because they ensure that the resulting power distribution is within the range of analyzed power distributions and that the SDM and ejected rod worth are maintained.

The overlap between regulating groups provides more uniform rates of reactivity insertion and withdrawal and is imposed to maintain acceptable power peaking during regulating rod motion.

Error adjusted maximum allowable setpoints for regulating rod position are provided in the COLR. The setpoints are derived by an adjustment of the measurement system independent limits to allow for THERMAL POWER level uncertainty and rod position errors.

LCO 3.2.1 has been modified by a Note that suspends the LCO requirement for those regulating rods not within the limits of the COLR solely due to testing in accordance with SR 3.1.4.2, which verifies the freedom of the rods to move. This SR may require the regulating rods to move below the LCO limit, which would otherwise violate the LCO.

APPLICABILITY

The regulating rod sequence, overlap, and physical position limits shall be maintained with the reactor in MODES 1 and 2. These limits maintain the validity of the assumed power distribution, ejected rod worth, SDM, and

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BASES

APPLICABILITY (continued)

reactivity rate insertion assumptions used in the safety analyses. Applicability in MODES 3, 4, and 5 is not required, because neither the power distribution nor ejected rod worth assumptions are exceeded in these MODES. SDM in MODES 3, 4, and 5 is governed by LCO 3.1.1, "SHUTDOWN MARGIN (SDM)."

ACTIONS

The regulating rod position limits provided in the COLR are based on both the initial conditions assumed in the accident analyses and on the SDM. Specifically, separate position limits are specified to determine whether the unit is operating in violation of the initial conditions (e.g., the range of power distributions) assumed in the accident analyses or whether the unit is in violation of the SDM or ejected rod worth limits. Separate position limits are provided because different Required Actions and Completion Times apply, depending on which position limit has been violated. The area between the boundaries of acceptable operation and unacceptable operation, illustrated on the regulating rod position limit figures in the COLR, is the restricted region. The actions required when operation occurs with the regulating rod group sequence or overlap requirements not met are described under Condition A. The actions required when operation occurs in the restricted region and unacceptable region are described under Conditions B and C.

A.1

Operation with the regulating rod groups out of sequence or with the group overlap limits exceeded may represent a condition beyond the assumptions used in the safety analyses. The design calculations assume no deviation in nominal overlap between regulating rod groups. However, small deviations in group overlap, as allowed by the COLR, may occur and would not cause significant differences in core reactivity, in power distribution, or rod worth, relative to the design calculations. Group sequence must be maintained because design calculations assume the regulating rods withdraw and insert in a predetermined order. The Completion Time of 2 hours is intended to restrict operation in this condition because of the potential severity associated with gross violations of group sequence or overlap requirements. The 2 hour Completion Time is based on operating experience which supports the restoration time without unnecessarily challenging unit operation and the low probability of an event occurring simultaneously with the limit out of specification.

BASES

ACTIONS (continued)

B.1, B.2.1 and B.2.2

Operation in the unacceptable region shown on the figures in the COLR corresponds to power operation with an SDM less than the minimum required value or with the ejected rod worth greater than the allowable value. The regulating rods may be positioned too far to provide sufficient negative reactivity insertion following a reactor trip and the ejected rod worth may exceed its initial condition limit. Therefore, Required Action B.1 requires the RCS boron concentration be increased to restore the regulating rod position to a value that preserves the SDM and ejected rod worth limits. The RCS boration must occur as described in Section B 3.1.1. The required Completion Time of 15 minutes to initiate boration is reasonable, based on limiting the potential xenon redistribution, the low probability of an accident occurring in this relatively short time period, and the number of steps required to complete this Action. This period allows the operator sufficient time for aligning the required valves and for starting the boric acid pumps. Boration continues until the regulating rod group positions are restored to at least within the restricted region, which restores the minimum SDM and reduces the potential ejected rod worth to within its limit. Required Action B.1 is modified by a Note indicating that it is not applicable to regulating rod groups positioned in the restricted region.

Indefinite operation with the regulating rods inserted in the restricted region or unacceptable region is not prudent. Reactivity limits may not be met and the abnormal regulating rod position or group configuration may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may adversely affect the long term fuel depletion pattern. Therefore, Required Action B.2.1 requires restoration of regulating rod groups to within their limits within 2 hours. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group positions or configurations, thereby limiting the potential for an adverse xenon redistribution.

The regulating rods can also be restored within the acceptable position limits by reducing the THERMAL POWER to a value allowed by the regulating rod position limits in the COLR as allowed by Required Action B.2.2. The required Completion Time of 2 hours is sufficient to allow the operator to complete the power reduction in an orderly manner and without challenging the unit systems.

BASES

ACTIONS (continued)

C.1

If the Required Action and associated Completion Time of Condition A or B are not met, then the reactor must be placed in MODE 3, a MODE in which this LCO does not apply. This Action ensures that the reactor does not continue operating in violation of the peaking limits, the ejected rod worth, the reactivity insertion rate assumed as initial conditions in the accident analyses, or the required minimum SDM assumed in the accident analyses. The required Completion Time of 12 hours is reasonable, based on operating experience regarding the amount of time required to reach MODE 3 from RTP without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

This Surveillance ensures that the sequence and overlap limits are not violated. A Surveillance Frequency of 12 hours is acceptable because little rod motion due to fuel burnup occurs in 12 hours. Also, the Frequency takes into account other information available in the control room for monitoring the status of the regulating rods.

SR 3.2.1.2

Verification of the regulating rod position limits as specified in the COLR at a Frequency of 12 hours is sufficient to detect whether the regulating rod groups may be approaching or exceeding their group position limits, because little rod motion occurs due to fuel burnup occurs in 12 hours. Also, the Frequency takes into account other information available in the control room for monitoring the status of the regulating rods.

SR 3.2.1.3

Prior to achieving criticality, an estimated critical position for the CONTROL RODS is determined. Verification that SDM meets the minimum requirements ensures that sufficient SDM capability exists with the CONTROL RODS at the estimated critical position if it is necessary to shut down or trip the reactor after criticality. The Frequency of 4 hours prior to criticality provides sufficient time to verify SDM capability and establish the estimated critical position.

BASES (continued)

REFERENCES

1. UFSAR, Section 3.1.
2. 10 CFR 50.46.
3. UFSAR, Section 15.2.
4. UFSAR, Chapter 15.
5. 10 CFR 50.36.

Attachment 2

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.1 Regulating Rod Position Limits

BASES

BACKGROUND

The position limits of the regulating rods are initial condition assumptions used in all safety analyses that assume rod withdrawal or insertion upon reactor trip. The position limits directly affect the core power distributions, the worth of a potential ejected rod, the assumptions of SDM, and the reactivity insertion rate during withdrawals and insertions.

The applicable criteria for these reactivity and power distribution design requirements are described in ONS Design Criteria (Ref. 1), and in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors" (Ref. 2).

Limits on regulating rod position have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are not violated.

The regulating rod groups operate with a predetermined amount of position overlap, in order to approximate a linear relation between rod worth and rod position (integral rod worth). To achieve this approximately linear relationship, the regulating rod groups are withdrawn and operated in a predetermined sequence. The integrated control system controls reactivity by moving the regulating rod groups in sequence within analyzed ranges. The group sequence and overlap limits are specified in the COLR.

The regulating rods are used for precise reactivity control of the reactor. The positions of the regulating rods are normally controlled automatically by the integrated control system but can also be controlled manually. They are capable of rapid reactivity changes compared with borating or diluting the Reactor Coolant System (RCS).

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that ensure that the criteria specified in 10 CFR 50.46 (Ref. 2) are not violated. 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 $F^N_{\Delta H}$ limits. $F_Q(Z)$ is the maximum local linear power density in

BASES

BACKGROUND (continued)

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 would exceed the loss of coolant accident (LOCA) limits. $F^N_{\Delta H}$ 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 $F^N_{\Delta H}$ limits prevents departure from nucleate boiling (DNB) during an anticipated transient. In addition to the $F_Q(Z)$ and $F^N_{\Delta H}$ limits, certain reactivity limits are met by regulating rod position limits. The regulating rod position limits also restrict the ejected CONTROL ROD worth to the values assumed in the safety analysis and support the minimum required SDM in MODES 1 and 2.

This LCO is required to minimize fuel cladding failures that breach the primary fission product barrier and release fission products into the reactor coolant in the event of a LOCA, loss of flow accident, ejected rod accident, or other postulated accidents or transients requiring termination by a Reactor Protection System trip function.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation or anticipated transients. The LCOs governing regulating rod position, AXIAL POWER IMBALANCE, and QPT 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. 2).

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.

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. 3).

d. The CONTROL RODS must be capable of shutting down the reactor with a minimum required SDM which assumes the highest worth CONTROL ROD stuck fully withdrawn.

Fuel cladding damage could result if an anticipated transient occurs with the simultaneous violation of one or more of the LCOs limiting the regulating rod position, the AXIAL POWER IMBALANCE, and the QPT. This potential for fuel cladding damage exists because changes in the power distribution can cause increased power peaking and correspondingly increased local linear heat rates (LHRs).

BASES

APPLICABLE SAFETY ANALYSES (continued)

The SDM requirement is met by limiting the regulating and safety rod position limits such that sufficient insertable reactivity is available in the rods to shut down the reactor to hot zero power with a reactivity margin that assumes that the maximum worth rod remains fully withdrawn upon trip (Ref. 4). Operation at the SDM based regulating rod position limit ensures that the maximum ejected rod worth is less than that assumed in the analyses.

Operation at the regulating rod position limits may cause the local core power to approach the maximum linear heat generation rate or peaking factor with the allowed QPT present.

The regulating rod and safety rod position limits ensure that the safety analysis assumptions for SDM, ejected rod worth, and power distribution peaking factors remain valid (Refs. 3 and 4).

The regulating rod position limits LCO satisfies Criterion 2 of 10 CFR 50.36 (Ref. 5).

LCO

The limits on regulating rod group sequence, overlap, and position as defined in the COLR, must be maintained because they ensure that the resulting power distribution is within the range of analyzed power distributions and that the SDM and ejected rod worth are maintained.

The overlap between regulating groups provides more uniform rates of reactivity insertion and withdrawal and is imposed to maintain acceptable power peaking during regulating rod motion.

Error adjusted maximum allowable setpoints for regulating rod position are provided in the COLR. The setpoints are derived by an adjustment of the measurement system independent limits to allow for THERMAL POWER level uncertainty and rod position errors.

(2)

LCO 3.~~1~~.1 has been modified by a Note that suspends the LCO requirement for those regulating rods not within the limits of the COLR solely due to testing in accordance with SR 3.1.4.2, which verifies the freedom of the rods to move. This SR may require the regulating rods to move below the LCO limit, which would otherwise violate the LCO.

APPLICABILITY

The regulating rod sequence, overlap, and physical position limits shall be maintained with the reactor in MODES 1 and 2. These limits maintain the validity of the assumed power distribution, ejected rod worth, SDM, and

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BASES

APPLICABILITY (continued)

reactivity rate insertion assumptions used in the safety analyses. Applicability in MODES 3, 4, and 5 is not required, because neither the power distribution nor ejected rod worth assumptions are exceeded in these MODES. SDM in MODES 3, 4, and 5 is governed by LCO 3.1.1, "SHUTDOWN MARGIN (SDM)."

ACTIONS

The regulating rod position limits provided in the COLR are based on both the initial conditions assumed in the accident analyses and on the SDM. Specifically, separate position limits are specified to determine whether the unit is operating in violation of the initial conditions (e.g., the range of power distributions) assumed in the accident analyses or whether the unit is in violation of the SDM or ejected rod worth limits. Separate position limits are provided because different Required Actions and Completion Times apply, depending on which position limit has been violated. The area between the boundaries of acceptable operation and unacceptable operation, illustrated on the regulating rod position limit figures in the COLR, is the restricted region. The actions required when operation occurs with the regulating rod group sequence or overlap requirements not met are described under Condition A. The actions required when operation occurs in the restricted region and unacceptable region are described under Conditions B and C.

A.1

Operation with the regulating rod groups out of sequence or with the group overlap limits exceeded may represent a condition beyond the assumptions used in the safety analyses. The design calculations assume no deviation in nominal overlap between regulating rod groups. However, small deviations in group overlap, as allowed by the COLR, may occur and would not cause significant differences in core reactivity, in power distribution, or rod worth, relative to the design calculations. Group sequence must be maintained because design calculations assume the regulating rods withdraw and insert in a predetermined order. The Completion Time of 2 hours is intended to restrict operation in this condition because of the potential severity associated with gross violations of group sequence or overlap requirements. The 2 hour Completion Time is based on operating experience which supports the restoration time without unnecessarily challenging unit operation and the low probability of an event occurring simultaneously with the limit out of specification.

BASES

ACTIONS (continued)

B.1, B.2.1 and B.2.2

Operation in the unacceptable region shown on the figures in the COLR corresponds to power operation with an SDM less than the minimum required value or with the ejected rod worth greater than the allowable value. The regulating rods may be positioned too far to provide sufficient negative reactivity insertion following a reactor trip and the ejected rod worth may exceed its initial condition limit. Therefore, Required Action B.1 requires the RCS boron concentration be increased to restore the regulating rod position to a value that preserves the SDM and ejected rod worth limits. The RCS boration must occur as described in Section B 3.1.1. The required Completion Time of 15 minutes to initiate boration is reasonable, based on limiting the potential xenon redistribution, the low probability of an accident occurring in this relatively short time period, and the number of steps required to complete this Action. This period allows the operator sufficient time for aligning the required valves and for starting the boric acid pumps. Boration continues until the regulating rod group positions are restored to at least within the restricted region, which restores the minimum SDM and reduces the potential ejected rod worth to within its limit. Required Action B.1 is modified by a Note indicating that it is not applicable to regulating rod groups positioned in the restricted region.

Indefinite operation with the regulating rods inserted in the restricted region or unacceptable region is not prudent. Reactivity limits may not be met and the abnormal regulating rod position or group configuration may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may adversely affect the long term fuel depletion pattern. Therefore, Required Action B.2.1 requires restoration of regulating rod groups to within their limits within 2 hours. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group positions or configurations, thereby limiting the potential for an adverse xenon redistribution.

The regulating rods can also be restored within the acceptable position limits by reducing the THERMAL POWER to a value allowed by the regulating rod position limits in the COLR as allowed by Required Action B.2.2. The required Completion Time of 2 hours is sufficient to allow the operator to complete the power reduction in an orderly manner and without challenging the unit systems.

BASES

ACTIONS (continued)

C.1

If the Required Action and associated Completion Time of Condition A or B are not met, then the reactor must be placed in MODE 3, a MODE in which this LCO does not apply. This Action ensures that the reactor does not continue operating in violation of the peaking limits, the ejected rod worth, the reactivity insertion rate assumed as initial conditions in the accident analyses, or the required minimum SDM assumed in the accident analyses. The required Completion Time of 12 hours is reasonable, based on operating experience regarding the amount of time required to reach MODE 3 from RTP without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

This Surveillance ensures that the sequence and overlap limits are not violated. A Surveillance Frequency of 12 hours is acceptable because little rod motion due to fuel burnup occurs in 12 hours. Also, the Frequency takes into account other information available in the control room for monitoring the status of the regulating rods.

SR 3.2.1.2

Verification of the regulating rod position limits as specified in the COLR at a Frequency of 12 hours is sufficient to detect whether the regulating rod groups may be approaching or exceeding their group position limits, because little rod motion occurs due to fuel burnup occurs in 12 hours. Also, the Frequency takes into account other information available in the control room for monitoring the status of the regulating rods.

SR 3.2.1.3

Prior to achieving criticality, an estimated critical position for the CONTROL RODS is determined. Verification that SDM meets the minimum requirements ensures that sufficient SDM capability exists with the CONTROL RODS at the estimated critical position if it is necessary to shut down or trip the reactor after criticality. The Frequency of 4 hours prior to criticality provides sufficient time to verify SDM capability and establish the estimated critical position.

BASES (continued)

REFERENCES

1. UFSAR, Section 3.1.
2. 10 CFR 50.46.
3. UFSAR, Section 15.2.
4. UFSAR, Chapter 15.
5. 10 CFR 50.36.