3/4.1.3 MOVABLE CONTROL ASSEMBLIES

GROUP HEIGHT - SAFETY AND REGULATING ROD GROUPS

LIMITING CONDITION FOR OPERATIONS

3.1.3.1 All control (safety and regulating) rods shall be OPERABLE and positioned within ± 6.5% (indicated position) of their group average height.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more control rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within one hour and be in at least HOT STANDBY within 6 hours.

b. With more than one control rod inoperable or misaligned from its group average height by more than ± 6.5% (indicated position), be in at least HOT STANDBY within 6 hours.

c. With one control rod inoperable due to causes other than addressed by ACTION a, above, or misaligned from its group average height by more than ± 6.5% (indicated position), POWER OPERATION may continue provided that within one hour either:

1. The control rod is restored to OPERABLE status within the above alignment requirements, or

2. The control rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:

a) An analysis of the potential ejected rod worth is performed within 72 hours and the rod worth is determined to be ≤ 1.0% Δk at zero power and ≤ 0.65% Δk at RATED THERMAL POWER for the remainder of the fuel cycle.

b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

*See Special Test Exceptions 3.10.1 and 3.10.2.

REACTIVITY CONTROL SYSTEMS

ACTION: (Continued)

c) A power distribution map is obtained from the incore detectors and F_Q $F^N_{\Delta H}$ are verified to be within their limits within 72 hours.

Either the THERMAL POWER level is reduced to ≤ 60% of the THERMAL POWER allowable for the reactor coolant pump combination within one hour and within the next 4 hours the High Flux Trip Setpoint is reduced to ≤ 70% of the THERMAL POWER allowable for the reactor coolant pump combination, or

e) The remainder of the rods in the group with the inoperable rod are aligned to within ± 6.5% of the inoperable rod within one hour while maintaining the rod sequence, insertion and overlap limits of Figure 3.1-2 and 3.1-3; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each control rod shall be determined to be within the group average height limit by verifying the individual rod positions at least once per 12 hours except during time intervals when the ~~Asymmetric Rod Fault Circuitry~~ is inoperable, then verify the individual rod position(s) of the rod(s), with ~~inoperable Fault Circuitry~~ at least once per 4 hours.

the asymmetric rod monitor asymmetric rod monitor

4.1.3.1.2 Each control rod not fully inserted shall be determined to be OPERABLE by movement of at least 2% in any one direction at least once every 31 days.

REACTIVITY CONTROL SYSTEMS

GROUP HEIGHT - AXIAL POWER SHAPING ROD GROUP

LIMITING CONDITION FOR OPERATION

3.1.3.2 All axial power shaping rods (APSR) shall be OPERABLE, unless fully withdrawn, and shall be positioned within ± 6.5% (indicated position) of their group average height.

APPLICABILITY: MODES 1* and 2*.

ACTION:

With a maximum of one APSR inoperable or misaligned from its group average height by more than ± 6.5% (indicated position), operation may continue provided that within 2 hours:

a. The APSR group is positioned such that the misaligned rod is restored to within limits for the group average height, or

b. It is determined that the imbalance limits of Specification 3.2.1 are satisfied and movement of the APSR group is prevented while the rod remains inoperable or misaligned.

SURVEILLANCE REQUIREMENTS

4.1.3.2.1 The position of each APSR rod shall be determined to be within the group average height limit by verifying the individual rod positions at least once per 12 hours except during time intervals when the ~~Asymmetric Rod Fault Circuitry~~ asymmetric rod monitor is inoperable, then verify the individual rod position(s) of the rod(s), with the inoperable ~~Fault Circuitry~~ asymmetric rod monitor at least once per 4 hours.

4.1.3.2.2 Unless all APSR are fully withdrawn, the APSR shall be determined to be OPERABLE by moving the APSR rods at least 2% at least once every 31 days.

*See Special Test Exceptions 3.10.1 and 3.10.2.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS

LIMITING CONDITION FOR OPERATION

3.1.3.3 All safety, regulating and axial power shaping control rod absolute position indicator channels and relative position indicator channels shall be OPERABLE and capable of determining the control rod group average positions within ± ~~6.5%~~ 1.5%.

APPLICABILITY: MODES 1 and 2.

ACTION:

a. With a maximum of one absolute position indicator channel per control rod group or one relative position indicator channel per control rod group inoperable either:

1. Reduce THERMAL POWER to ≤ 60% of the THERMAL POWER allowable for the reactor coolant pump combination and reduce the High Flux Trip Setpoint to ≤ 70% of the THERMAL POWER allowable for the reactor coolant pump combination within 8 hours, or

2. Operation may continue provided:

a) The position of the control rod with the inoperable position indicator is verified within 8 hours by actuating its 0%, 25%, 50%, 75% or, 100% position reference indicator, and

b) The control rod group(s) containing the inoperable position indicator channel is subsequently maintained at the 0%, 25%, 50%, 75% or, 100% withdrawn position and verified at this position at least once per 12 hours thereafter, and

c) Operation is within the limits of Specification 3.1.3.6.

b. With more than one ~~absolute~~ relative position indicator channel inoperable, operation in MODES 1 and 2 may continue for up to 24 hours provided all of the ~~relative~~ absolute position indicator channels are OPERABLE.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATOR CHANNELS (Continued)

SURVEILLANCE REQUIREMENTS

4.1.3.3 Each absolute and relative position indicator channel shall be determined to be OPERABLE by verifying that the relative position indicator channels and the absolute position indicator channels agree within ~~6.5~~ 3.46% at least once per 12 hours except during time intervals when the ~~Asymmetric Rod Fault Circuitry~~ is inoperable, then compare the relative position indicator and absolute position indicator channel(s) of the rod(s) with inoperable ~~Fault Circuitry~~ at least once per 4 hours.

the asymmetric rod monitor

asymmetric rod monitor

3/4.1.2 BORATION SYSTEMS (Continued)

stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity change in the event the single injection system becomes inoperable.

The boron capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% Δk/k after xenon decay and cooldown from 200°F to 70°F. This condition requires either 600 gallons of 7875 ppm borated water from the boric acid storage system or 3,000 gallons of 1800 ppm borated water from the borated water storage tank.

The bottom 4 inches of the borated water storage tank are not available, and the instrumentation is calibrated to reflect the available volume. All boric acid tank volume is available. The limits on water volume, and boron concentration ensure a pH value of between 7.0 and 11.0 of the solution recirculated within containment after a design basis accident. The pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion cracking on mechanical systems and components.

The OPERABILITY of one boron injection system during REFUELING ensures that this system is available for reactivity control while in MODE 6.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section (1) ensure that acceptable power distribution limits are maintained, (2) ensure that the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of a rod ejection accident. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original criteria are met. For example, misalignment of a safety or regulating rod requires a restriction in THERMAL POWER. The reactivity worth of a misaligned rod is limited for the remainder of the fuel cycle to prevent exceeding the assumptions used in the safety analysis.

The position of a rod declared inoperable due to misalignment should not be included in computing the average group position for determining the OPERABILITY of rods with lesser misalignments.

3/4.1.3. MOVABLE CONTROL ASSEMBLIES (Continued)

The maximum rod drop time permitted is consistent with the assumed rod drop time used in the safety analyses. Measurement with $T_{avg} \geq 525°F$ and with reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a reactor trip at operating conditions.

Control rod positions and OPERABILITY of the rod position indicators are required to be verified on a nominal basis of once per 12 hours with frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied. (Insert A)

Technical Specification 3.1.3.8 provides the ability to prevent excessive power peaking by transient xenon at RATED THERMAL POWER. Operating restrictions resulting from transient xenon power peaking, including xenon-free startup, are inherently included in the limits of Sections 3.1.3.6 (Regulating Rod Insertion Limits), 3.1.3.9 (Axial Power Shaping Rod Insertion Limits), and 3.2.1 (Axial Power Imbalance) for transient peaking behavior bounded by the following factors. For the period of cycle operation where regulating rod groups 6 and 7 are allowed to be inserted at RATED THERMAL POWER, an 8% peaking increase is applied at or above 92% FP. An 18% increase is applied below 92% FP. For operation where only regulating rod group 7 is allowed to be inserted at RATED THERMAL POWER, a 5% peaking increase is applied at or above 92% FP and a 13% increase is applied below 92% FP.

If these values, checked every cycle, conservatively bound the peaking effects of all transient xenon, then the need for any hold at a power level cutoff below RATED THERMAL POWER is precluded. If not, either the power level at which the requirements of Section 3.1.3.8 must be satisfied or the above-listed factors will be suitably adjusted to preserve the LOCA linear heat rate limits.

The limitation on axial power shaping rod insertion is necessary to ensure that power peaking limits are not exceeded.

INSERT A

A 1.5% group average position uncertainty is applied to the rod index curves. Therefore, the position indicators must be capable of supporting this accuracy. The Surveillance Requirement ensures this accuracy by keeping the RPI calibrated to a "known" position as indicated by the API. Using the API as a "known" position is valid provided two consecutive reed switched are not inoperable. Having one entire string, (i. e., every other reed switch) inoperable is acceptable.

A specific surveillance of the reed switches is not required because:

1) When one or more reed switch fails closed a large API indication of asymmetry occurs.

2) Two failed open reed switches in series result in a large indication of asymmetry.

3) Failed open reed switches not in series (up to every other switch) are bounded by the analysis.

Therefore, a reed switch condition not bounded by the analysis will be indicated by API system asymmetry indications.