PROPOSED TECHNICAL SPECIFICATIONS

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - T_{avg} > 200°F

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be ≥ 5.5% Δk/k.

APPLICABILITY: MODES 1, 2*, 3 and 4.

ACTION:

With the SHUTDOWN MARGIN < 5.5% Δk/k, immediately initiate and continue boration at ≥ 40 gpm of 1731 ppm boric acid solution or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be ≥ 5.5% Δk/k:

a. Within one hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable or untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

b. When in MODES 1 or 2#, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2##, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e below, with the CEA groups at the Transient Insertion Limits of Specification 3.1.3.6.

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* See Special Test Exception 3.10.1.

\# With $K_{eff} \geq 1.0$.

\## With $K_{eff} < 1.0$.

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

3.1.1.4 The moderator temperature coefficient (MTC) shall be:

a. Less positive than 0.5×10^{-4} $\Delta k/k/^{\circ}F$ whenever THERMAL POWER is $\leq$70% of RATED THERMAL POWER,

b. Less positive than 0.0 $\Delta k/k/^{\circ}F$ whenever THERMAL POWER is >70% of RATED THERMAL POWER, and

c. Less negative than -3.4×10^{-4} $\Delta k/k/^{\circ}F$ at RATED THERMAL POWER.

APPLICABILITY: MODES 1 and 2*

ACTION:

With the moderator temperature coefficient outside any one of the above limits, be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.1.4.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the above limits.

4.1.1.4.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.

b. At any THERMAL POWER, prior to reaching a RATED THERMAL POWER equilibrium boron concentration of 800 ppm.

c. At any THERMAL POWER, within 14 EFPD after reaching a RATED THERMAL POWER equilibrium boron concentration of 300 ppm.

*With $K_{eff} \geq 1.0$.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.8 Each of the following borated water sources shall be OPERABLE:

a. At least one boric acid makeup tank and one associated heat tracing circuit per tank with the contents of the tank in accordance with Figure 3.1-1, and

b. The refueling water tank with:

1. A contained borated water volume of between 464,900 and 500,500 gallons (equivalent to an indicated tank level of between 91.7% and 100%, respectively),

2. Between 1731 and 2250 ppm of boron,

3. A minimum solution temperature of 40°F, and

4. A maximum solution temperature of 110°F.

APPLICABILITY: MODES 1, 2, 3 and 4

ACTION:

a. With the above required boric acid makeup tank inoperable, restore the make up tank to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and borated to a SHUTDOWN MARGIN equivalent to at least 5.0% $\Delta k/k$ at 200°F; restore the above required boric acid makeup tank to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the refueling water tank inoperable, restore the tank to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.8 Each of the above required borated water sources shall be demonstrated OPERABLE:

EMERGENCY CORE COOLING SYSTEMS

REFUELING WATER TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water tank shall be OPERABLE with:

a. A contained borated water volume of between 464,900 and 500,500 gallons (equivalent to an indicated level between 91.7% and 100%, respectively),

b. Between 1731 and 2250 ppm of boron,

c. A minimum solution temperature of 40°F, and

d. A maximum solution temperature of 110°F

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With the refueling water tank inoperable, restore tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWT shall be demonstated OPERABLE:

a. At least once per 7 days by:

1. Verifying the contained borated water volume in the tank, and

2. Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWT temperature.

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating condition, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS T_{avg}. The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature, and is associated with a postulated steam line break accident and resulting uncontrolled RCS cooldown. A SHUTDOWN MARGIN of 5.5% $\Delta k/k$ will ensure that adequate reactivity control is available for this accident. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. With $T_{avg} \leq 200°F$, the reactivity transients resulting from any postulated accident are minimal and a 5.0% $\Delta k/k$ shutdown margin provides adequate protection.

3/4.1.1.3 BORON DILUTION

A minimum flow rate of at least 3000 GPM provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 3000 GPM will circulate an equivalent Reactor Coolant System volume of 9,975 cubic feet in approximately 25 minutes. The reactivity change rate associated with boron concentration reductions will therefore be within the capability of operator recognition and control.

3/4.1.1.4 MODERATOR TEMPERATURE COEFFICIENT (MTC)

The limitations on MTC are provided to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The surveillance requirements for measurement of the MTC during each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup. The confirmation that the measured MTC value is within its limit provides assurances that the coefficient will be maintained within acceptable values throughout each fuel cycle.

DESCRIPTION OF AMENDMENT REQUEST

This proposed change would revise Technical Specifications 3.1.1.4, "Moderator Temperature Coefficient", 4.1.1.4.2, the associated Surveillance Requirement, 3.1.2.8.b and 3.5.4, "Refueling Water Tank" and 3.1.1.1, "Shutdown Margin - T_{avg} > 200° F." Technical Specification (T.S.) 3.1.1.4 imposes limitations on Moderator Temperature Coefficient (MTC) to ensure that the assumptions used in the accident and transient analyses remain valid through each fuel cycle. T.S. 3.5.4 and 3.1.2.8.b require operability of the RWT by specifying the contained borated water volume and concentration, and both the minimum and maximum solution temperature. T.S. 3.1.1.1 ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

T.S. 3.1.1.4 currently states that the MTC shall be less negative than -2.8×10^{-4} delta k/k/°F at rated thermal power. The proposed change will state that the MTC shall be less negative than -3.4×10^{-4} delta k/k/°F. This change is required to accommodate the MTC associated with Cycle 6 end of core life fuel configuration.

As part of the Cycle 6 reload analysis, the FSAR Chapter 15 accident analyses were reviewed to assure continued compliance. The most limiting accident associated with a decrease in the MTC is a major secondary system pipe break. For this event the cooldown of the RCS, coupled with a negative moderator coefficient of reactivity, results in a positive reactivity addition. When using the same conservative assumptions specified in Chapter 15, the results of the Cycle 6 analysis were shown to be bounded by the original Cycle 1 results. Therefore, no additional Technical Specification changes are necessary to assure compliance with the Safety Analysis.

Current Technical Specification Surveillance Requirements require the periodic verification of the MTC value. The confirmation that the measured MTC value is within its limit provides assurances that the coefficient will be maintained within acceptable values throughout each fuel cycle. The proposed change to Surveillance Requirement 4.1.1.4.2 will allow for greater operational flexibility in the performance of MTC measurements. Performing the MTC measurements as proposed in the revised Surveillance Requirement will not affect the confirmation of MTC since the MTC changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.

T.S. 3.5.4 and 3.1.2.8.b currently specify a minimum and maximum volume, boron concentration and solution temperature for the RWT to be considered operable. The minimum solution temperature assures that the boric acid remains in solution and prevents crystallization. The maximum solution temperature assures that the maximum borated water injection temperature assumed by the Final Safety Analysis Report (FSAR) emergency core cooling systems (ECCS) evaluation is not exceeded. The proposed change would revise the maximum solution temperature from 100°F to 110°F to alleviate an operational concern when the RWT temperature increases due to direct solar heating of the RWT during the summer months.

The maximum RWT temperature assumed by the FSAR (Section 6.2.3.3.1.3) is 120°F. Presently, during the summer months the RWT temperature approaches the 100°F specified by T.S. 3.5.4 and 3.1.2.8.b, and the only method of maintaining the T.S. requirement is to cool the RWT using a containment spray pump and shutdown cooling heat exchanger. Raising the RWT maximum allowable temperature to 110°F maintains the FSAR assumptions and should accommodate outside environmental conditions without requiring use of an ECCS system to maintain the T.S. value.

T.S. 3.1.1.4 4 currently specifies a shutdown margin of $\geq$ 5.0% $\Delta k/k$. The proposed change will increase the shutdown margin for Modes 1 through 4 to 5.5% $\Delta k/k$. This increase is being proposed now to support future (beyond Cycle 6) reloads. It is anticipated that future reloads will not be bounded by the Chapter 15 Safety Analysis without increasing the required shutdown margin for Modes 1 through 4. Implementing the change at this time avoids additional changes to the Technical Specifications at a later date.

This proposed change will provide additional shutdown margin for Cycle 6 (beyond that required by the Safety Analysis) and therefore, will have only positive effects on this cycle's operation. Similar changes have been granted other licensees in support of extended fuel cycle length programs.

BASIS FOR PROPOSED NO SIGNIFICANT HAZARDS CONSIDERATION

The proposed change does not involve a significant hazards consideration because operation of Arkansas Nuclear One Unit 2 in accordance with this change would not:

(1) involve a significant increase in the probability or consequences of an accident previously evaluated. The revision of the allowable MTC is necessary for Cycle 6 operation of ANO-2, and is a function of the cycle-specific core parameters. The revision of the MTC Surveillance Requirement will allow greater operational flexibility without affecting the confidence in the MTC measurement. The Cycle 6 reload analysis has been evaluated against the accidents specified by Chapter 15 of the ANO-2 FSAR. It was determined from this evaluation that there will not be a significant increase in the probability or consequences of these previously evaluated accidents as a result of this change. The revision of the maximum RWT temperature will resolve an operational concern, while maintaining RWT temperature within the assumptions of the FSAR accident analysis, so this change will not involve a significant increase in the probability or consequences of previously evaluated accidents. Increasing the required shutdown for Modes 1 through 4 from $\geq$ 5.0% $\Delta k/k$ to $\geq$ 5.5% $\Delta k/k$ is being proposed to assure future operating cycles comply with the accident analysis limits specified in Chapter 15 of the ANO-2 FSAR. This change is specifically intended to assure future cycle operation will not increase the probability or consequence of any accident previously evaluated.

(2) create the possibility of a new or different kind of accident from any previously analyzed. The revision of the allowable MTC is necessary for Cycle 6 operation of ANO-2, and is a function of the cycle-specific core parameters. The revision of the MTC Surveillance Requirement will allow greater operational flexibility for the MTC measurements. These changes are not significant and do not make changes in analytical methods used to demonstrate conformance with the Technical Specifications and regulations, and the NRC has previously found such methods acceptable. The revision of the maximum RWT temperature will resolve an operational concern, while maintaining RWT temperature within FSAR accident analysis assumptions. Increasing the shutdown margin from 5.0 to 5.5% $\Delta k/k$ increases the required amount of negative reactivity available to shut the reactor down. No new or different kind of accident can be created by increasing the capability to shut the reactor down. Therefore, this change will not create the possibility of a new or different kind of accident from any previously analyzed.

(3) involve a significant reduction in a margin of safety. The revision of the maximum solution temperature of the RWT, the revision of the allowable MTC and its associated Surveillance Requirement and the increase in the shutdown margin are not significant changes. The results of the main steam line break accident analysis of the Cycle 6 reload analysis are within the acceptance criteria and therefore the same level of protection is provided. The margin of safety is therefore preserved by this change.

The Commission has provided guidance concerning the application of the standards for determining whether a significant hazards consideration exists by providing certain examples (48 FR 14870) of amendments that are considered not likely to involve significant hazards consideration. Example (iii) relates to a change resulting from a nuclear reactor core reloading, if no fuel assemblies significantly different from those found previously acceptable to the NRC for a previous core at the facility in question are involved. This assumes that no significant changes are made to the acceptance criteria for the Technical Specifications, that the analytical methods used to demonstrate conformance with the Technical Specifications and regulations are not significantly changed, and the NRC has previously found such methods acceptable.

Example (vi) relates to a change which either may result in some increase in the probability or consequences of a previously analyzed accident or may in some way reduce a safety margin, but where the results of the change are clearly within all acceptance criteria with respect to the system or component specified in the Standard Review Plan (SRP): For example, a small refinement of a previously used calculation model or design method. The proposed changes are similar to one or more of these examples. The specifics of how each proposed change is similar to the examples of 48 FR 14870 are discussed below:

The proposed changes to the allowable MTC and shutdown margin are similar to Example (iii) of 48 FR 14870 in that the Technical Specifications on the MTC and shutdown margin will reflect the use of more highly enriched fuel that will be exposed to increased burnup by end of cycle. This change is not significant and does not make changes in analytical methods used to demonstrate conformance with the Technical Specifications and regulations, and the NRC has previously found such methods acceptable. As previously mentioned, although the revision to the shutdown margin is not necessary to support Cycle 6 operation it will be necessary to support subsequent longer cycles.

The proposed revision in maximum allowable RWT solution temperature allows additional operational flexibility, while maintaining a margin to the FSAR accident analysis assumption for maximum RWT temperature. The proposed change to the maximum allowable RWT solution temperature may be considered similar to Example (vi) of 48 FR 14870 in that it may, in some way reduce existing requirements but where the changes satisfy the SRP acceptance criteria. The increase in the allowable RWT temperature does reduce existing requirements, but there is still ample margin to the RWT temperature assumed in the FSAR accident analysis and ECCS functional analysis. The proposed change to the MTC Surveillance Requirement may also be considered similar to Example (vi) in that it does modify existing requirements, but it will not affect the confidence in the measurement of MTC and will simply allow greater operational flexibility.

Therefore, based upon the discussion and reasoning presented above, AP&L has determined that this Technical Specifications amendment package does not involve a significant hazards consideration.