MODERATOR TEMPERATURE COEFFICIENT

3.1.2.1 The moderator temperature coefficient (MTC) shall be:

a) Less positive than or equal to 5.0×10^{-5} $\Delta k/k/^{o}F$ for all rods withdrawn, beginning of the cycle life (BOL), hot zero THERMAL POWER (HZP) conditions; and

b) Less positive than or equal to 5.0×10^{-5} $\Delta k/k/^{o}F$ from HZP to 70% RATED THERMAL POWER condition; and

c) Less positive than or equal to 5.0×10^{-5} $\Delta k/k/^{o}F$ from 70% RATED THERMAL POWER decreasing linearly to less positive than or equal to 0 $\Delta k/k/^{o}F$ at 100% RATED THERMAL POWER condition; and

d) Less negative than -3.5×10^{-4} $\Delta k/k/^{o}F$ for the all rods withdrawn, end of cycle life (EOL), RATED THERMAL POWER condition.

APPLICABILITY: Specification 3.1.2.1a, b, and c - MODES 1 and 2* only**.
Specification 3.1.2.1d - MODES 1, 2, and 3 only**.

ACTION:

a) With the MTC more positive than the limits of Specifications 3.1.2.1a, b, or c above, operation in MODES 1 and 2 may proceed provided:

1) Control rod withdrawal limits are established and maintained sufficient to restore the MTC to less positive or equal to limits described in 3.1.2.1a, b, and c above within 24 hours or be in HOT STANDBY within the next 6 hours. These withdrawal limits shall be in addition to the insertion limits of specification 3.2.1,

2) The control rods are maintained within the withdrawal limits established above until a subsequent calculation verifies that the MTC has been restored to within its limit for the all rods withdrawn condition; and

3) A Special Report is prepared and submitted to the Commission pursuant to Specification 6.9.3, within 10 days, describing the value of the measured MTC, the interim control rod withdrawal limits, and the predicted average core burnup necessary for restoring the MTC to within its limit for the all rods withdrawn condition.

b) With the MTC more negative than the limit of Specification 3.1.2.1d above, be in HOT SHUTDOWN within 12 hours.

* With K_{eff} greater than or equal to 1.
** The above limits may be suspended during the performance of LOW POWER PHYSICS TESTS.

The reactor vessel materials have been tested to determine their initial RT_{NDT}. Adjusted reference temperatures, based upon the fluence and copper content of the material in question, are then determined. The heatup and cooldown limit curves include the shift in RT_{NDT} at the end of the service period shown on the heatup and cooldown curves.

The actual shift in NDTT of the vessel material will be established periodically during operation by removing and evaluating, in accordance with ASTM E185-73, reactor vessel material irradiation surveillance specimens installed near the inside wall of the reactor vessel in the core area. Since the neutron spectra at the irradiation samples has a definite relationship to the spectra at the vessel inside radius, the measured transition shift for a sample can be related with confidence to the adjacent section of the reactor vessel. The heatup and cooldown curves must be recalculated when the ΔRT_{NDT} determined from the surveillance capsule is different from the calculated ΔRT_{NDT} for the equivalent capsule radiation exposure.

The pressure-temperature limit lines shown for reactor criticality and for inservice leak and hydrostatic testing have been provided to assure compliance with the minimum temperature requirements of Appendix G to 10 CFR 50.

The number of reactor vessel irradiation surveillance specimens and the frequencies for removing and testing these specimens are provided in Table 4.2-1 to assure compliance with the requirements of Appendix H to 10 CFR Part 50.

The limitations imposed on pressurizer heatup and cooldown and spray water temperature differential are provided to assure that the pressurizer is operated within the design criteria assumed for the fatigue analysis performed in accordance with the ASME Code requirements.

B3.1.2.1 MODERATOR TEMPERATURE COEFFICIENT

The limitations on moderator temperature coefficient (MTC) are provided to ensure that the value of this coefficient remains within the limiting condition assumed in the FSAR accident and transient analyses.

The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.

The most negative MTC equivalent value to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the FSAR analyses to nominal operating conditions. These corrections involved substracting the incremental change in the MDC associated with a core condition of all rods inserted (most positive MDC) to an all rods withdrawn condition and, a conversion for the rate of change of moderator density with temperature at RATED THERMAL POWER conditions.

Safety Evaluation For A Proposed Change To The Turkey Point Units 3 and 4 Technical Specifications on Moderator Temperature Coefficient

This safety evaluation has been prepared to support the Technical Specification change for Turkey Point Units 3 and 4 on moderator temperature coefficient (MTC). The impact of a positive moderator temperature coefficient on the accident analyses presented in Chapter 14 of the Turkey Point Units 3 and 4 FSAR (Reference 1) has been assessed. The transients that are impacted by a positive moderator coefficient are discussed in some detail, below. These events were previously analyzed in conjunction with a Technical Specification change raising the MTC limit to +5 pcm/°F below 70 percent of rated power (Reference 2). Another Technical Specification change to permit Optimized Fuel Assemblies (OFA) in the core (Reference 3) required reanalysis of several transients with a +5 pcm/°F MTC at full power.

The proposed Technical Specification change substitutes a linear rampdown of the allowable MTC from +5 pcm/°F to zero between 70 percent and 100 percent rated power in place of the previous step change at 70 percent power. This is diagrammed in Figure 1. The corrective action to restore the MTC to within limits conforms to the Standard Technical Specification for Westinghouse plants.

The following evaluations were made for those transients that were determined in Reference 2 to be sensitive to a positive MTC. The assumption of a +5 pcm/°F MTC existing above 70 percent power is conservative since the proposed Technical Specification requires that the coefficient be linearly ramped to zero above 70 percent power.

Boron Dilution

The conclusions of Reference 2 remain valid for the proposed Technical Specification.

RCCA Withdrawal from a Subcritical Condition

As noted in Reference 2, a constant MTC of +5 pcm/°F was used in the analysis of this event. The conclusions presented in Reference 2 remain valid.

Uncontrolled RCCA Bank Withdrawal at Power

The limiting case from the FSAR which occurs at 80 percent power was reanalyzed as reported in Reference 2, assuming a constant MTC of +5 pcm/°F. This assumption is conservative since the proposed Technical Specification would require the MTC to be less positive than +5 pcm/°F above 70 percent power. The conclusions of Reference 2 remain valid.

Loss of Reactor Coolant Flow

The complete loss of flow event analyzed in support of the OFA transition assumed a +5 pcm/°F MTC at full power. The conclusions presented in Reference 3 remain valid.

Locked Rotor

As noted in Reference 2, the locked rotor event was analyzed with an MTC of +5 pcm/°F at full power. The conclusions presented in Reference 2 remain valid.

Rod Ejection

The control rod ejection analyses performed in support of the OFA transition were based on a coefficient which was at least +5 pcm/°F at the appropriate zero or full power nominal average temperature, and which became less positive for higher temperatures. This was necessary since the TWINKLE computer code used in the analyses is a diffusion-theory code rather than a point-kinetics approximation and the moderator temperature feedback cannot be artificially held constant with temperature. The conclusions of Reference 3 remain valid.

Dropped Rod

The dropped control rod transient was reanalyzed recently with the assumption of a constant +5 pcm/°F MTC at full power. The results show that the safety criteria are met.

Loss of External Electric Load

As noted in Reference 2, the loss of load event was analyzed with an MTC of +5 pcm/°F at full power. The conclusions presented in Reference 2 remain valid.

Based on the above, it is determined that the rampdown of the allowable MTC from +5 pcm/°F to 0 pcm/°F between 70 percent and 100 percent power is bounded by the safety analysis, and is therefore acceptable.

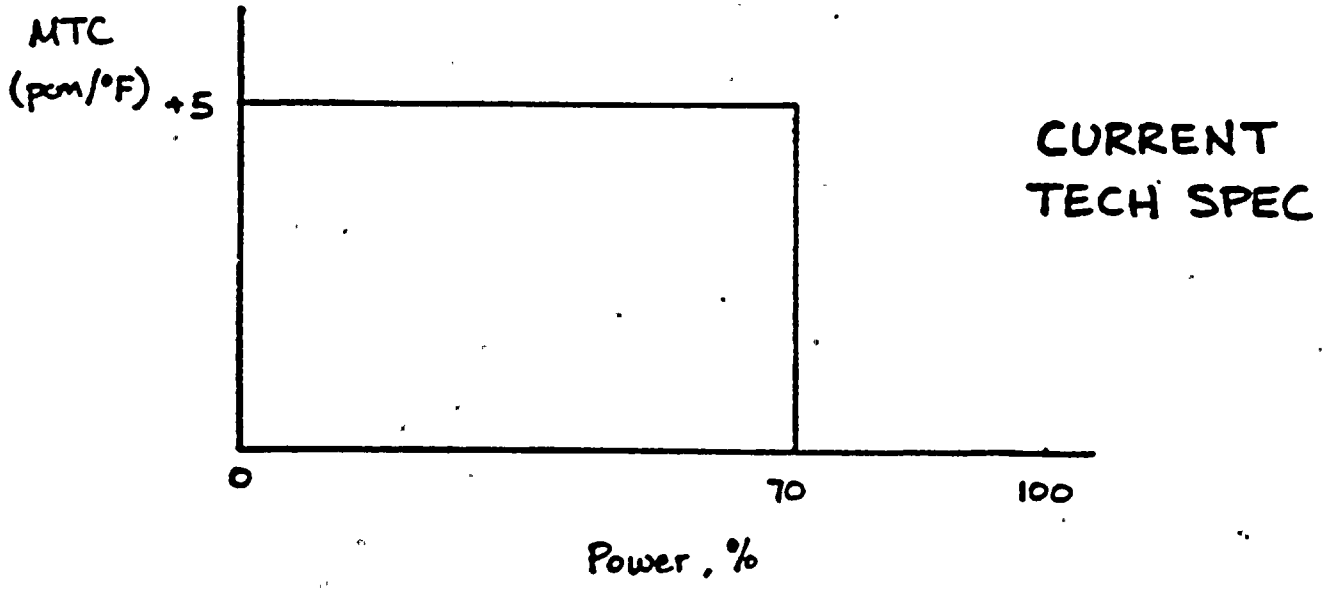
References

1. "Turkey Point Units 3 and 4 Final Safety Analysis Report", Docket Numbers: 50-250 and 50-251.

2. FPL letter L-81-517 dated December 10, 1981, "Turkey Point Units 3 and 4 Docket Nos. 50-250 and 50-251 Proposed License Amendment Moderator Temperature Coefficient", R. E. Uhrig to D. G. Eisenhut.

3. FPL letter L-83-344 dated June 3, 1983, "Turkey Point Units 3 and 4 Docket Nos. 50-250 and 50-251 Proposed License Amendment Optimized Fuel Assembly and Wet Annular Burnable Absorber", R. E. Uhrig to D. G. Eisenhut.

TURKEY POINT 3+4 MTC TECH SPEC



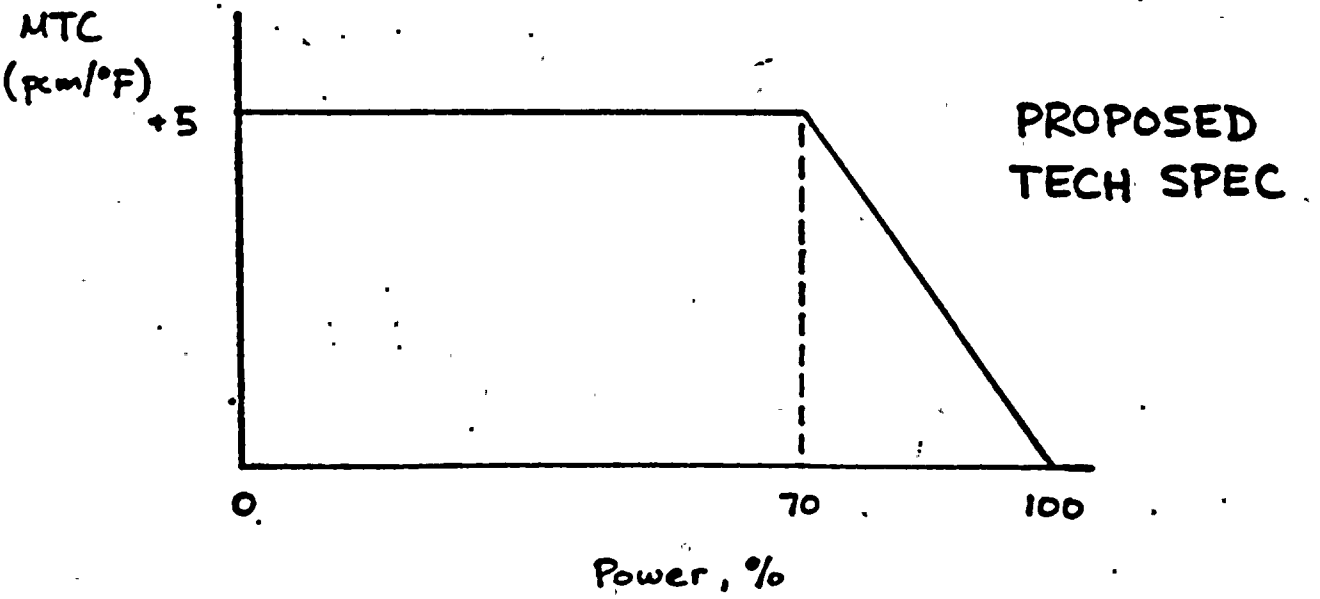


FIGURE 1

No Significant Hazards Consideration

The proposed change to the Turkey Point Units 3 and 4 Technical Specifications on moderator temperature coefficient (MTC) will increase operational flexibility and remove overly restrictive operational requirements at and above 70 percent reactor power. As stated in the safety evaluation the change leads to conditions which are well within bound of previous safety analysis which were performed for an MTC of +5 pcm/°F above 70 percent power, thus bounding a less positive MTC below full power.

On this basis the proposed change does not:

(1) involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) involve a significant reduction in a margin of safety.

The proposed change may be considered similar to the example in 10CFR50.92 for amendments that are considered not likely to involve significant hazards considerations, which reads in part:

> "iii) 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 that NRC has previously found such methods acceptable."

Therefore it is concluded that in accordance with the provisions of 10CFR50.92 the change will not involve a significant safety hazard.