

## Industry/TSTF Standard Technical Specification Change Traveler

**Predicting end-of-cycle MTC and deleting need for end-of-cycle MTC verification in all cases**

Classification: 1) Technical Change

Priority: 2) Medium

NUREGs Affected:  1430  1431  1432  1433  1434

**Description:**

NUREG 1432 Surveillance Requirements SR 3.1.3.2 (Digital) and SR 3.1.3.2 (Analog) are each divided into two Surveillance Requirements. The end of cycle (EOC) required MTC measurement Frequency is removed from SR 3.1.3.2 and becomes the Frequency for the new SR 3.1.3.3. SR 3.1.3.3 requires the same MTC verification as SR 3.1.3.2 except a third Note is added. The Note states that the EOC measurement of MTC is only required if the MTC measured in SR 3.1.3.1 and SR 3.1.3.2 (e.g., the BOC measurements) are not within a specified amount with respect to the limits in the COLR.

**Justification:**

**Background**

Topical Report CE NPSD-911-A, Analysis of Moderator Temperature Coefficients in support of a change in the Technical Specification End-of-Cycle Negative MTC limit, CEOG Task 764, analyzed a database of measured and calculated MTC's and established that if the measured beginning-of-cycle moderator temperature coefficients fall within  $0.16 \times 10^{-4} \Delta\rho/F$  of the best estimate prediction, that it can be assumed that the end-of-cycle coefficient will also. Therefore, the EOC measurement is not required. The measured data analysis must be based on the current ABB-CE methodology as described in the report. This change reflects the conclusions of this analysis. The Topical Report was approved by the NRC on June 14, 2000.

**Need for Change**

NUREG-1432 is revised to incorporate the allowances approved in the Topical Report.

In addition, TSTF-284, Revision 3, deleted Note 1 from SR 3.1.3.2 (SR 3.1.4.2 in Revision 1 of NUREG-1432), but this Note was not deleted in the published version of Revision 2 of NUREG-1432. The Note is deleted to correct the NUREG.

**Proposed Change**

SR 3.1.3.2 (Analog and Digital) are revised to eliminate Surveillance Note 2 and the Frequency requiring measurement at the two-thirds of the expected core burnup. A new Surveillance, SR 3.1.3.3, is added which requires an MTC measurement at two-thirds of the expected core burnup only if the MTC determined in SR 3.1.3.1 and SR 3.1.3.2 is not within  $\pm 0.16 \times 10^{-4} \Delta\rho/F$  of the respective limits in the COLR.

5/19/2001

**Justification**

The TS provide limitations on the moderator temperature coefficient (MTC) to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The requirements to measure the MTC at the beginning-of-cycle (BOC) (once at hot zero power and once at power) and near end-of-cycle (EOC) (i.e., 2/3 expected core burnup) provide confirmation that the measured MTC value is within its limits and will remain in its limits throughout each cycle. The purpose of Topical Report CE NPSD-911 is to provide the justification to support eliminating the need to determine the MTC upon reaching two-thirds of core burnup if the results of the MTC tests required at the beginning-of-cycle are within a tolerance of  $0.16 \times 10^{-4} \Delta k/k/F$  of the calculated MTC (design value). However, if the results of the first two tests are not within that limit, then performance of the 2/3 cycle surveillance will be required. The reports concluded that if the MTC at the beginning-of-cycle is within  $0.16 \times 10^{-4} \Delta k/k/F$  of the design value, then the MTC at the end-of-cycle will also be within  $0.16 \times 10^{-4} \Delta k/k/F$  of the design value.

The analysis used measured MTC data from several plants and compared that data to the calculated MTC. This was done to evaluate the methodology used in calculating the MTC. The reports concluded that evaluation of the data showed that if the MTC measured at the beginning-of-cycle is within  $0.16 \times 10^{-4} \Delta k/k/F$  of the calculated MTC, then the near end-of-cycle calculated MTC will be within  $0.16 \times 10^{-4} \Delta k/k/F$  of the true MTC. Thus, the method would adequately model the MTC for the entire cycle, and the near end-of cycle MTC surveillance would not be required.

**Determination of No Significant Hazards Considerations**

A change to NUREG-1432 is proposed to eliminate the measurement of EOC MTC if the BOC measurements are with a given tolerance to the predicted value.

In accordance with the criteria set forth in 10 CFR 50.92, the Industry has evaluated these proposed Improved Technical Specification changes and determined they do not represent a significant hazards consideration. The following is provided in support of this conclusion.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

A change to NUREG-1432 is proposed to eliminate the measurement of EOC MTC if the BOC measurements are with a given tolerance to the predicted value. MTC is not an initiator of any accident previously evaluated. Consequently, the probability of an accident previously evaluated is not significantly increased. The EOC MTC value is an important assumption in determining the consequences of accidents previously evaluated. The analysis presented in the Topical Report determined that the EOC MTC will be within limit if the BOC measured MTC values are within a given tolerance of the measured values. Therefore, the EOC MTC will continue to be within limit and the consequences of accidents will continue to be as previously evaluated. Therefore, the consequences of an accident previously evaluated are not significantly increased by this change. Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

A change to NUREG-1432 is proposed to eliminate the measurement of EOC MTC if the BOC measurements are with a given tolerance to the predicted value. The proposed change does not involve a physical alteration of the plant (no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. Thus, this change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does this change involve a significant reduction in a margin of safety?

A change to NUREG-1432 is proposed to eliminate the measurement of EOC MTC if the BOC measurements are with a given tolerance to the predicted value. The Topical Report concluded that the risk of not measuring the EOC MTC is acceptably small provided that the BOC measured values are within a specific tolerance of the predicted values. Therefore, this change does not involve a significant reduction in a margin of safety.

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**Revision History****OG Revision 0****Revision Status: Active****Next Action: NRC**

Revision Proposed by: CEOG

Revision Description:  
Original Issue**Owners Group Review Information**

Date Originated by OG: 17-Mar-99

Owners Group Comments  
(No Comments)

Owners Group Resolution: Approved Date: 30-Jun-99

**TSTF Review Information**

TSTF Received Date: 20-Jul-99

Date Distributed for Review 06-Apr-01

OG Review Completed:  BWOG  WOG  CEOG  BWROG

TSTF Comments:

2/14/2001 - discussed by TSTF. CEOG only. Needs Safety Evaluation quality justification.

TSTF Resolution: Approved Date: 02-May-01

**NRC Review Information**

NRC Received Date: 24-May-01

NRC Comments:  
(No Comments)

Final Resolution: NRC Action Pending

Final Resolution Date:

**Incorporation Into the NUREGs**

File to BBS/LAN Date:

TSTF Informed Date:

TSTF Approved Date:

NUREG Rev Incorporated:

**Affected Technical Specifications**

SR 3.1.3.2 MTC (Analog)

SR 3.1.3.2 MTC (Digital)

SR 3.1.3.2 Bases MTC (Analog)

SR 3.1.3.2 Bases MTC (Digital)

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SR 3.1.3.3	MTC (Analog) Change Description: New
SR 3.1.3.3	MTC (Digital) Change Description: New
SR 3.1.3.3 Bases	MTC (Analog) Change Description: New
SR 3.1.3.3 Bases	MTC (Digital) Change Description: New

INSERT 1

2. Only required if MTC determined in SR 3.1.3.1 and SR 3.1.3.2 is not within +/-  $0.16 \times 10^{-4} \Delta\rho/^\circ\text{F}$  of the respective limits in the COLR.

INSERT 2

SR 3.1.3.3 is modified by a second Note, which indicates that the Surveillance, which determines MTC towards the end of core life, is only required if the MTC determined in SR 3.1.3.1 and SR 3.1.3.2 is not within  $0.16 \times 10^{-4} \Delta\rho/^\circ\text{F}$  of the respective limits in the COLR. Analysis in Reference 5 has shown that if the measured beginning of cycle moderator temperature coefficients fall within  $0.16 \times 10^{-4} \Delta\rho/^\circ\text{F}$  of the best estimate prediction, then it can be assumed that the end of cycle coefficient will also agree with the prediction and measurement is not required.

INSERT 3

5. CE-NPSD-911-A, Analysis of Moderator Temperature Coefficients in Support of a Change in the Technical Specification End-of-Cycle MTC Limit, September 2000.

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SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.1.3.2	<p style="text-align: center;"><del>- NOTES -</del></p> <p>1. <del>This Surveillance is not required to be performed prior to entry into MODE 1 or 2.</del></p> <p>2. <del>If the MTC is more negative than the COLR limit when extrapolated to the end of cycle, SR 3.1.3.2 may be repeated. Shutdown must occur prior to exceeding the minimum allowable boron concentration at which MTC is projected to exceed the lower limit.</del></p> <p>Verify MTC is within the lower limit.</p>	<p><del>Deleted by TSTF-284,R3</del></p> <p>Each fuel cycle within 7 effective full power days (EFPD) of reaching 40 EFPD core burnup</p> <p><u>AND</u></p> <p><del>Each fuel cycle within 7 EFPD of reaching 2/3 of expected core burnup</del></p>

Insert SR 3.1.3.3

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.1.3.2</p> <p>③</p> <p>①</p> <p>②</p> <p>③</p> <p>Insert 1</p> <p style="text-align: center;">----- - NOTES - -----</p> <p>1. <del>This Surveillance is not required to be performed prior to entry into MODE 1 or 2.</del></p> <p>2. If the MTC is more negative than the COLR limit when extrapolated to the end of cycle, SR 3.1.3.2 may be repeated. Shutdown must occur prior to exceeding the minimum allowable boron concentration at which MTC is projected to exceed the lower limit.</p> <p>Verify MTC is within the lower limit.</p>	<p><del>Each fuel cycle within 7 effective full power days (EFPD) of reaching 40 EFPD core burnup</del></p> <p>AND</p> <p>Each fuel cycle within 7 EFPD of reaching 2/3 of expected core burnup</p>

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BASES

ACTIONS (continued)

MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE  
REQUIREMENTS

SR 3.1.3.1 and SR 3.1.3.2

The SRs for measurement of the MTC at the beginning and middle of each fuel cycle provide for confirmation of the limiting MTC values. The MTC changes smoothly from most positive (least negative) to most negative value during fuel cycle operation, as the RCS boron concentration is reduced to compensate for fuel depletion. The requirement for measurement prior to operation > 5% RTP satisfies the confirmatory check on the most positive (least negative) MTC value. The requirement for measurement, within 7 days after reaching 40 effective full power days and 2/3 core burnup, satisfies the confirmatory check of the most negative MTC value. The measurement is performed at any THERMAL POWER, so that the projected EOC MTC may be evaluated before the reactor actually reaches the EOC condition. MTC values may be extrapolated and compensated to permit direct comparison to the specified MTC limits.

SR 3.1.3.2 is modified by a Note, which indicates that if the extrapolated MTC is more negative than the EOC COLR limit, the Surveillance may be repeated, and that shutdown must occur prior to exceeding the minimum allowable boron concentration at which MTC is projected to exceed the lower limit. An engineering evaluation is performed if the extrapolated value of MTC exceeds the Specification limits.

Insert 2



REFERENCES

1. 10 CFR 50, Appendix A, GDC 11.
2. FSAR, Section [ ].
3. FSAR, Section [ ].
4. FSAR, Section [ ].

Insert 3



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SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.1.3.2	<p style="text-align: center;"><del>- NOTES -</del></p> <p>1. This Surveillance is not required to be performed prior to entry into MODE 1 or 2.</p> <p>2. If the MTC is more negative than the COLR limit when extrapolated to the end of cycle, SR 3.1.3.2 may be repeated. Shutdown must occur prior to exceeding the minimum allowable boron concentration at which MTC is projected to exceed the lower limit.</p> <p>Verify MTC is within the lower limit.</p>	<p>Deleted by TSTF-284, Rev.3</p> <p>Each fuel cycle within 7 effective full power days (EFPD) of reaching 40 EFPD core burnup</p> <p><del>AND</del></p> <p>Each fuel cycle within 7 EFPD of reaching 2/3 of expected core burnup</p>

Insert SR 3.1.3.3

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
<p>SR 3.1.3.2 ③</p>	<p style="text-align: center;">----- - NOTES - -----</p> <p>1. <del>This Surveillance is not required to be performed prior to entry into MODE 1 or 2.</del></p> <p>① ② If the MTC is more negative than the COLR limit when extrapolated to the end of cycle,</p> <p>③ SR 3.1.3.2 may be repeated. Shutdown must occur prior to exceeding the minimum allowable boron concentration at which MTC is projected to exceed the lower limit.</p> <p style="text-align: center;">-----</p> <p>Verify MTC is within the lower limit.</p>	<p><del>Each fuel cycle within 7 effective full power days (EFPD) of reaching 40 EFPD core burnup</del></p> <p><del>AND</del></p> <p>Each fuel cycle within 7 EFPD of reaching 2/3 of expected core burnup</p>

Insert 1

BASES

ACTIONS (continued)

MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1 and SR 3.1.3.2, SR 3.1.4.2

The SRs for measurement of the MTC at the beginning and middle of each fuel cycle provide for confirmation of the limiting MTC values. The MTC changes smoothly from most positive (least negative) to most negative value during fuel cycle operation, as the RCS boron concentration is reduced to compensate for fuel depletion. The requirement for measurement prior to operation > 5% RTP satisfies the confirmatory check on the most positive (least negative) MTC value. The requirement for measurement, within 7 days after reaching 40 effective full power days and a 2/3 core burnup, satisfies the confirmatory check of the most negative MTC value. The measurement is performed at any THERMAL POWER so that the projected EOC MTC may be evaluated before the reactor actually reaches the EOC condition. MTC values may be extrapolated and compensated to permit direct comparison to the specified MTC limits.

3

SR 3.1.3.2 is modified by a Note, which indicates that if extrapolated MTC is more negative than the EOC COLR limit, the Surveillance may be repeated, and that shutdown must occur prior to exceeding the minimum allowable boron concentration at which MTC is projected to exceed the lower limit. An engineering evaluation is performed if the extrapolated value of MTC exceeds the Specification limits.

Insert 2

REFERENCES

1. 10 CFR 50, Appendix A, GDC 11.
2. FSAR, Section [ ].
3. FSAR, Section [ ].
4. FSAR, Section [ ].

Insert 3