

## **Identification of Error in TSTF-547-A, Revision 1, "Clarification of Rod Position Requirements"**

### **Problem Statement**

TSTF-547 added to LCO 3.1.7, "Rod Position Indication," Required Action A.2.2 that prohibits entering Mode 2 from Mode 3 with an inoperable rod position indication (RPI). However, Required Action A.2.2 is joined by a logical OR with other Required Actions that do not include this requirement and that permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. Therefore, Mode 2 may be entered with an inoperable RPI using LCO 3.0.4a by relying on the other permitted Required Actions. This has the effect of making Required Action A.2.2 moot. This situation is confusing and should be resolved.

### **TSTF-547 Background**

TSTF-547, "Clarification of Rod Position Requirements," is applicable to Westinghouse plants. Revision 0 was submitted on March 6, 2014. Revision 1 modified the traveler to reflect changes to the traveler process, but the justification, Technical Specifications, and Bases were not affected. Revision 1 was approved by the NRC on March 4, 2016.

Amendments to adopt TSTF-547 have been approved for Beaver Valley, Farley, and Vogtle. Amendment requests are under NRC review for Braidwood, Byron, Diablo Canyon, and Watts Bar.

TSTF-547 makes many improvements to LCO 3.1.4, "Rod Group Alignment Limits," LCO 3.1.5, "Shutdown Bank Insertion Limits," LCO 3.1.6, "Control Bank Insertion Limits," and LCO 3.1.7, "Rod Position Indication."

Prior to TSTF-547, LCO 3.1.7, Required Action A.1 required verifying the position of rods with inoperable RPIs using the moveable incore detector once per 8 hours. Required Action A.2 provided the alternative to reduce thermal power to  $\leq 50\%$  Rated Thermal Power (RTP). TSTF-547 revised TS 3.1.7 to provide an alternative to frequent use of the moveable incore detector system when an RPI is inoperable.

TSTF-547 added new Required Actions A.2.1 and A.2.2, which are joined with a logical OR to the existing actions, and existing Required Action A.2 was renamed A.3. See Attachment 1 for the change.

The traveler justification for the addition of Required Actions A.2.1 and A.2.2 stated (emphasis added):

If one or more [D]RPIs are inoperable, TS 3.1.7 requires verification of the position of the associated rods using the movable incore detector system once per 8 hours. The proposed change revises TS 3.1.7 to provide an alternative to using the moveable incore detectors every 8 hours (approximately 90 times per month) by utilizing a different monitoring method. This reduces the wear on the movable incore detector system. Wear of the movable incore detector system does not pose a reduction in the margin of safety, but excessive wear could result in a loss of functionality of the system. This could lead to the inability to complete required Surveillances and a plant shutdown.

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The proposed change adds two new Required Actions to LCO 3.1.7 as an alternative to the 8 hour monitoring in the existing Condition A Required Actions. Proposed Required Action A.2.1 requires verification of the position of rods associated with an inoperable [D]RPI using the moveable incore detector system and includes six Completion Times:

- a. Initial verification within 8 hours of the inoperability of the [D]RPI;
- b. Re-verification once every 31 Effective Full Power Days (EFPD) thereafter;
- c. Verification within 8 hours if rod control system parameters indicate unintended rod movement;
- d. Verification within 8 hours if the rod with an inoperable [D]RPI is intentionally moved greater than 12 steps;
- e. Verification prior to exceeding 50% RTP if power is reduced below 50% RTP; and
- f. Verification within 8 hours after reaching RTP.

*Required Action A.2.2 states that the inoperable [D]RPI must be restored to Operable status prior to entering MODE 2 from MODE 3. Existing Required Action A.2 is relabeled A.3.*

### Technical Evaluation

New Required Action A.2.1 continues to use the movable detector system to monitor the position of the rod with the inoperable [D]RPI. Periodic verification is less frequent and additional verification is made following circumstances in which the rod may have moved. The initial position of the rod is determined within 8 hours and every 31 EFPD thereafter. The 8 hour initial Completion Time is the same as existing Required Action A.1 and the 31 EFPD period coincides with the typical Frequency of power distribution Surveillances that utilize the movable incore detector system. If there is unintended movement of a rod or if a rod with an inoperable [D]RPI is moved more than 12 steps, the movable incore detectors are used to verify the rod position within 8 hours. If there are changes in core power, which could result in changes in rod position, the rod position must be verified before exceeding 50% RTP and within 8 hours of reaching full power. This confirms the position of the rod with an inoperable [D]RPI to ensure that power distribution requirements are not violated and to establish a starting point for the proposed alternate monitoring actions.

*New Required Action A.2.2 requires the inoperable [D]RPI to be restored to Operable status prior to entering Mode 2 from Mode 3. This allows use of the alternative monitoring scheme until the next shutdown, after which the [D]RPI must be restored to Operable status.*

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The ability to immediately detect a rod drop or misalignment is not directly provided by the movable incore detectors used in current Required Action A.1, or by the alternate monitoring method proposed in Required Actions A.2.1 and A.2.2. However, should there be a drop of a rod, it will typically be detectable by the excore power range detectors. Additionally, a negative reactivity insertion corresponding to the reactivity worth of the dropped rod may cause a change in core parameters, such as AFD and QPTR. Note that the proposed Required Actions provide an alternative to the existing rod position indication requirements. The rod group alignment limits and the bank insertion limits of LCO 3.1.4, LCO 3.1.5, and LCO 3.1.6 continue to require the rods to be Operable and within the insertion limits.

The NRC Safety Evaluation for TSTF-547 states the following regarding new Required Actions (emphasis added):

The implementation of new RAs A.2.1 and A.2.2 would allow use of an alternative monitoring scheme until the next shutdown, after which the [D]RPI must be restored to an Operable status. The NRC staff finds that the new RAs A.2.1 and A.2.2 and Completion Times are more appropriate because they require verification of rod position following circumstances in which rod motion could occur. This is more appropriate than current TS 3.1.7 RA A.1, which requires verification of rod position using the moveable incore detection system once per 8 hours, regard less of whether the rods have moved or not. *Additionally, the new RAs A.2.1 and A.2.2 contain a requirement to restore the [D]RPI to operable status prior to restart.*

### **LCO 3.0.4 Background**

LCO 3.0.4 provides requirements for entering the Applicability of a specification with the LCO not met. LCO 3.0.4 provides three options:

- a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;
- b. After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or
- c. When an allowance is stated in the individual value, parameter, or other Specification.

For example, the Applicability of LCO 3.1.7 is Modes 1 and 2. If an RPI was inoperable and the plant was in Mode 3, LCO 3.0.4 provides requirements that must be met to reenter Modes 1 and 2. Required Action A.1, A.2.1, and A.3 all satisfy LCO 3.0.4a, in that they permit continued operation in the Applicability for an unlimited period of time.

TSTF-529-A, Revision 4, approved by the NRC on April 21, 2016, clarified the LCO 3.0.4 Bases regarding use of LCO 3.0.4a (emphasis added):

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LCO 3.0.4.a allows entry into a MODE or other specified condition in the Applicability with the LCO not met when the associated ACTIONS to be entered following entry into the MODE or other specified condition in the Applicability will permit continued operation within the MODE or other specified condition for an unlimited period of time. *Compliance with ACTIONS that permit continued operation of the unit for an unlimited period of time in a MODE or other specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the unit before or after the MODE change. Therefore, in such cases, entry into a MODE or other specified condition in the Applicability may be made and the Required Actions followed after entry into the Applicability.*

*For example, LCO 3.0.4.a may be used when the Required Action to be entered states that an inoperable instrument channel must be placed in the tripped condition within the Completion Time. Transition into a MODE or other specified condition in the Applicability may be made in accordance with LCO 3.0.4 and the channel is subsequently placed in the tripped condition within the Completion Time, which begins when the Applicability is entered. If the instrument channel cannot be placed in the tripped condition and the subsequent default ACTION ("Required Action and associated Completion Time not met") allows the OPERABLE train to be placed in operation, use of LCO 3.0.4.a is acceptable because the subsequent ACTIONS to be entered following entry into the MODE include ACTIONS (place the OPERABLE train in operation) that permit safe plant operation for an unlimited period of time in the MODE or other specified condition to be entered.*

The NRC's Safety Evaluation for TSTF-529 included an attachment that evaluated the changes to the TS Bases. It stated:

The NRC staff finds this change acceptable because it is needed to provide clarification that required actions must be followed after entry into the modes and other specified conditions in the applicability if not performed prior to entry.

Regarding the example in the second paragraph, the staff evaluation stated, "The NRC staff finds this change acceptable because it clarifies the intent of LCO 3.0.4."

TS 3.1.7 is applicable in Modes 1 and 2. Applying LCO 3.0.4 and the Bases guidance to TS 3.1.7, if an RPI is inoperable, the plant may enter Modes 1 and 2 provided the Required Action to be entered permits continued operation for an unlimited period of time.

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**Use of Logical Connectors**

Section 1.2 of the Technical Specifications describes the use of logical connectors. Example 1.2-2 is very similar to the Required Actions in TS 3.1.7.

EXAMPLE 1.2-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Trip . . . <u>OR</u> A.2.1 Verify . . . <u>AND</u> A.2.2.1 Reduce . . . <u>OR</u> A.2.2.2 Perform . . . <u>OR</u> A.3 Align . . .	

This example represents a more complicated use of logical connectors. Required Actions A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Actions may be chosen. If A.2 is chosen, then both A.2.1 and A.2.2 must be performed as indicated by the logical connector AND. Required Action A.2.2 is met by performing A.2.2.1 or A.2.2.2. The indented position of the logical connector OR indicates that A.2.2.1 and A.2.2.2 are alternative choices, only one of which must be performed.

Note the statement, "Required Actions A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Actions may be chosen."

Applying this guidance to TS 3.1.7, Required Actions A.1, A.2, and A.3 are alternative choices and any of these three Actions may be chosen.

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### **Evaluation**

If an RPI is inoperable in Modes 1 or 2 and the plant enters Mode 3, TS 3.1.7 is no longer applicable. If the plant desires to reenter Modes 1 or 2 while the RPI is inoperable, LCO 3.0.4 must be applied. LCO 3.04a, as further discussed in the LCO 3.0.4a Bases, states that Mode 2 may be entered if the actions to be entered permit continued operation for an unlimited period of time.

Section 1.4 of the TS make clear that when given three Required Actions joined by a logical OR, any one of those Required Actions may be chosen. In this case, Required Action A.1, A.3, or both A.2.1 and A.2.2, may be followed and that choice may be changed while maintaining compliance with the TS.

Therefore, if a plant is in Mode 3 and desires to enter Mode 2 with an inoperable RPI, the licensee may choose to utilize LCO 3.0.4a and follow Required Action A.1 or A.3 to enter Modes 1 and 2. The licensee may later choose to follow Required Action A.2.1 and A.2.2. However, that choice does not retroactively limit the decision to enter Mode 2 with an inoperable RPI.

As a result, Required Action A.2.2, "Restore the inoperable RPI" with a Completion Time of "Prior to entering Mode 2 from Mode 3," is never limiting on the licensee.

Required Action A.2.2 also conflicts with LCO 3.0.2. LCO 3.0.2 states, "If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required, unless otherwise stated." If a licensee is relying on Required Action A.2.1 and exits the Applicability of LCO 3.1.7, the Required Actions no longer apply. Therefore, Required Action A.2.2 is not applicable. In order to utilize the "unless otherwise stated" provision of LCO 3.0.2 to impose the Action in Mode 3, the Condition should have been modified by a Note that states, "Required Action A.2.2 shall be completed whenever this Condition is entered" (similar to LCO 3.4.3, RCS P/T Limits, Condition A). Without the Note, Required Action A.2.2 isn't applicable until after Mode 2 is entered, by which time it is already moot.

The traveler justification stated that the alternative monitoring scheme in Required Action A.2.1 may only be used until the next shutdown, after which the [D]RPI must be restored to Operable status. The NRC Safety Evaluation repeated that statement. However, the basis for that restriction is not described. The TS changes in TSTF-547 were modeled on plant-specific amendments previously approved by the NRC, many of which were one-time changes to address emergent conditions. Required Action A.2.2 was appropriate to limit the use of these one-time changes but was inappropriately included in TSTF-547.

The restriction on the use of the alternate monitoring scheme in Required Action A.2.1 is not needed to protect safety. The NRC staff stated that the alternate monitoring scheme is more appropriate than Required Action A.1:

The NRC staff finds that the new RAs A.2.1 and A.2.2 and Completion Times are more appropriate because they require verification of rod position following circumstances in which rod motion could occur. This is more appropriate than current TS 3.1.7 RA A.1,

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which requires verification of rod position using the moveable incore detection system once per 8 hours, regard less of whether the rods have moved or not.

Required Action A.1 does not have a requirement to restore the inoperable RPI prior to entering the Applicability.

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**Attachment 1**

**TSTF-547 Changes to Technical Specification 3.1.7, Action A**



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CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. One [D]RPI per group inoperable <del>infer</del> one or more groups.</p>	<p>A.1 Verify the position of the rods with inoperable [D]RPI <del>position indicators</del> indirectly by using movable incore detectors.</p>	<p>Once per 8 hours</p>
	<p><u>OR</u></p>	
	<p>A.2.1 Verify the position of the rods with inoperable [D]RPI indirectly by using the moveable incore detectors.</p>	<p>8 hours</p> <p><u>AND</u></p> <p>Once per 31 EFPD thereafter</p>
	<p><u>AND</u></p>	<p><u>AND</u></p> <p>8 hours after discovery of each unintended rod movement</p> <p><u>AND</u></p> <p>8 hours after each movement of rod with inoperable [D]RPI &gt; 12 steps</p> <p><u>AND</u></p> <p>Prior to THERMAL POWER exceeding 50% RTP</p> <p><u>AND</u></p> <p>8 hours after reaching RTP</p>
	<p>A.2.2 Restore inoperable [D]RPI to OPERABLE status.</p>	<p>Prior to entering MODE 2 from MODE 3</p>
	<p><u>OR</u></p> <p>A.3.2 Reduce THERMAL POWER to ≤ 50% RTP.</p>	<p>8 hours</p>

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**Attachment 2**

**TSTF-547 Variation**

[LICENSEE] proposes to not include the new Required Action A.2.2 to Technical Specification 3.1.7, "Rod Position Indication." Required Action A.2.2 states, "Restore inoperable [D]RPI to OPERABLE status," with a Completion Time of "Prior to entering MODE 2 from MODE 3." This required Action was included in TSTF-547 in error. Because Required Actions A.1 and A.3 permit continued operation in the Applicability of TS 3.1.7 for an unlimited period of time, LCO 3.0.4a may be used to enter Mode 2 from Mode 3. As Required Actions A.1, A.2, and A.3 are joined by a logical OR, a licensee may choose to follow Required Action A.2 (which includes A.2.1 and A.2.2) after entering Mode 2. TSTF-547 did not add a Note requiring the Action to be followed as an "otherwise stated" allowance in LCO 3.0.2, so Required Action A.2.2 does not apply in Mode 3 and is not restrictive after Mode 2 is entered. For all these reasons, Required Action A.2.2 is moot. Further, the requirement is not needed to protect plant safety. The staff's Safety Evaluation for TSTF-547 noted that the monitoring method in Required Action A.2.1 is more appropriate than the existing method in Required Action A.1. Therefore, its use should not be restricted.