

FINAL SAFETY EVALUATION OF TECHNICAL SPECIFICATIONS TASK FORCE
TRAVELER TSTF-547, REVISION 1, "CLARIFICATION OF ROD POSITION REQUIREMENTS"

1.0 INTRODUCTION

By letter dated March 6, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14065A582), the Technical Specifications (TS) Task Force (TSTF) submitted Traveler TSTF-547, Revision 0, "Clarification of Rod Position Requirements," for U.S. Nuclear Regulatory Commission (NRC) review and approval. By letter dated December 31, 2015 (ADAMS Accession No. ML15365A610), the TSTF submitted Revision 1 to Traveler TSTF-547. Traveler TSTF-547 proposes changes to Volumes 1 and 2 of NUREG-1431, Revision 4, "Standard Technical Specifications: Westinghouse Plants," dated April 30, 2012 (ADAMS Accession Nos. ML12100A222 and ML12100A228, respectively).

The proposed changes would revise the Standard TS (STS) to provide time to correct rod movement failures that do not affect operability, provide an alternative to frequent verification of rod position using the movable incore detectors, and allow time for thermal equilibrium of analog rod position indication. The proposed changes would also align requirements of TS 3.1.4, "Rod Group Alignment Limits," and TS 3.1.7, "Rod Position Indication," eliminate an unnecessary Required Action (RA) from TS 3.1.7, and make some editorial improvements to TSs 3.1.4, 3.1.5, "Shutdown Bank Insertion Limits," 3.1.6, "Control Bank Insertion Limits," and 3.1.7.

2.0 REGULATORY EVALUATION

2.1 Description of Rod Cluster Control Assemblies

The rod cluster control assemblies (RCCA), or rods, are moved by their control rod drive mechanisms (CRDM). Each CRDM moves its RCCA one step (approximately 5/8 inch) at a time, but at varying rates (steps per minute) depending on the signal output from the Rod Control System. The RCCAs are divided among control banks and shutdown banks. Each bank may be further subdivided into two groups to provide for precise reactivity control. A group consists of two or more RCCAs that are electrically paralleled to step simultaneously. If a bank of RCCAs consists of two groups, the groups are moved in a staggered fashion, but always within one step of each other. All units have four control banks and at least two shutdown banks.

The shutdown banks are maintained either in the fully inserted or fully withdrawn position. The control banks are moved in an overlap pattern, using the following withdrawal sequence: when control bank A reaches a predetermined height in the core, control bank B begins to move out with control bank A. Control bank A stops at the position of maximum withdrawal, and control bank B continues to move out. When control bank B reaches a predetermined height, control bank C begins to move out with control bank B. This sequence continues until control banks A, B, and C are at the fully withdrawn position, and control bank D is approximately halfway withdrawn. The insertion sequence is the opposite of the withdrawal sequence. The control rods are arranged in a radially symmetric pattern, so that control bank motion does not introduce radial asymmetries in the core power distributions.

The control banks are used for precise reactivity control of the reactor. The positions of the control banks are normally automatically controlled by the Rod Control System, but they can also be manually controlled. They are capable of adding negative reactivity very quickly (compared to borating). The control banks must be maintained above designed insertion limits and are typically near the fully withdrawn position during normal full power operations.

The axial position of shutdown rods and control rods is indicated by two separate and independent systems, which are the Bank Demand Position Indication System (commonly called group step counters) and the Rod Position Indication (RPI) System. The Bank Demand Position Indication System counts the pulses from the rod control system that moves the rods. There is one step counter for each group of rods. Individual rods in a group all receive the same signal to move and should, therefore, all be at the same position indicated by the group step counter for that group. The Bank Demand Position Indication System is considered relatively precise (± 1 step or $\pm 5/8$ inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse but incorrectly reflect the position of the rod. However, the RPI System provides a more accurate indication of actual rod position, but at a lower precision than the step counters. This system is based on inductive analog signals from a series of coils spaced along a hollow tube. To increase the reliability of the system, the inductive coils are connected alternately to data system A or B. Thus, if one data system fails, the RPI will indicate rod position with half accuracy. The RPI System is capable of monitoring rod position within at least ± 12 steps with either full accuracy or half accuracy. Depending on the plant design, the RPI system may be analog or digital. The digital system is called the Digital Rod Position Indication (DRPI) system. In the STS, the acronym "[D]RPI" is used to indicate either system design.¹

The shutdown margin (SDM) is defined in NUREG-1431 as the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming:

- a. All RCCAs are fully inserted except for the single RCCA of highest reactivity worth, which is assumed to be fully withdrawn. However, with all RCCAs verified fully inserted by two independent means, it is not necessary to account for a stuck RCCA in the SDM calculation. With any RCCA not capable of being fully inserted, the reactivity worth of the RCCA must be accounted for in the determination of SDM, and
- b. In Power Operation and Startup, the fuel and moderator temperatures are changed to the nominal zero power design level.

The Core Operating Limits Report (COLR) is defined in NUREG-1431 as the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific parameter limits must be determined for each reload cycle in accordance with TS 5.6.3. Plant operation within these limits is addressed in individual Specifications.

2.2 Description of Changes

This safety evaluation addresses changes to the STS governing rod group alignment limits (TS 3.1.4), shutdown bank insertion limits (TS 3.1.5), control bank insertion limits (TS 3.1.6),

¹ Throughout this SE, brackets are used to denote information that may be different for each plant and/or each vendor STS (i.e., differing TS numbers).

and rod position indication instrumentation (TS 3.1.7). The specific changes are described in the following subsections.

2.2.1 Provide Time to Correct Rod Movement Failures that Do Not Affect Operability

The limiting condition for operation (LCO) 3.1.5 requires that each shutdown bank be within required insertion limits. Current Condition A for one or more shutdown banks not within the limits, requires:

A.1.1 Verify SDM is within the limits specified in the COLR within 1 hour.

OR

A.1.2 Initiate boration to restore SDM to within limit within 1 hour.

AND

A.2 Restore shutdown banks to within limits within 2 hours.

LCO 3.1.6 requires that each control bank be within required insertion limits. Current Condition A for control bank insertion limits not met requires:

A.1.1 Verify SDM is within the limits specified in the COLR within 1 hour.

OR

A.1.2 Initiate boration to restore SDM to within limit within 1 hour.

AND

A.2 Restore control banks to within limits within 2 hours.

The proposed change would add a new Condition A to LCO 3.1.5 that would require, with one shutdown bank inserted \leq [16] steps beyond the insertion limits specified in the COLR: NOTE: The minimum number of steps that the rods must be moved to ensure correct performance of SR 3.1.4.2 is typically 16 steps but the number of steps varies by plant.

A.1 Verify all control banks are within the insertion limits specified in the COLR within one hour.

AND

A.2.1 Verify SDM is within the limits specified in the COLR within one hour.

OR

A.2.2. Initiate boration to restore SDM to within the limit within one hour.

AND

A.3 Restore the shutdown bank to within the insertion limits specified in the COLR within 24 hours.

The existing Condition A would be renumbered as Condition B and would be modified to apply for one or more shutdown banks not within limits for reasons other than Condition A. The existing RAs A.1.1, A.1.2, and A.2 would be renumbered B.1.1, B.1.2, and B.2. The existing Condition B and RA B.1 would be renumbered Condition C and RA C.1.

The proposed change would add a new Condition A to LCO 3.1.6 that would require, if control bank A, B, or C is inserted \leq [16] steps beyond the insertion, sequence, and overlap limits specified in the COLR, that:

A.1 Verify all shutdown banks are within the insertion limits specified in the COLR within one hour.

AND

A.2.1 Verify SDM is within the limits specified in the COLR within one hour.

OR

A.2.2. Initiate boration to restore SDM to within the limit within one hour.

AND

A.3 Restore the control bank to within the insertion, sequence, and overlap limits specified in the COLR within 24 hours.

The existing Condition A would be renumbered as Condition B and would be modified to apply for control bank insertion limits not met for reasons other than Condition A. The existing RAs A.1.1, A.1.2, and A.2 would be renumbered B.1.1, B.1.2, and B.2.

The existing Condition B would apply when control bank sequence or overlap limits are not met. Condition B would be modified to apply when control bank sequence or overlap limits are not met for reasons other than Condition A. Existing Condition B and RAs B.1.1, B.1.2, and B.2 would be renumbered as Condition C and RAs C.1.1, C.1.2, and C.2. Existing Condition C and RA C.1 would be renumbered as Condition D and RA D.1.

The shutdown banks must be within their insertion limits any time the reactor is critical or approaching criticality. This ensures that a sufficient amount of negative reactivity is available to shut down the reactor and maintain the required SDM following a reactor trip.

The limits on control banks sequence, overlap, and physical insertion, as defined in the COLR, must be maintained because they serve the function of preserving power distribution, ensuring that the SDM is maintained, ensuring that ejected rod worth is maintained, and ensuring adequate negative reactivity insertion is available on trip.

2.2.2 Provide an Alternative to Frequent Verification of Rod Position Using the Movable Incore Detectors

LCO 3.1.7, "Rod Position Indication," requires that the [D]RPI and the Demand Positon Indication System be operable during Startup and Power Operation. Condition A applies for one [D]RPI per group of rods inoperable for one or more groups of rods. The associated RAs are:

A.1 Verify the position of the rods with inoperable [D]RPI position indicators indirectly by using the movable incore detectors once per 8 hours.

OR

A.2 Reduce thermal power to \leq 50 percent rated thermal power within 8 hours.

The proposed change would add two new RAs to Condition A as alternatives to the once-per-8-hour indirect determination of rod position. The revised RAs would be:

A.1 Verify the position of rods with inoperable [D]RPI indirectly by using the moveable incore detectors once per 8 hours

OR

A.2.1 Verify the position of rods with inoperable [D]RPI indirectly by using the moveable incore detectors within 8 hours, once per 31 days of full power operation thereafter, within 8 hours after discovery of each unintended rod movement, within 8 hours after each movement of rods with inoperable [D]RPI > [12] steps, prior to exceeding 50 percent rated thermal power and within 8 hours after reaching rated thermal power.

AND

A.2.2 Restore inoperable [D]RPI to operable status prior to entering Startup from Hot Standby

OR

A.3 Reduce thermal power to \leq 50 percent rated thermal power

The 12-step agreement limit between the Bank Demand Position Indication System and the [D]RPI System indicates that the Bank Demand Position Indication System is adequately calibrated, and can be used for indication of the measurement of control rod bank position. When one [D]RPI channel per group fails, the position of the rod may still be determined indirectly by use of the movable incore detectors.

Surveillance Requirement (SR) 3.1.4.1 requires verification that the individual rods are within the alignment limit every 12 hours or in accordance with the Surveillance Frequency Control Program. This SR is proposed to be modified by a Note to indicate that the SR is not applicable for rods with an inoperable [D]RPI.

Verification that individual rod positions are within alignment limits at a Frequency of 12 hours provides a history that allows the operator to detect a rod that is beginning to deviate from its expected position. The specified Frequency takes into account other rod position information that is continuously available to the operator in the control room, so that during actual rod motion, deviations can immediately be detected. Alternatively, the SR frequency may be controlled by the Surveillance Frequency Control Program.

2.2.3 Allow Time for Thermal Equilibrium of Analog RPI

The accuracy of the analog RPI system is affected by rod temperatures. With this effect, movement of associated rods may make the indications of the analog RPI system inaccurate. The proposed revision would allow a 1-hour period for the drive shaft to reach thermal equilibrium following rod movement to ensure the accuracy of the RPI analog indications, prior to requiring verification of compliance with TS limits. This change affects SR 3.1.4.1, SR 3.1.5.1, SR 3.1.6.2, SR 3.1.6.3, and LCO 3.1.7, and is only applicable to analog RPis.

SR 3.1.4.1 requires verification that individual rods are within the alignment limits every [12 hours or in accordance with the Surveillance Frequency Control Program]. The proposed change adds a Note to the Surveillance that states, "[Not required to be performed until 1 hour after associated rod motion.]"

SR 3.1.5.1 requires verification that each shutdown bank is within the insertion limits every [12 hours or in accordance with the Surveillance Frequency Control Program]. The proposed

change adds a Note to the Surveillance that states, "[Not required to be performed until 1 hour after associated rod motion.]"

Since the shutdown banks are positioned manually by the control room operator, a verification of shutdown bank position at a frequency of 12 hours, after the reactor is taken critical, is adequate to ensure that they are within their insertion limits. Also, the 12-hour frequency takes into account other information available in the control room for the purpose of monitoring the status of shutdown rods. Alternatively, the SR frequency may be controlled by the Surveillance Frequency Control Program.

SR 3.1.6.2 requires verification that each control bank is within the insertion limits every [12 hours or in accordance with the Surveillance Frequency Control Program]. The proposed change adds a Note to the Surveillance that states, "[Not required to be performed until 1 hour after associated rod motion.]"

Verification of the control bank insertion limits at a frequency of 12 hours is sufficient to detect control banks that may be approaching the insertion limits since, normally, very little rod motion occurs in 12 hours. Alternatively, the SR frequency may be controlled by the Surveillance Frequency Control Program.

SR 3.1.6.3 requires verification that each control bank that is not fully withdrawn from the core is within the sequence and overlap limits every [12 hours or in accordance with the Surveillance Frequency Control Program]. The proposed change adds a Note to the Surveillance that states, "[Not required to be performed until 1 hour after associated rod motion.]"

When control banks are maintained within their insertion limits as verified by SR 3.1.6.2, it is unlikely that their sequence and overlap will not be in accordance with requirements provided in the COLR. A frequency of 12 hours is consistent with the insertion limit verification in SR 3.1.6.2. Alternatively, the SR frequency may be controlled by the Surveillance Frequency Control Program.

LCO 3.1.7, "Rod Position Indication," requires that the [D]RPI and the Demand Position Indication System be operable during Startup and Power Operation. LCO 3.1.7 is revised to add a Note that states individual [D]RPis are not required to be Operable following movement of associated rods.

2.2.4 Clarify SRs in TS 3.1.4 and TS 3.1.7

SR 3.1.4.1 requires verification of individual rod positions are within the alignment limits once per 12 hours or in accordance with the Surveillance Frequency Control Program. The proposed change is the addition of a Note to SR 3.1.4.1 stating that the SR is not required to be performed for rods associated with an inoperable demand position indicator. This Note is being added because SR 3.1.4.1 cannot be performed for rods with an inoperable demand position indicator.

LCO 3.1.4 specifies that all shutdown and control rods shall be operable and individual indicated rod positions shall be within 12 steps of their group step counter demand position. SR 3.1.7.1 requires verification that each [D]RPI agrees within the required steps of the group demand position for the [full indicated range] of rod travel. The proposed change is the addition of a Note to SR 3.1.7.1 stating that the SR would not be required to be met for rods known not to meet LCO 3.1.4.

2.2.5 Eliminate an Unnecessary RA from TS 3.1.7

LCO 3.1.7, "Rod Position Indication," requires that the [D]RPI and the Demand Position Indication System be operable during Startup and Power Operation. Condition B, is applicable when more than one [D]RPI per group is inoperable. Existing RA B.2 states, "Monitor and Record Reactor Coolant System Tavg."

RA B.2 is proposed to be deleted.

The existing RA B.3 is also being deleted as described below in Section 2.2.6, Item 5. Existing RA B.4 is being renumbered as B.2.

2.2.6 Other Proposed Changes

The proposed changes described in this section are editorial and do not change the technical content.

1. LCO 3.1.4, Condition B, is revised to eliminate RA B.1 and to combine RAs B.2.4 and B.2.5. Condition B applies when one rod is not within the alignment limits and RA B.1 requires restoring the rod to within limits within 1 hour. An alternative set of RAs is provided in the RA section, and will continue to be required when Condition B is applicable. RA B.1 is an Action that requires restoration of equipment such that the Condition does not apply. Restoring equipment to operable status is understood to be an option. Therefore, stating this as an RA is not necessary.
2. LCO 3.1.5 and LCO 3.1.6 contain a note modifying their Applicability that states "This LCO is not applicable while performing SR 3.1.4.2." The proposed change moves the LCO 3.1.5 and LCO 3.1.6 Applicability Notes to LCO Notes and revises the Notes to state, "Not applicable to shutdown banks inserted while performing SR 3.1.4.2" for LCO 3.1.5 and "Not applicable to control banks inserted while performing SR 3.1.4.2" for LCO 3.1.6. This change clarifies the note and does not alter its meaning.
3. TS 3.1.7 is revised to consistently use the defined abbreviation "[D]RPI." This affects the Actions Note, RA A.1, RA B.2, and RA C.1.
4. TS 3.1.7, Condition A, is revised from "for one or more groups" to the more standard terminology "in one or more groups," and TS 3.1.7, Condition B is revised to include the phrase "in one or more groups" to be more consistent with the wording of Condition A.
5. TS 3.1.7, RA B.3 is redundant to RA A.1. RA B.3 is proposed to be deleted. Condition A applies when one [D]RPI per group is inoperable and Condition B applies when more than one [D]RPI per group is inoperable. Each entry into Condition B also requires entry into Condition A. Restating the RA is not necessary.
6. TS 3.1.7, Condition C is revised to contain similar terminology to Conditions A and B. The existing Condition C states, "One or more rods with inoperable position indicators have been moved > 24 steps in one direction since the last determination of the rod's position." Conditions A and B are worded such that the condition describing the inoperable equipment (e.g., "One [D]RPI per group inoperable...") is listed first. The

proposed change rewords Condition C to state, "One or more [D]RPI inoperable in one or more groups and associated rods have been moved >24 steps in one direction since the last position determination."

7. LCO 3.1.7, Condition D is revised from "One demand position indicator per bank inoperable for one or more banks" to "One or more demand position indicators per bank inoperable in one or more banks." The proposed change makes the terminology consistent with the Note modifying the RAs.

The current TS 3.1.7 is modified by a Note which states, "Separate Condition entry is allowed for each inoperable rod position indicator and each demand position indicator." The Bases for the Note states that the Note is acceptable because the RAs for each condition provide appropriate compensatory actions for each inoperable indicator. There is one demand position indicator per group of rods. For banks with two groups of rods, there are two demand indicators per bank. The separate condition entry Note modifying the TS 3.1.7 Actions states that separate condition entry is allowed for inoperable demand position indicators which means that the Condition D is applicable to more than one inoperable demand position indicator per bank. The proposed change makes the existing Condition D terminology consistent with the Note.

2.3 Regulatory Review

The categories of items required to be in the TSs are provided in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR 50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met. The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met. Also, 10 CFR 50.36(a)(1) states that a summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the TSs.

The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of NUREG-0800, Revision 3, *Standard Review Plan* (March 2010) (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light-water reactor nuclear designs. NUREG-1431 contains the STS for Westinghouse-designed plants.

3.0 TECHNICAL EVALUATION

The NRC staff reviewed the proposed changes to NUREG-1431 and the technical justification for the changes provided in Traveler TSTF-547. The NRC staff reviewed the technical justification for the proposed changes to ensure the reasoning was logical, complete and clearly written as described in Chapter 16 of NUREG-0800. The NRC staff reviewed the proposed changes for continued compliance with the requirements of 10 CFR 50.36 and for consistency with conventional terminology and with the format and usage rules embodied in the STS. The NRC staff considered whether there should be any limitations or conditions placed on adoption of the Traveler by future applicants.

Although the TS bases are not part of the TS, the staff confirmed that that TS bases described the basis for each revised TS requirement accurately as described in Chapter 16 of NUREG-0800.

3.1 Provide Time to Correct Rod Movement Failures that Do Not Affect Operability Review

The proposed new Condition A of TSs 3.1.5 and 3.1.6 for shutdown and control bank insertion limits would allow 24 hours to restore a single bank to be within its insertion limit when inserted below the insertion limit. With one shutdown or control bank inserted a maximum of [16] steps below the rod insertion limit, the RAs associated with new Condition A also require verification that all other control and shutdown banks are within the insertion limits; and verification that the reactor can be shutdown using control rods or boration. The Completion Time for these RAs is 1 hour.

The new conditions define limits of both duration and insertion if a bank is immovable due to failures external to the CRDM. A maximum of one control or shutdown bank may be inserted beyond the limits for a maximum of 24 hours provided all other banks are within the insertion limits and that the reactor could be shut down using control rods or boration. The new Condition A imposes a limit on the insertion of [16] steps less than the insertion limit. The value of [16] steps corresponds to the minimum number of steps that the rods must be moved to ensure correct performance of SR 3.1.4.2.

The NRC staff reviewed the justification for the proposed addition of Condition A to TS 3.1.5 and TS 3.1.6 provided in the Technical Evaluation Section of Traveler TSTF-547, to ensure the reasoning is logical, complete and clearly written. The justification in Traveler TSTF-547 states:

1. All control and shutdown rod assemblies are required to be Operable. If a rod is untrippable (i.e., inoperable), then a plant shutdown is required in accordance with LCO 3.1.4, Condition A.
2. Only one control bank and shutdown bank may be inserted beyond insertion limits by no more than [16] steps. If one or more control banks or shutdown banks exceed the insertion limit, a brief time period is permitted to correct the condition and then a plant shutdown is required.
3. If one rod is not within the alignment limits, adequate SDM is verified and a power reduction is required by LCO 3.1.4, Condition B. If more than one rod is not within the alignment limit as defined in LCO 3.1.4, adequate SDM is verified and a plant shutdown is required.

The insertion limits are established to ensure a sufficient amount of negative reactivity can be rapidly inserted to shutdown the reactor. The NRC staff finds that allowing continued full-power operations for 24 hours with a rod movement failure is acceptable for the following reasons:

- (1) the Shutdown Margin continues to be met;
- (2) all control and shutdown rods are trippable – i.e., capable of being rapidly inserted into the core;
- (3) only one bank may exceed insertion limits by no more than a specified number of steps;

- (4) all immovable rod assemblies are aligned; and
- (5) the rods must be restored to within the insertion limits within 24 hours.

The change to TS 3.1.5 and TS 3.1.6 to provide time to correct rod movement failures that do not affect operability will allow sufficient time for diagnosis and repairs while maintaining the safety function of the control rods since the affected rods are still trippable. The thermal margins may be affected by power distribution changes due to control rod bank insertion, both during the insertion and during the resulting local xenon transient. However, insertions at or near the typical value of 16 steps from fully withdrawn, as provided in the proposed changes to TSs 3.1.5 and 3.1.6, would result in a very small negative reactivity impact at the top of active fuel. The resulting effect on the axial power distribution is not expected to be significant. In addition, alignment of all rods with the rod bank position (as per LCO 3.1.4) must be maintained and it will be verified that the reactor can still be shutdown. Therefore, the NRC staff has determined that the proposed 24-hour completion time for Condition A in LCO 3.1.5 and 3.1.6 specifying shutdown bank and control bank insertion limits is acceptable.

The NRC staff concludes that TS 3.1.5 and TS 3.1.6, as modified by the addition of Condition A, continue to specify the minimum performance level of equipment needed for safe operation of the facility as a LCO; and continue to specify the appropriate remedial measures if the LCO is not met. SRs are not being changed by the addition of Condition A. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) continue to be met because the minimum performance level of equipment needed for safe operation of the facility is contained in the LCO and the appropriate remedial measures are specified if the LCO is not met.

3.2 Provide an Alternative to Frequent Verification of Rod Position Using the Movable Incore Detectors Review

LCO 3.1.7 requires that the [D]RPI and the Demand Position Indication System be Operable during Power Operation and Startup. When one or more [D]RPI are inoperable, current TS 3.1.7 requires verification of rod position once per 8 hours using the movable incore detector system or reduce thermal power to less than or equal to 50 percent rated thermal power (RTP) within 8 hours. The proposed change provides an alternative set of RAs.

New RA A.2.1 requires use of the movable detector system to monitor the position of the rod within 8 hours of the inoperability of [D]RPI, 8 hours after discovery of each unintended rod movement, 8 hours after each greater than 12 step movement of a rod with inoperable [D]RPI, prior to exceeding 50 percent RTP, 8 hours after reaching RTP, and once per 31 effective full power days (EFPD) thereafter. New RA A.2.2 would require the inoperable [D]RPI to be restored to Operable status prior to entering Startup from Hot Standby.

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, regardless 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.

If the rod position indication is failed for an individual rod, its position is determined indirectly by use of the moveable incore detectors. The NRC staff has determined that this change, which

verifies rod position using the movable incore detectors based on the occurrence of events requiring rod motion, rather than determining position on a specified frequency, is acceptable because events requiring rod motion of the shutdown banks and control banks A, B, and C are relatively infrequent during steady state operation. Events involving significant movement of rods in control bank D are also relatively infrequent. The indirect determination of rod position is required after significant changes in power level or following substantial rod motion.

The addition of the Note to SR 3.1.4.1 stating that the SR is not required to be performed for rods associated with an inoperable [D]RPI is appropriate because the RAs of TS 3.1.7 for an inoperable [D]RPI provide the appropriate actions for indirectly determining the position of the affected rods.

The NRC staff concludes that the addition of an alternative monitoring scheme to indirectly determine the position of rods associated with an inoperable [D]RPI is acceptable. TS 3.1.7, as modified, continues to specify the minimum performance level of equipment needed for safe operation of the facility as an LCO and continues to specify the appropriate remedial measures if the LCO is not met. The revised SR 3.1.4.1, which has been clarified to specify when it is required to be performed, continues to be an appropriate test to ensure that the necessary quality of systems is maintained. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) continue to be met because the minimum performance level of equipment needed for safe operation of the facility is contained in the LCO and the appropriate remedial measures are specified if the LCO is not met. The NRC staff finds that the requirements of 10 CFR 50.36(c)(3) continue to be met because the revised SR provides the appropriate testing to ensure the necessary quality of components is maintained and that the LCO will be met.

3.3 Allow Time for Thermal Equilibrium of Analog RPI Review

Several changes are proposed to allow a 1-hour period for the drive shaft to reach thermal equilibrium following rod movement to ensure accuracy of the RPI analog indications to verify TS limits. LCO 3.1.7 would be revised with a Note that individual RPIs are not required to be operable for 1 hour following rod motion. SRs 3.1.4.1, 3.1.5.1, 3.1.6.2 and 3.1.6.3 would be revised to not be required to be performed until 1 hour after the associated rod motion.

The 1-hour period is based on the necessary time to allow the rod drive shaft to reach thermal equilibrium following rod motion. There are thermal effects which cause the analog position indicators to drift following rod motion. During this period prior to establishment of thermal equilibrium, the indicators could be unstable and could indicate an inaccurate rod position. The provision to allow a one-hour period to reach thermal equilibrium ensures that actions are not taken based on an inaccurate indication of rod position, which could lead to unnecessary transients. During this 1-hour period, the Demand Position Indication System would be available to indicate the demand position of the rods.

The NRC staff reviewed the technical justification provided in the Traveler TSTF-547 to ensure the reasoning is logical, complete and clearly written as described in Chapter 16 of NUREG-0800.

The NRC staff concludes that TS 3.1.7, as modified by the addition of a Note, continues to specify the minimum performance level of equipment needed for safe operation of the facility, and continues to specify the appropriate remedial measures if the LCO is not met. The changes to the SRs ensure the SRs are performed when the position indication system has achieved thermal stability following rod motion. The SRs would continue to ensure the necessary quality

of systems and components is maintained, that facility operation will be within safety limits, and the limiting conditions for operation will be met. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) continue to be met.

3.4 Clarify SRs in TS 3.1.4 and TS 3.1.7 Review

3.4.1 Clarification of SR 3.1.4.1

LCO 3.1.4 requires that all shutdown and control rods shall be operable and individual indicated rod positions shall be within 12 steps of their group step counter demand position. SR 3.1.4.1 requires verification of the individual rod positions within the alignment limit periodically. SR 3.1.4.1 cannot be performed for rods with an inoperable bank demand position indicator. Failure to meet an SR is considered a failure to meet an LCO requirement. Therefore, if SR 3.1.4.1 cannot be performed, entry into LCO 3.1.4 Condition D is required. LCO 3.1.4 Condition D applies when more than one rod is not within the alignment limit. The RA associated with Condition D requires, in part, that the reactor be in Hot Standby within 6 hours.

LCO 3.1.7 requires the [D]RPI and bank demand position indication to be operable. LCO 3.1.7 Condition D applies if one demand position indicator per bank is inoperable for one or more banks. The Condition D RAs require verification that all [D]RPIs for the affected banks are operable and require verification that the most withdrawn rod and least withdrawn rod of the affected banks are less than or equal to [12] steps apart once per 8 hours. Alternatively, thermal power must be reduced to less than or equal to 50 percent RTP.

A Note is being added to SR 3.1.4.1 stating that this SR is not required to be performed for rods associated with an inoperable demand position indicator. The alignment limit is based on the demand position indicator. If the bank demand position indicator is inoperable, the SR cannot be performed.

Following modification of SR 3.1.4.1, Condition D of LCO 3.1.7 would be the applicable Condition to be entered in the event of inoperable demand position indicators. The RAs associated with Condition D of LCO 3.1.7 provide the appropriate actions in this situation by requiring that the [D]RPIs are operable and that the individual rods in the bank are not misaligned by more than [12] steps.

3.4.2 Clarification of SR 3.1.4.1 and SR 3.1.7.1

LCO 3.1.4 requires that all shutdown and control rods shall be operable and individual indicated rod positions shall be within 12 steps of their group step counter demand position.

LCO 3.1.7 requires the [D]RPI and bank demand position indication to be operable.

SR 3.1.7.1 requires verification that each [D]RPI agree within [12] steps of the group demand position for the [full indicated range] of rod travel. This SR is performed once prior to criticality after each removal of the reactor head. Failure to meet an SR is considered a failure to meet the LCO per SR 3.0.1. The requirements of SRs must be satisfied in between performances of the surveillance test itself. If a control or shutdown rod is not within 12 steps of its bank demand position indication, then the requirements of both LCO 3.1.4 and LCO 3.1.7 are not met.

A Note is being added to SR 3.1.7.1 stating that this SR is not required to be performed for rods that are known not to meet LCO 3.1.4. If a rod is known not to be within [12] steps of the group

demand position, LCO 3.1.4 provides the appropriate RAs. With one rod not within the alignment limit, Condition B requires either (1) verification of shutdown margin or boration until SDM is met; and a reduction in RTP; or (2) verification of shutdown margin or boration until SDM is met, and that hot channel factors must be verified within limits, and safety analyses must be re-evaluated to confirm continued operation is permissible. If more than one rod is misaligned, the SDM must be determined by verifying that the shutdown margin is within limits or by initiating boration to restore required SDM and shutdown the plant.

The NRC staff reviewed the technical justification for the proposed changes provided in the Traveler TSTF-547 for logical reasoning, completeness and clarity. The purpose of the changes is to prescribe the appropriate Actions to be followed when equipment is inoperable.

TS 3.1.4 provides limits on rod alignment to ensure acceptable power peaking factors and local linear heat rates and an acceptable shutdown margin, all of which are initial conditions in the applicable safety analyses. It is appropriate to consolidate requirements associated with rod misalignments in this TS. TS 3.1.7 provides requirements for instrumentation to monitor rod position. The instrumentation is used to verify that the rod alignment limits in TS 3.1.4 are satisfied. Similarly, it is appropriate to consolidate requirements associated with instrumentation operability in this TS.

The NRC staff concludes that the clarifications to SRs 3.1.4.1 and 3.1.7.1 to specify configurations in which performance of the SRs is not required are appropriate. The TSs, as modified, continue to specify the minimum performance level of equipment needed for safe operation of the facility as an LCO, and continue to specify the appropriate remedial measures if the LCO is not met. The revised SRs 3.1.4.1 and 3.1.7.1 continue to be appropriate, because they ensure the necessary quality of systems is maintained. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) and 10 CFR 50.36(c)(3) continue to be met.

3.5 Eliminate an Unnecessary RA from LCO 3.1.7 Review

The NRC staff reviewed the justification for deletion of LCO 3.1.7, RA B.2 that monitors and records reactor coolant average temperature (T_{avg}). RA B.2 is one of the RAs associated with LCO 3.17 Condition B. Condition B applies when more than one [D]RPI per group is inoperable in one or more groups. RA B.1 requires that the control rods be placed in manual control immediately and existing RA B.4 (renumbered as B.2) requires restoring the inoperable position indicators to operable status such that a maximum of one [D]RPI per group is inoperable within 24 hours.

The NRC staff has determined that RA B.2 provides no safety benefit for identifying trends in reactor coolant T_{avg} . This RA was intended to help assure that significant changes in power distribution and the ability to shutdown the reactor are avoided. During normal steady state power operation, there is very little rod motion. LCO 3.1.7 RA B.1 and RA B.4 (renumbered as RA B.2) continue to apply when more than one [D]RPI per group is inoperable. LCO 3.1.4 and LCO 3.1.7 provide the appropriate requirements for monitoring rod position and alignment and provide the appropriate actions, if a rod is misaligned. This provides the necessary verification that SDM is maintained. The nuclear instrumentation monitors neutron flux in the core providing indication of changes in power distribution. Therefore, the NRC staff concludes that RA B.2 of LCO 3.1.7 is unnecessary and can be deleted.

The NRC staff concludes that the proposed changes to LCO 3.1.7 are acceptable because the LCO continues to specify the minimum performance level of equipment needed for safe

operation of the facility. As described in the preceding paragraph the appropriate remedial measures are prescribed when the LCO is not met. SRs are not being changed by the deletion of RA B.2. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) continue to be met.

3.6 Other Proposed Changes

The NRC staff found that the following changes are editorial in nature and do not change the TS requirements, and are therefore acceptable.

1. LCO 3.1.4, Condition B, is revised to eliminate RA B.1 and to combine RAs B.2.4 and B.2.5. Condition B applies when one rod is not within the alignment limits and RA B.1 requires restoring the rod to within limits within 1 hour. An alternative set of RAs is provided in the RA section, and will continue to be required when Condition B is applicable. RA B.1 is an Action that requires restoration of equipment such that the Condition does not apply. Restoring equipment to operable status is understood to be an option. Therefore, stating this as an RA is not necessary.
2. LCO 3.1.5 and LCO 3.1.6 contain a note modifying their Applicability that states "This LCO is not applicable while performing SR 3.1.4.2." The proposed change moves the LCO 3.1.5 and LCO 3.1.6 Applicability Notes to LCO Notes and revises the Notes to state, "Not applicable to shutdown banks inserted while performing SR 3.1.4.2" for LCO 3.1.5 and "Not applicable to control banks inserted while performing SR 3.1.4.2" for LCO 3.1.6. This change clarifies the note and does not alter its meaning.
3. TS 3.1.7 is revised to consistently use the defined abbreviation "[D]RPI." This affects the Actions Note, RA A.1, RA B.2, and RA C.1.
4. TS 3.1.7, Condition A, is revised from "for one or more groups" to the more standard terminology "in one or more groups," and TS 3.1.7, Condition B is revised to include the phrase "in one or more groups" to be more consistent with the wording of Condition A.
5. TS 3.1.7, RA B.3 is redundant to RA A.1. RA B.3 is proposed to be deleted. Condition A applies when one [D]RPI per group is inoperable and Condition B applies when more than one [D]RPI per group is inoperable. Each entry into Condition B also requires entry into Condition A. Restating the RA is not necessary.
6. TS 3.1.7, Condition C, is revised to contain similar terminology to Conditions A and B. The existing Condition C states, "One or more rods with inoperable position indicators have been moved > 24 steps in one direction since the last determination of the rod's position." Conditions A and B are worded such that the condition describing the inoperable equipment (e.g., "One [D]RPI per group inoperable...") is listed first. The proposed change rewords Condition C to state, "One or more [D]RPI inoperable in one or more groups and associated rods have been moved >24 steps in one direction since the last position determination."
7. LCO 3.1.7, Condition D, is revised from "One demand position indicator per bank inoperable for one or more banks" to "One or more demand position indicators per bank inoperable in one or more banks." The proposed change makes the terminology consistent with the Note modifying the RAs.

The current TS 3.1.7 is modified by a Note which states, "Separate Condition entry is allowed for each inoperable rod position indicator and each demand position indicator." The Bases for the Note states that the Note is acceptable because the RAs for each condition provide appropriate compensatory actions for each inoperable indicator.

There is one demand position indicator per group of rods, two demand indicators per bank in those banks with two groups. The separate condition entry Note modifying the TS 3.1.7 Actions states that separate condition entry is allowed for inoperable demand position indicators which means that Condition D is applicable to more than one inoperable demand position indicator per bank. The proposed change makes the existing Condition D terminology consistent with the Note.

The regulation at 10 CFR 50.36(a)(1) states, in part: "A summary statement of the bases or reasons for such specifications ... shall also be included in the application, but shall not become part of the technical specifications." Accordingly, along with the proposed STS changes, the TSTF also submitted STS Bases changes that corresponded to the proposed STS changes.

3.7 Summary of NRC Staff Conclusions

The regulations at 10 CFR 50.36 require that TSs will include items in specified categories, including LCOs and SRs. The proposed changes modify the LCOs, Conditions, RAs, Completion Times, and SRs applicable to control rod and shutdown rod insertion and alignment limits and the instrumentation to monitor rod position and alignment. The STS continue to specify the LCOs and specify the remedial measures to be taken if one of these requirements is not satisfied. The STS continue to specify the appropriate SRs for tests and inspections to ensure the necessary quality of affected structures, systems and components is maintained. The NRC staff finds that the proposed LCOs, and SRs meet the requirements of 10 CFR 50.36(c)(2) and 50.36(c)(3), respectively.

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