# Industry/TSTF Standard Technical Specification Change Traveler

**Fuel movement with inoperable refueling equipment interlocks**

Classification: 3) Improve Specifications

NUREGs Affected: ☐ 1430 ☐ 1431 ☐ 1432 ☑ 1433 ☑ 1434

Description:

Two changes are being made:

1. Change to the Required Action for LCO 3.9.1 "Refueling Equipment Interlocks": Provide an alternative Required Action (A.2) if the refueling interlocks become inoperable, which will safely permit continued fuel movement if:
a) a continuous control rod withdrawal block is inserted to replace the conditional rod block provided by the interlocks, and
b) all the control rods in the core are verified to be fully inserted.

2. Change to the Surveillance Frequency for SR 3.9.1.1: Revise the SR frequency from 7 to 31 days.

Justification:

System Description/Background for Both Portions of this Change

Refueling equipment interlocks restrict the operation of the refueling equipment or the withdrawal of control rods to reinforce unit procedures in preventing the reactor from achieving criticality during refueling. The refueling equipment interlock circuitry senses the conditions of the refueling equipment and the control rods. Depending on the sensed conditions, interlocks are actuated to prevent the operation of the refueling equipment or the withdrawal of control rods (rod block).

The control rods, when fully inserted, serve as the system capable of maintaining the reactor subcritical in cold conditions during all fuel movement activities and accidents, as required by General Design Criterion (GDC) 26 of 10CFR50, Appendix A.

The following provide input to one or both channels of the interlock instrumentation:
1. the full insertion of all control rods,
2. the position of the refueling platform, and
3. the loading of the refueling platform main hoist.

During refueling operations, the indicated conditions (the "all-rods-in", the "refueling platform position", and the "refueling platform main hoist-fuel loaded" inputs) are combined in logic circuits to determine if all restrictions on refueling equipment operations and control rod insertion are satisfied.

Criticality is prevented during the loading of fuel, provided all control rods are fully inserted during the process. The refueling equipment interlocks accomplish this by preventing movement of the bridge into the core region when any control rod is withdrawn, or by preventing withdrawal of a control rod (by inserting a control rod block) when the bridge is over the core with the hoist loaded with fuel.

Item 1, Change to the Required Action for LCO 3.9.1 "Refueling Equipment Interlocks":
Provide an alternative Required Action (A.2) if the refueling interlocks become inoperable, which will safely permit continued fuel movement if:
a) a continuous control rod withdrawal block is inserted to replace the conditional rod block provided by the interlocks, and
b) all the control rods in the core are verified to be fully inserted.

The primary difference from TSTF-225, Revision 0 is associated with this item. The new Required Action A.2.2 that was proposed by TSTF-225 is revised such that it will require the operator to "Verify all control rods are fully inserted",

rather than just verifying rods are inserted "in core cells containing one or more fuel assemblies." The revised, more restrictive wording of Action A.2.2 will ensure that if fuel is being loaded with any control rods withdrawn (in accordance with the provisions of LCO 3.10.6.c), the refueling interlocks will be required to be Operable. This will eliminate the possibility of a reloading error in cells which are not protected by refueling interlocks or an inserted control rod.

The remaining justifications previously provided for TSTF-225, Revision 0, remain valid with only minor adjustment, and are provided below.

The proposed change adds additional Required Actions (A.2.1 and A.2.2) to Technical Specification 3.9.1, "Refueling Equipment Interlocks." The additional Required Actions provide an alternative action for when the refueling interlocks are inoperable. Basically, operable refueling interlocks permit fuel loading to proceed without the need to have a control rod withdrawal block in effect at all times, since the interlocks insert appropriate blocks if the need arises. The requested alternative for when the refueling interlocks are inoperable is to block control rod withdrawal immediately, and to perform an additional verification that all of the control rods are fully inserted. The proposed additional Required Actions provide an equivalent level of assurance that fuel will not be loaded into a core cell with a control rod withdrawn as do the current Required Action or the Surveillance Requirement.

As discussed in the Bases for the current Required Action, the purpose of the requirement (to suspend in-vessel fuel movement) is to ensure "operations are not performed with equipment that would potentially not be blocked from unacceptable operations (e.g., loading fuel into a cell with a control rod withdrawn)." The method that the refueling equipment interlocks use to perform this function whenever fuel is being moved over or in the reactor vessel is to block control rod withdrawal. Conversely, when a control rod is withdrawn, the refueling interlocks prevent fuel from being moved over or in the vessel. Simply put, operable refueling interlocks permit fuel loading to proceed without the need to have a continuous control rod withdrawal block in effect. The proposed change will allow the refueling interlocks to be inoperable and fuel movement to continue if a continuous control rod withdrawal block is placed in effect, and all control rods are verified to be fully inserted, thereby ensuring fuel loading will not occur with a control rod inappropriately withdrawn.

As discussed above, the first refueling equipment interlock safety function is to block control rod withdrawal whenever fuel is being moved over or in the reactor vessel. The proposed alternative Required Actions will perform this function by requiring that a control rod block be placed in effect. The second refueling equipment interlock safety function is to prevent fuel from being loaded into the vessel when a control rod is withdrawn. This function will also continue to be performed by the proposed alternate LCO 3.9.1 Required Actions. Required Action A.2.1 will require that a control rod block first be placed in effect, thereby ensuring that control rods are not subsequently withdrawn. Following placement of the continuous control rod withdrawal block in effect, Required Action A.2.2 will require all control rods to be verified to be fully inserted. This verification is in addition to the requirements to periodically verify control rod position in Surveillance Requirement (SR) 3.9.3.1. These proposed Required Actions will ensure that control rods are not withdrawn and cannot be withdrawn, because a continuous block to control rod withdrawal will be in place. The withdrawal block utilized must ensure that if rod withdrawal is attempted, the rod will not respond (i.e., it will remain inserted). Like Required Action A.1, Actions A.2.1 and A.2.2 will ensure unacceptable operations are blocked (e.g., loading fuel into a cell with a control rod withdrawn).

The proposed Required Actions increase consistency within the Technical Specifications, since they are similar to the Required Actions for an existing, related Limiting Condition for Operation (LCO) 3.9.4, "Control Rod Position Indication". LCO 3.9.4 controls the operability of the control rod position indicators, which serve a support system role for the refueling interlocks controlled by LCO 3.9.1 (the position indicators provide information to the "all-rods-in" interlock. The key point is that LCO 3.9.4 Required Action A.2 (with subactions A.2.1 and A.2.2) does not require that all fuel movement be suspended. The proposed LCO 3.9.1 Required Actions are consistent with the current Required Actions of LCO 3.9.4 since they require either fuel movement be suspended (similar to the Spec 3.9.4 A.1 series of Actions), or all control rods be verified to be inserted and control rod withdrawal be blocked (similar to the Spec 3.9.4 A.2 series of Actions).

This change will allow plants to continue to safely perform fuel movements in the vessel should the interlocks become

inoperable for any reason, whether it be due to an administrative declaration (because the surveillance is overdue), or due to an actual hardware difficulty (that needs to undergo corrective maintenance).

Item 2, Change to the Surveillance Frequency for SR 3.9.1.1: Revise SR Frequency from 7 to 31 days.

This item is added into the generic change for two reasons.

First, this will permit plants to not have to administratively declare the refueling interlocks inoperable after 7 days, when they actually are still fully functional. SR 3.9.1.1 currently requires that a Channel Functional Test be performed on the refueling equipment interlocks every 7 days during in-vessel fuel movement using equipment associated with the refueling equipment interlocks. This includes testing the all-rods-in interlock, the refuel platform position interlock, and the refuel platform main hoist fuel loaded interlock. To meet this SR, the test must be performed within the 7 day period prior to entering the Applicability (i.e., within 7 days prior to fuel movement with equipment associated with the interlocks) and then every 7 days thereafter, as long as the LCO is still applicable.

The changes made in Item 1 above, adding the new Required Action A.2, will permit a complete offload, shuffle, or onload of fuel, without the need for plants to halt refueling activities solely for the performance of these surveillance tests. However, with Item 1 only (without Item 2), plants would be required to administratively declare the interlocks inoperable due to the SR being overdue, although the interlocks are still capable of performing the safety function.

The refueling period typically lasts longer than 7 days. Without the change in Item 1 above (the alternate Action), plants must halt refueling activities, which are typically critical path activities, to perform the surveillance. Without Item 2 (the longer Frequency), plants could still feel pressured to do this, even though this halt increases the fuel movement critical path while the surveillance is being completed, paperwork is being closed out, and approval is being obtained to restart fuel movement. In addition, performance of the surveillances during fuel movement also causes a disruption in the continuity of fuel movement operations. Thus, the change of the SR Frequency from 7 to 31 days will reduce the risk associated with halting and recommencing fuel movements by eliminating the discontinuity.

Although the formal interlock surveillance would not be performed at the same frequency as before, the associated instruments have indications either on the refueling bridge console or in the control room, or both. Therefore, if a problem develops with one of the instrument channels between surveillance tests, refueling operators or control room operators would be provided with an indication that the channel is not performing its intended function. This is consistent with the Bases for SR 3.9.1.1, which notes that the SR Frequency was simply based on engineering judgement, and was considered adequate in view of other indications of refueling equipment interlocks and the associated input status that are available to unit operations personnel. This Bases justification remains valid for a 31 day SR Frequency as well. Also, the proposed 31 day Frequency is consistent with the Channel Functional Test frequency for the Source Range Monitor (SRM) Instrumentation in SR 3.3.1.2.5. The 31 day Frequency is also one-third of the 92 day interval for Channel Functional Tests permitted for the Control Rod Block Instrumentation (LCO 3.3.2.1) when the plant is in Mode 1 or 2.

The reliability of the refueling interlocks, and the ability to identify problems with the interlock circuitry during the time between performance of surveillances, was borne out by reviews performed at a lead plant for this change, the Perry Nuclear Power Plant. No difficulties were identified in over 30 performances of surveillances on the interlocks. The corrective maintenance that was required on this circuitry was identified by the indications normally available to the operators between performance of surveillances. It was concluded that extending the surveillance frequency for the CFTs would not allow an inoperability to go undetected until the next performance of the surveillance.

The second reason for this SR Frequency change is so plants performing a spiral reload without a full set of blade guides (per the requirements of LCO 3.10.6), would not have to unnecessarily halt fuel movement when the 7 day SR is due. Plants performing such a spiral reload without a full set of blade guides by definition do not have all the control rods inserted in the core, since any rod inserted without a blade guide would not be supported. Since all the control rods are not inserted, the new Required Action A.2 added by Item 1 above could not be utilized (i.e., the interlocks must be kept Operable during such spiral reloads). Therefore, such plants would not have the option of simply declaring the interlocks inoperable after 7 days, and would have to halt fuel movement and re-perform the SRs. This halt is not

necessary, for the same reasons as described above (the interlocks are very reliable and problems with them that could develop between SR performances are self-identifying).


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## Revision History

### OG Revision 0 Revision Status: Closed

Revision Proposed by: Grand Gulf

Revision Description:
Original Issue

#### Owners Group Review Information

Date Originated by OG: 22-Nov-96

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 22-Nov-96

#### TSTF Review Information

TSTF Received Date: 02-Dec-96 Date Distributed for Review 16-May-97

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
NA - PWRs

TSTF Resolution: Superceeded Date: 04-Aug-97

### OG Revision 1 Revision Status: Closed

Revision Proposed by: BWROG

Revision Description:
Deleted note on Action A.2.2 and added "in core cells containing one or more fuel assemblies." Revised justification.

#### Owners Group Review Information

Date Originated by OG: 13-Aug-97

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 13-Aug-97

#### TSTF Review Information

TSTF Received Date: 01-Dec-97 Date Distributed for Review 01-Dec-97

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

## OG Revision 1 Revision Status: Closed

Change format of OR and AND in insert 3.9.1.A.

TSTF Resolution: Approved Date: 05-Feb-98

### NRC Review Information

NRC Received Date: 10-Mar-98

NRC Comments:

NRC approved on 4/10/1998. Subsequently, based on reviews of a lead plant submittal, NRC requested that new Required Action A.2.2 be modified to require that if refueling interlock(s) are inoperable during fuel movement, that all control rods be verified to be fully inserted rather than just those control rods "in core cells containing one or more fuel assemblies."

Final Resolution: NRC Requests Changes: TSTF Will Revise Final Resolution Date: 31-Oct-00

## TSTF Revision 1 Revision Status: Active Next Action: TSTF

Revision Proposed by: BWROG

Revision Description:
NRC approved on 4/10/1998. Subsequently, based on reviews of a lead plant submittal, NRC requested that new Required Action A.2.2 be modified to require that if refueling interlock(s) are inoperable during fuel movement, that all control rods be verified to be fully inserted rather than just those control rods "in core cells containing one or more fuel assemblies." In addition, Revision 1 incorporates a 31 day Frequency for the refueling interlock SR 3.9.1.1. The Description and Justification have been completely replaced in Revision 1.

### Owners Group Review Information

Date Originated by OG: 09-Nov-00

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 09-Nov-00

### TSTF Review Information

TSTF Received Date: 10-Nov-00 Date Distributed for Review

OG Review Completed: ☐ BWOG ☐ WOG ☐ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Date:

### Incorporation Into the NUREGs

File to BBS/LAN Date: TSTF Informed Date: TSTF Approved Date:

NUREG Rev Incorporated:

## Affected Technical Specifications

| | |
|---|---|
| Action 3.9.1.A | Refueling Equipment Interlocks |
| Action 3.9.1.A Bases | Refueling Equipment Interlocks |
| SR 3.9.1.1 | Refueling Equipment Interlocks |
| SR 3.9.1.1 Bases | Refueling Equipment Interlocks |

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## 3.9 REFUELING OPERATIONS

### 3.9.1 Refueling Equipment Interlocks

LCO 3.9.1 The refueling equipment interlocks shall be OPERABLE.

APPLICABILITY: During in-vessel fuel movement with equipment associated with the interlocks.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One or more required refueling equipment interlocks inoperable. | A.1 Suspend in-vessel fuel movement with equipment associated with the inoperable interlock(s). | Immediately |

Insert 3.9-1A

**Insert 3.9-1A:**

| | | | |
|---|---|---|---|
| | | OR | |
| | A.2.1 | Insert a control rod withdrawal block | Immediately |
| | | AND | |
| | A.2.2 | Verify all control rods are fully inserted. | Immediately |

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SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.9.1.1 | Perform CHANNEL FUNCTIONAL TEST on each of the following required refueling equipment interlock inputs:<br>a. All-rods-in,<br>b. Refuel platform position,<br>c. Refuel platform [fuel grapple], fuel loaded,<br>[d. Refuel platform fuel grapple fully retracted position,]<br>[e. Refuel platform frame mounted hoist, fuel loaded,]<br>[f. Refuel platform monorail mounted hoist, fuel loaded,] and<br>[g. Service platform hoist, fuel loaded.] | 7 (31) days |

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BASES

LCO (continued)

To prevent these conditions from developing, the all-rods-in, the refueling platform position, the refueling platform fuel grapple fuel loaded, the refueling platform trolley frame mounted hoist fuel loaded, the refueling platform monorail mounted hoist fuel loaded, the refueling platform fuel grapple fully retracted position, and the service platform hoist fuel loaded inputs are required to be OPERABLE. These inputs are combined in logic circuits, which provide refueling equipment or control rod blocks to prevent operations that could result in criticality during refueling operations.

APPLICABILITY

In MODE 5, a prompt reactivity excursion could cause fuel damage and subsequent release of radioactive material to the environment. The refueling equipment interlocks protect against prompt reactivity excursions during MODE 5. The interlocks are required to be OPERABLE during in-vessel fuel movement with refueling equipment associated with the interlocks.

In MODES 1, 2, 3, and 4, the reactor pressure vessel head is on, and CORE ALTERATIONS are not possible. Therefore, the refueling interlocks are not required to be OPERABLE in these MODES.

ACTIONS

A.1, A.2.1, and A.2.2

Insert B3.9-3A

With one or more of the required refueling equipment interlocks inoperable (does not include the one-rod-out interlock addressed in LCO 3.9.2), the unit must be placed in a condition in which the LCO does not apply. In-vessel fuel movement with the affected refueling equipment must be immediately suspended. This action ensures that operations are not performed with equipment that would potentially not be blocked from unacceptable operations (e.g., loading fuel into a cell with a control rod withdrawn).

Suspension of in-vessel fuel movement shall not preclude completion of movement of a component to a safe position.

Insert B3.9-3B

(continued)

**Insert B 3.9-3A**

...(Required Action A.1) or the interlocks are not needed (Required Action A.2).

Therefore, Required Action A.1 requires that...

**Insert B 3.9-3B**

Alternatively, Required Actions A.2.1 and A.2.2 require a control rod withdrawal block to be inserted, and all control rods to be subsequently verified to be fully inserted. Required Action A.2.1 ensures no control rods can be withdrawn, because a block to control rod withdrawal is in place. The withdrawal block utilized must ensure that if rod withdrawal is requested, the rod will not respond (i.e., it will remain inserted). Required Action A.2.2 is performed after placing the rod withdrawal block in effect, and provides a verification that all control rods are fully inserted. This verification that all control rods are fully inserted is in addition to the periodic verifications required by SR 3.9.3.1.

Like Required Action A.1, Required Actions A.2.1 and A.2.2 ensure unacceptable operations are blocked (e.g., loading fuel into a cell with the control rod withdrawn).

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BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

Performance of a CHANNEL FUNCTIONAL TEST demonstrates each required refueling equipment interlock will function properly when a simulated or actual signal indicative of a required condition is injected into the logic. The CHANNEL FUNCTIONAL TEST may be performed by any series of sequential, overlapping, or total channel steps so that the entire channel is tested.

(31)

The ⑦ day Frequency is based on engineering judgment and is considered adequate in view of other indications of refueling interlocks and their associated input status that are available to unit operations personnel.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.
2. FSAR, Section [7.6.1].
3. FSAR, Section [15.1.13].
4. FSAR, Section [15.1.14].

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## 3.9 REFUELING OPERATIONS

### 3.9.1 Refueling Equipment Interlocks

LCO 3.9.1 The refueling equipment interlocks shall be OPERABLE.

APPLICABILITY: During in-vessel fuel movement with equipment associated with the interlocks.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One or more required refueling equipment interlocks inoperable. | A.1 Suspend in-vessel fuel movement with equipment associated with the inoperable interlock(s). | Immediately |

Insert 3.9-1A

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.9.1.1 | Perform CHANNEL FUNCTIONAL TEST on each of the following required refueling equipment interlock inputs:<br>a. All-rods-in,<br>b. Refuel platform position, and<br>c. Refuel platform [main] hoist, fuel loaded. | 7 (31) days |

**Insert 3.9-1A:**

| | | | |
|---|---|---|---|
| | OR | | |
| | A.2.1 | Insert a control rod withdrawal block | Immediately |
| | | AND | |
| | A.2.2 | Verify all control rods are fully inserted. | Immediately |

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BASES

LCO (continued)

blocks to prevent operations that could result in criticality during refueling operations.

APPLICABILITY

In MODE 5, a prompt reactivity excursion could cause fuel damage and subsequent release of radioactive material to the environment. The refueling equipment interlocks protect against prompt reactivity excursions during MODE 5. The interlocks are only required to be OPERABLE during in-vessel fuel movement with refueling equipment associated with the interlocks.

In MODES 1, 2, 3, and 4, the reactor pressure vessel head is on, and no fuel loading activities are possible. Therefore, the refueling interlocks are not required to be OPERABLE in these MODES.

ACTIONS

A.1, A.2.1, and A.2.2

Insert B 3.9-3A

With one or more of the required refueling equipment interlocks inoperable, the unit must be placed in a condition in which the LCO does not apply. In-vessel fuel movement with the affected refueling equipment must be immediately suspended. This action ensures that operations are not performed with equipment that would potentially not be blocked from unacceptable operations (e.g., loading fuel into a cell with a control rod withdrawn). Suspension of in-vessel fuel movement shall not preclude completion of movement of a component to a safe position.

Insert B 3.9-3B

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

Performance of a CHANNEL FUNCTIONAL TEST demonstrates each required refueling equipment interlock will function properly when a simulated or actual signal indicative of a required condition is injected into the logic. The CHANNEL FUNCTIONAL TEST may be performed by any series of sequential, overlapping, or total channel steps so that the entire channel is tested.

(continued)

**Insert B 3.9-3A**

...(Required Action A.1) or the interlocks are not needed (Required Action A.2).

Therefore, Required Action A.1 requires that...

**Insert B 3.9-3B**

Alternatively, Required Actions A.2.1 and A.2.2 require a control rod withdrawal block to be inserted, and all control rods to be subsequently verified to be fully inserted. Required Action A.2.1 ensures no control rods can be withdrawn, because a block to control rod withdrawal is in place. The withdrawal block utilized must ensure that if rod withdrawal is requested, the rod will not respond (i.e., it will remain inserted). Required Action A.2.2 is performed after placing the rod withdrawal block in effect, and provides a verification that all control rods are fully inserted. This verification that all control rods are fully inserted is in addition to the periodic verifications required by SR 3.9.3.1.

Like Required Action A.1, Required Actions A.2.1 and A.2.2 ensure unacceptable operations are blocked (e.g., loading fuel into a cell with the control rod withdrawn).

TSTF-225, Rev 1

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1 (continued)

(31) The 7 day Frequency is based on engineering judgment and is considered adequate in view of other indications of refueling interlocks and their associated input status that are available to unit operations personnel.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.
2. FSAR, Section [7.6.1.1].
3. FSAR, Section [15.4.1.1].