Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-18-073

May 11, 2018

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Units 1 and 2
Facility Operating License Nos. NPF-90 and NPF-96
NRC Docket Nos. 50-390 and NRC Docket No. 50-391

Subject: **Supplemental Information to Correct an Error Related to the Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, "Clarification of Rod Position Requirements" (WBN-TS-16-025) (CAC Nos. MF8912 and MF8913)**

References:

1. TVA letter to NRC, CNL-16-148, "Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, 'Clarification of Rod Position Requirements' (WBN-TS-16-025)," dated November 23, 2016 (ML16335A179)

2. Technical Specification Task Force (TSTF) letter to NRC, "TSTF Comments on Draft Model Safety Evaluation of Traveler TSTF-547, Revision 0, 'Clarification of Rod Position Requirements,' and Transmittal of TSTF-547, Revision 1," dated December 31, 2015 (ML15365A610)

3. NRC letter to TSTF, "Final Safety Evaluation of Technical Specifications Task Force Traveler TSTF-547, Revision 1, 'Clarification of Rod Positon Requirements' (TAC No. MF3570)," dated March 4, 2016 (ML16012A130 and ML15328A350)

4. TVA letter to NRC, CNL-17-123, "Supplement to Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, 'Clarification of Rod Position Requirements' (WBN-TS-16-025)," dated September 29, 2017 (ML17272A955)

5. TVA letter to NRC, CNL-17-143, “Additional Supplement to Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, ‘Clarification of Rod Position Requirements’ (WBN-TS-16-025),” dated November 16, 2017 (ML17321A033)

6. TVA letter to NRC, CNL-17-149, “Revised Additional Supplement to Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, ‘Clarification of Rod Position Requirements’ (WBN-TS-16-025),” dated December 27, 2017 (ML1736A052)

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to the Technical Specifications (TS) for the Watts Bar Nuclear Plant (WBN), Units 1 and 2. The proposed amendment revises the requirements on control and shutdown rods, and rod and bank position indication in accordance with Technical Specification Task Force (TSTF)-547, Revision 1, “Clarification of Rod Position Requirements” (References 2 and 3). In Reference 4, TVA submitted a supplement to the license amendment request (LAR) to revise WBN Units 1 and 2 TS 3.1.6 and 3.1.7 to add the plant specific number of steps for control rod movement for consistency with WBN Units 1 and 2 SR 3.1.5.2. In Reference 5, TVA submitted an additional supplement to justify changes to the WBN Units 1 and 2 TS that were not specifically identified in TSTF-547, Revision 1. In Reference 6, TVA submitted an additional supplement to add the justification for TS changes that were not addressed in Reference 5.

Subsequent to the submittal of Reference 5, TVA was informed by the Pressurized Water Reactor Owner’s Group (PWROG) of a generic error in TSTF-547, Revision 1. The TSTF-547, Revision 1 added Required Action A.2.2 to Standard TS 3.1.7, "Rod Position Indication," (WBN Units 1 and 2 TS 3.1.8) 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" connector with other Required Actions that do not include this requirement. For example, proposed WBN Units 1 and 2 TS 3.1.8, Required Action A.1 requires verification every eight hours of the position of the rods with an inoperable RPI indirectly by using either movable incore detectors (WBN Units 1 TS 3.1.8) or the power distribution monitoring system (PDMS) (WBN Units 1 and 2 TS 3.1.8).

WBN Units 1 and 2 Limiting Condition for Operation (LCO) 3.0.4a states:

> “When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:
>
> 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;”

Therefore, Mode 2 could be entered with an inoperable RPI using the allowance provided by LCO 3.0.4a by entering either Required Actions A.1 or A.3 to WBN Units 1 and 2 TS 3.1.8.

Thus, the allowance provided by LCO 3.0.4a has the effect of making the newly added Required Action A.2.2 irrelevant. Accordingly, TVA is supplementing the LAR to delete proposed WBN Units 1 and 2 TS 3.1.8, Required Action A.2.2 and renumber Required Action A.2.1 as A.2. Other minor changes to the Bases for WBN Units 1 and 2 TS 3.1.8 are being made as described in Section 6.0 to the Enclosure.

The enclosure to this submittal provides additional information supporting this supplement Attachments 1 and 2 to the enclosure provide the existing respective WBN Unit 1 and Unit 2 TS 3.1.8 pages marked up to show the proposed changes . Attachments 3 and 4 to the enclosure provide the revised (clean) respective WBN Unit 1 and Unit 2 TS 3.1.8 pages. Attachments 5 and 6 to the enclosure provide the existing respective WBN Unit 1 and Unit 2 TS 3.1.8 Bases pages marked to show the proposed changes for information only. Attachments 7 and 8 to the enclosure provide the revised (clean) respective WBN Unit 1 and Unit 2 TS 3.1.8 Bases pages for information only.

Attachments 1 through 8 to the enclosure supersede the changes to WBN Unit 1 and Unit 2 TS 3.1.8 provided in Attachments 2 through 5 of Reference 1 and Attachments 1 through 4 of Reference 4.

TVA is working with the TSTF to address the generic error in TSTF-547, Revision 1.

This response does not change the no significant hazards considerations determination contained in Reference 1. There are no new commitments associated with this submittal. The commitment in Attachment 2 to Reference 5 remains valid. Please address any questions regarding this request to Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 11th day of May 2018.

Respectfully,

for

J. W. Shea
Vice President, Nuclear Regulatory Affairs and Support Services

Enclosure: Supplemental Information to Correct an Error Related to the Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, "Clarification of Rod Position Requirements" (WBN-TS-16-025) (CAC Nos. MF8912 and MF8913

cc (see Page 4):

cc (Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Watts Bar Nuclear Plant
NRC Project Manager – Watts Bar Nuclear Plant
Director, Division of Radiological Health - Tennessee State Department of Environment and Conservation (w/o attachments)

Enclosure

Subject: **Supplemental Information to Correct an Error Related to the Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, "Clarification of Rod Position Requirements" (WBN-TS-16-025) (CAC Nos. MF8912 and MF8913)**

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Supplemental Information to Correct an Error Related to the Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, "Clarification of Rod Position Requirements" (WBN-TS-16-025)

1.0 Introduction

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to the Technical Specifications (TS) for the Watts Bar Nuclear Plant (WBN), Units 1 and 2. The proposed amendment revises the requirements on control and shutdown rods, and rod and bank position indication in accordance with Technical Specification Task Force (TSTF)-547, Revision 1, "Clarification of Rod Position Requirements" (References 2 and 3). In Reference 4, TVA submitted a supplement to the license amendment request (LAR) to revise WBN Units 1 and 2 TS 3.1.6 and 3.1.7 to add the plant specific number of steps for control rod movement for consistency with WBN Units 1 and 2 SR 3.1.5.2. In Reference 5, TVA submitted an additional supplement to justify changes to the WBN Units 1 and 2 TS that were not specifically identified in TSTF-547, Revision 1. In Reference 6, TVA submitted an additional supplement to add the justification for TS changes that were not addressed in Reference 5.

Subsequent to the submittal of Reference 5, TVA was informed by the Pressurized Water Reactor Owner's Group (PWROG) of a generic error in TSTF-547, Revision 1. TSTF-547, Revision 1 added Required Action A.2.2 to Standard TS (STS) 3.1.7, "Rod Position Indication," (WBN Units 1 and 2 TS 3.1.8) 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" connector with other Required Actions that do not include this requirement. For example, proposed WBN Units 1 and 2 TS 3.1.8, Required Action A.1 requires verification every eight hours of the position of the rods with an inoperable RPI indirectly by using either the movable incore detectors (WBN Units 1 TS 3.1.8) or the power distribution monitoring system (PDMS) (WBN Units 1 and 2 TS 3.1.8).

WBN Units 1 and 2 Limiting Condition for Operation (LCO) 3.0.4a states:

> "When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:
>
> 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;"

Therefore, Mode 2 could be entered with an inoperable RPI using the allowance provided by LCO 3.0.4a by entering either Required Actions A.1 or A.3 to WBN Units 1 and 2 TS 3.1.8. Thus, the allowance provided by LCO 3.0.4a has the effect of making the newly added Required Action A.2.2 irrelevant. Accordingly, TVA is supplementing this amendment request to delete proposed WBN Units 1 and 2 TS 3.1.8, Required Action A.2.2 and renumber Required Action A.2.1 as A.2 as shown in Figures 1 and 2 to this enclosure.

Enclosure

Figure 1 - Proposed Change to WBN 1 TS 3.1.8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 Rod Position Indication

LCO 3.1.8 The ~~Analog~~ Rod Position Indication (~~A~~RPI) System and the Demand Position Indication System shall be OPERABLE.

---------- NOTE ----------
Individual RPIs are not required to be OPERABLE for 1 hour following movement of the associated rods.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each inoperable ~~od position indicator per group~~RPI and each demand position indicator ~~per bank~~.

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~NOTE~~ ~~Rod position monitoring by Required Actions A.2.1 and A.2.2 may only be applied to one inoperable ARPI and shall only be allowed: (1) until the end of the current cycle, or (2) until an entry into MODE 5 of sufficient duration, whichever occurs first, when the repair of the inoperable ARPI can safely be performed. Required Actions A.2.1, A.2.2 and A.2.3 shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable ARPI could have safely been performed.~~	A.1 Verify the position of the rods with inoperable ~~position indicators~~RPI indirectly by using either the movable incore detectors or the PDMS.	Once per 8 hours
	OR	
	A.2.1 Verify the position of the rod~~s~~ with the inoperable ~~position indicator~~RPI indirectly by using either the movable incore detectors or the PDMS. This Required Action is being renumbered as A.2	8 hours AND Once every 31 ~~days~~ EFPD thereafter AND
A. One ~~A~~RPI per group inoperable ~~for~~ in one or more groups.	~~AND~~	8 hours ~~, if rod control system parameters indicate~~after discovery of each unintended rod movement AND (continued)

Enclosure

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	~~A.2.2 Review the parameters of the rod control system for indications of unintended rod movement for the rod with an inoperable position indicator.~~	~~16 hours~~8 hours after each movement of rod with inoperable RPI > 12 steps
	~~AND~~	~~AND~~
	~~A.2.3 Verify the position of the rod with an inoperable position indicator by using either the movable incore detectors or the PDMS.~~	Prior to THERMAL POWER exceeding 50% RTP ~~AND~~ 8 hours after reaching RTP ~~AND~~ ~~Once per 8 hours thereafter~~ ~~8 hours, if the rod with an inoperable position indicator is moved greater than 12 steps.~~
	this new proposed action is being deleted AND A.2.2 Restore inoperable RPI to OPERABLE status.	Prior to entering MODE 2 from MODE 3. ~~AND~~ ~~Prior to increasing THERMAL POWER above 50% RTP and within 8 hours of reaching 100% RTP~~
	OR A.3 Reduce THERMAL POWER to ~~≤less than or equal to~~ 50% RTP.	8 hours
		(continued)

Enclosure

Figure 2 - Proposed Change to WBN 2 TS 3.1.8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 Rod Position Indication

LCO 3.1.8 The Rod Position Indication (RPI) System and the Demand Position Indication System shall be OPERABLE.

---------- NOTE ----------
Individual RPIs are not required to be OPERABLE for 1 hour following movement of the associated rods.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each inoperable ~~rod position indicator~~RPI ~~per group~~ and each demand position indicator ~~per bank~~.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RPI per group inoperable in one or more groups.~~----------NOTE----------~~ ~~Rod position monitoring by Required Actions A.2.1 and A.2.2 may only be applied to one inoperable RPI and shall only be allowed: (1) until the end of the current cycle, or (2) until an entry into MODE 5 of sufficient duration, whichever occurs first, when the repair of the inoperable RPI can safely be performed. Required Actions A.2.1, A.2.2 and A.2.3 shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable RPI could have safely been performed.~~ ----------	A.1 Verify the position of the rods with inoperable ~~position indicators~~RPI indirectly by using the PDMS. OR A.2.1 Verify the position of the rods with the inoperable ~~position indicator~~RPI indirectly by using the PDMS. This Required Action is being renumbered as A.2	Once per 8 hours 8 hours AND Once every 31 ~~days~~ EFPD thereafter AND 8 hours~~, if rod control system parameters indicate~~ after discovery of each unintended rod movement AND

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)			8 hours after each movement of rod with inoperable RPI > 12 steps AND Prior to THERMAL POWER exceeding 50% RTP AND 8 hours after reaching RTP
		AND	
	A.2.2	Restore inoperable RPI to OPERABLE status.	Prior to entering MODE 2 from MODE 3
	OR		
	A.3	Reduce THERMAL POWER to ≤ 50% RTP	8 hours
B. More than one RPI per group inoperable in one or more groups.	B.1	Place the control rods under manual control.	Immediately
	AND		
	B.2	Restore inoperable RPIs to OPERABLE status such that a maximum of one RPI per group is inoperable.	24 hours

this new proposed action is being deleted

(continued)

A detailed description of this issue and appropriate justification for deleting proposed Required Action A.2.2 is provided in this enclosure.

This supplement also makes the following changes to the proposed revision to the Bases for WBN Units 1 and 2 TS 3.1.8 in References 1 and 4:

1. For consistency with TSTF-547, Revision 1, in the Bases for LCO 3.1.8 on page B3.1-50 for WBN Units 1 and 2, the proposed verbiage that states “The SR of the LCO is modified by a Note which states it is not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. If a rod is known to not be within 12 steps of the group demand position, the Actions of LCO 3.1.5 provide appropriate Actions. Otherwise,” has been deleted. This change is redundant to the proposed last paragraph for WBN Units 1 and 2 SR 3.1.8.1 in References 1 and 4 that is also consistent with TSTF-547, Revision 1.
2. The first sentence for item c. in the Bases for Required Actions A.1 and A.2 (as renumbered in this supplement) has been modified for consistency with the Completion Time for Required Action A.2 (as renumbered in this supplement).
3. The Bases for Required Action A.3 in References 1 and 4, has been modified to reference proposed renumbered Required Action A.2 in addition to A.1.

The above changes to the proposed revision to the Bases for WBN Units 1 and 2 TS 3.1.8 for items 2 and 3 above are a deviation from TSTF-547, Revision 1 and are discussed further in Section 6.0 to this enclosure.

Attachments 1 and 2 to this enclosure provide the existing respective WBN Unit 1 and Unit 2 TS 3.1.8 pages marked up to show the proposed changes . Attachments 3 and 4 to this enclosure provide the revised (clean) respective WBN Unit 1 and Unit 2 TS 3.1.8 pages. Attachments 5 and 6 to this enclosure provide the existing respective WBN Unit 1 and Unit 2 TS 3.1.8 Bases pages marked to show the proposed changes for information only. Attachments 7 and 8 to this enclosure provide the revised (clean) respective WBN Unit 1 and Unit 2 TS 3.1.8 Bases pages for information only.

Attachments 1 through 8 to the enclosure supersede the changes to WBN Unit 1 and Unit 2 TS 3.1.8 provided in Attachments 2 through 5 of Reference 1 and Attachments 1 through 4 of Reference 4.

TVA is working with the TSTF to address the generic error in TSTF-547, Revision 1.

2.0 TSTF-547, Revision 1 Background and Initial Proposed TS Change

TSTF-547, Revision 1 (Reference 2), which was approved by the Nuclear Regulatory Commission (NRC) in Reference 3, makes improvements to STS 3.1.4, "Rod Group Alignment Limits" (WBN Units 1 and 2 TS 3.1.5), STS 3.1.5, "Shutdown Bank Insertion Limits" (WBN Units 1 and 2 TS 3.1.6), STS 3.1.6, "Control Bank Insertion Limits" (WBN Units 1 and 2 TS 3.1.7), and STS 3.1.7, "Rod Position Indication" (WBN Units 1 and 2 TS 3.1.8)

WBN Units 1 and 2 TS 3.1.8 Required Action A.1 (as proposed in References 1 and 4), requires the verification of the position of an inoperable RPI every eight hours by using

either the movable incore detectors (WBN Unit 1 TS 3.1.8) or the PDMS (WBN Units 1 and 2 TS 3.1.8). In accordance with References 2 and 3, the LAR in Reference 1, as supplemented by Reference 4, revised Required Actions A.2.1 and A.2.2 to WBN Units 1 and 2 TS 3.1.8 as an alternative to the eight-hour monitoring in the existing WBN Units 1 and 2 TS 3.1.8 Condition A Required Actions. Proposed Required TS 3.1.8 Actions A.2.1 and A.2.2 are joined to the existing Required Actions with a logical "OR" connector to the existing actions; and the existing Required Action A.2 [i.e., reduce thermal power to less than or equal to 50 percent (%) rated thermal power (RTP) within eight hours] was relabeled as A.3.

Proposed Required Action A.2.1 requires verification of the position of rods associated with an inoperable RPI and includes six new Completion Times as shown in Attachments 1 through 4. In addition to performing the proposed WBN Units 1 and 2 TS 3.1.8 Required Action A.2.1, proposed TS 3.1.8 Action A.2.2 also has to be performed. WBN Units 1 and 2 TS 3.1.8 Action A.2.2 requires the inoperable RPI to be restored to operable status prior to entering Mode 2 from Mode 3. However if WBN Units 1 or 2 were entering Mode 2 from Mode 3 with an inoperable RPI, the proposed TS changes associated with References 1 and 4 (in accordance with TSTF-547, Revision 1) would allow the plant to enter the alternative monitoring scheme of either Required Actions A.1 or A.3, thus bypassing Required Action A.2.2.

3.0 LCO 3.0.4 Background and Application

WBN Units 1 and 2 LCO 3.0.4 provides requirements for entering the Applicability of a specification with the LCO not met. WBN Units 1 and 2 LCO 3.0.4 states:

> "When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:
>
> 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.
>
> This Specification shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit."

The Bases for LCO 3.0.4 state:

> "LCO 3.0.4 establishes limitations on changes in MODES or other specified conditions in the Applicability when an LCO is not met. It allows placing the unit in a MODE or other specified condition stated in that Applicability (e.g., the Applicability desired to be entered) when unit conditions are such that the requirements of the LCO would not be met, in accordance with either LCO 3.0.4a, LCO 3.0.4.b, or LCO 3.0.4.c.

> LCO 3.0.4a allows entry into a MODE or other specified condition in the Applicability with the LCO not met 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. Compliance with Required 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 in accordance with the provisions of the Required Actions."

For example, the Applicability of WBN Units TS 3.1.8 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. TS 3.1.8, Required Actions A.1, A.2.1, and A.3 satisfy LCO 3.0.4a, in that they permit continued operation in the Applicability for an unlimited period of time. Therefore, the plant could enter Modes 1 and 2 with an inoperable RPI.

Enclosure

4.0 Use of Logical Connectors

The following information addresses the use of logical connectors. Specific examples of the use of logical connectors are provided in WBN Units 1 and 2 TS 1.2, "Logical Connectors," Example 1.2-2, which is similar to the Required Actions in WBN Units 1 and 2 TS 3.1.8.

EXAMPLES (continued)

EXAMPLE 1.2-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Trip . . . OR A.2.1 Verify . . . AND A.2.2.1 Reduce . . . OR A.2.2.2 Perform . . . OR 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.

As noted in the previous example, “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 WBN Units 1 and 2 TS 3.1.8, Required Actions A.1, A.2, and A.3 are alternative choices and any of these three Actions may be chosen.

5.0 Justification for Deleting WBN Units 1 and 2 TS 3.1.8, Required Action A.2.2

If an RPI is inoperable in Modes 1 or 2 and the plant subsequently enters Mode 3, WBN Units 1 and 2 TS 3.1.8 is no longer applicable. If WBN desired to reenter Modes 1 or 2 while the RPI is inoperable, LCO 3.0.4 must be applied. In accordance with LCO 3.0.4a, Mode 2 could be entered with an inoperable RPI if the actions to be entered permit continued operation for an unlimited period of time.

Therefore, if WBN is in Mode 3 and desires to enter Mode 2 with an inoperable RPI, the plant could utilize LCO 3.0.4a and enter WBN Units 1 and 2 TS 3.1.8, Required Action A.1 or A.3. 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, WBN Units 1 and 2 TS 3.1.8, Required Action A.2.2, "Restore inoperable RPIs to OPERABLE status," with a Completion Time of "Prior to entering MODE 2 from MODE 3," will never be limiting or implemented.

In addition, WBN Units 1 and 2 TS 3.1.8, Required Action A.2.2 conflicts with WBN Units 1 and 2 LCO 3.0.2. LCO 3.0.2 that 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 an RPI becomes inoperable (with either WBN Units 1 or 2 in Modes 1 or 2) and the unit elects to enter TS 3.1.8, Required Action A.2.1; then subsequently enters Mode 3, the Applicability of TS 3.1.8 is exited and the associated Required Actions no longer apply (i.e., Required Action A.2.2 becomes not applicable). In order to invoke the "unless otherwise stated" provision of LCO 3.0.2 to impose Required Action A.2.2 while in Mode 3 (i.e., restore inoperable RPIs to operable status prior to entering Mode 2 from Mode 3), WBN Units 1 and 2 TS 3.1.8 TS 3.1.8 Condition A would need to be modified by a Note that states, "Required Action A.2.2 shall be completed whenever this Condition is entered," (similar to the Note in WBN Units 1 and 2 TS 3.4.3, "RCS Pressure and Temperature (P/T) Limits," Condition A). Without that Note, Required Action A.2.2 is not applicable until after Mode 2 is entered, by which time the Required Action is irrelevant.

It is noted that the restriction in WBN Units 1 and 2 TS 3.1.8 Required Action A.2.2 (i.e. restore inoperable RPIs to operable status prior to entering Mode 2 from Mode 3) is not needed to ensure plant safety. As previously noted in Section 3.0, above, the Bases for LCO 3.0.4 states:

> “Compliance with Required 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 in accordance with the provisions of the Required Actions."

Therefore, it appears that the TS changes in TSTF-547, Revision 1 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 those one-time changes; however, Required Action A.2.2 was inappropriately included in TSTF-547 and should be deleted.

6.0 Justification for TSTF-547, Revision 1, Deviation for WBN Units 1 and 2 TS 3.1.8, Bases

As noted in Section 1.0 to this enclosure, this section discusses the deviations from TSTF-547, for the following proposed changes to the WBN Units 1 and 2 TS 3.1.8 Bases:

- The first sentence in proposed item c. to the Bases for WBN Units 1 and 2 TS 3.1.8 Required Actions A.1 and A.2 (as renumbered in this supplement) in References 1 and 4 has been revised from "Verification within 8 hours if rod control system parameters indicate unintended rod movement." to "Verification within 8 hours after discovery of each unintended rod movement." This proposed revision is consistent with the Completion Time of proposed Required Action A.2 (as renumbered in this supplement) that states "8 hours after discovery of each unintended rod movement." Therefore, this is an acceptable deviation from TSTF-547, Revision 1.
- The proposed revision to the Bases for WBN Units 1 and 2 TS 3.1.8 Required Action A.3 in References 1 and 4, has been modified to reference proposed renumbered Required Action A.2 in addition to Required Action A.1. Similar to Required Action A.1, proposed renumbered Required Action A.2 also verifies the position of the rods with the inoperable RPI indirectly by using either the movable incore detectors (WBN Unit 1 TS 3.1.8) or the PDMS (WBN Units 1 and 2 TS 3.1.8). Therefore, this is an acceptable deviation from TSTF-547, Revision 1.

7.0 Conclusions

Based on the above discussion, TVA is deleting WBN Units 1 and 2 TS 3.1.8, Required Action A.2.2 as proposed in References 1 and 4 as reflected in Attachments 1 through 4 of this enclosure.

8.0 References

1. TVA letter to NRC, CNL-16-148, "Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, 'Clarification of Rod Position Requirements' (WBN-TS-16-025)," dated November 23, 2016 (ML16335A179)
2. Technical Specification Task Force (TSTF) letter to NRC, "TSTF Comments on Draft Model Safety Evaluation of Traveler TSTF-547, Revision 0, 'Clarification of Rod Position Requirements,' and Transmittal of TSTF-547, Revision 1," dated December 31, 2015 (ML15365A610)
3. NRC letter to TSTF, "Final Safety Evaluation of Technical Specifications Task Force Traveler TSTF-547, Revision 1, 'Clarification of Rod Positon Requirements' (TAC No. MF3570)," dated March 4, 2016 (ML16012A130 and ML15328A350)
4. TVA letter to NRC, CNL-17-123, "Supplement to Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, 'Clarification of Rod Position Requirements' (WBN-TS-16-025)," dated September 29, 2017 (ML17272A955)
5. TVA letter to NRC, CNL-17-143, "Additional Supplement to Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, 'Clarification of Rod Position Requirements' (WBN-TS-16-025)," dated November 16, 2017 (ML17321A033)
6. TVA letter to NRC, CNL-17-149, "Revised Additional Supplement to Application to Revise Technical Specifications to Adopt TSTF-547, Revision 1, 'Clarification of Rod Position Requirements' (WBN-TS-16-025)," dated December 27, 2017 (ML1736A052)

Enclosure

ATTACHMENT 2 - PROPOSED TS CHANGES (MARK-UP) FOR WBN UNIT 2 TS 3.1.8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 Rod Position Indication

LCO 3.1.8 The Rod Position Indication (RPI) System and the Demand Position Indication System shall be OPERABLE.

---------- NOTE ----------
Individual RPIs are not required to be OPERABLE for 1 hour following movement of the associated rods.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each inoperable ~~rod position indicator~~RPI ~~per group~~ and each demand position indicator ~~per bank~~.

CONDITION	REQUIRED ACTION		COMPLETION TIME
~~----------NOTE----------~~ ~~Rod position monitoring by Required Actions A.2.1 and A.2.2 may only be applied to one inoperable RPI and shall only be allowed: (1) until the end of the current cycle, or (2) until an entry into MODE 5 of sufficient duration, whichever occurs first, when the repair of the inoperable RPI can safely be performed. Required Actions A.2.1, A.2.2 and A.2.3 shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable RPI could have safely been performed.~~ ~~----------~~ A. One RPI per group inoperable in one or more groups	A.1 <u>OR</u> A.2~~.1~~	Verify the position of the rods with inoperable ~~position indicators~~RPI indirectly by using the PDMS. Verify the position of the rods with the inoperable ~~position indicator~~RPI indirectly by using the PDMS.	Once per 8 hours 8 hours <u>AND</u> Once every 31 ~~days~~ EFPD thereafter <u>AND</u> 8 hours~~, if rod control system parameters indicate~~ after discovery of each unintended rod movement

		AND (continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	~~A.2.2~~ ~~Review the parameters of the rod control system for indications of unintended rod movement for the rod with an inoperable position indicator.~~ ~~AND~~ ~~A.2.3~~ ~~Verify the position of the rod with an inoperable position indicator by using the PDMS.~~ OR A.3 Reduce THERMAL POWER to ~~≤less than or equal to~~ 50% RTP	~~168~~ hours after each movement of rod with inoperable RPI > 12 steps AND Prior to THERMAL POWER exceeding 50% RTP AND 8 hours after reaching RTP ~~AND~~ ~~Once per 8 hours thereafter~~ ~~8 hours, if the rod with an inoperable position indicator is moved greater than 12 steps.~~ ~~AND~~ ~~Prior to increasing THERMAL POWER above 50% RTP and within 8 hours of reaching 100% RTP~~ 8 hours

B. More than one RPI per group inoperable in one or more groups.	B.1	Place the control rods under manual control.	Immediately
	AND		
	B.2	Restore inoperable RPIs to OPERABLE status such that a maximum of one RPI per group is inoperable.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
~~A.~~ C. One or more ~~rods with~~RPI inoperable ~~position indicators have~~in one or more groups and associated rod has been moved >~~in excess of~~ 24 steps in one direction since the last determination of the rod's position.	~~B~~C.1	Verify the position of the rods with inoperable ~~position indicators~~RPIs indirectly by using the PDMS.	4 hours
	OR		
	~~B~~C.2	Reduce THERMAL POWER to ≤~~less than or equal to~~ 50% RTP.	8 hours
~~B.~~ D. One or more demand position indicators per bank inoperable ~~for~~ in one or more banks.	~~C~~D.1.1	Verify by administrative means all RPIs for the affected banks are OPERABLE.	Once per 8 hours
	AND		
	~~C~~D.1.2	Verify the most withdrawn rod and the least withdrawn rod of the affected banks are ≤ 12 ~~less than or equal to 12~~ steps apart.	Once per 8 hours
	OR		
	~~C~~D.2	Reduce THERMAL POWER to ≤~~less than or equal to~~ 50% RTP.	8 hours
~~C.~~ E. Required Action and associated Completion Time not met.	~~D~~E.1	Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.8.1	---------- NOTE ---------- Not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. ---------- Verify each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel.	~~18 months~~Once prior to criticality after each removal of the reactor head

Enclosure

ATTACHMENT 3 - REVISED TS PAGES (FINAL TYPED)
FOR WBN UNIT 1 TS 3.1.8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 Rod Position Indication

LCO 3.1.8 The Rod Position Indication (RPI) System and the Demand Position Indication System shall be OPERABLE.

---------- NOTE ----------
Individual RPIs are not required to be OPERABLE for 1 hour following movement of the associated rods.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each inoperable RPI and each demand position indicator.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RPI per group inoperable in one or more groups.	A.1 Verify the position of the rods with inoperable RPI indirectly by using either the movable incore detectors or the PDMS.	Once per 8 hours
	OR	
	A.2 Verify the position of the rods with the inoperable RPI indirectly by using either the movable incore detectors or the PDMS.	8 hours AND Once every 31 EFPD thereafter AND 8 hours after discovery of each unintended rod movement AND (continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)		8 hours after each movement of rod with inoperable RPI > 12 steps AND Prior to THERMAL POWER exceeding 50% RTP AND 8 hours after reaching RTP
	OR	
	A.3 Reduce THERMAL POWER to ≤ 50% RTP.	8 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. More than one RPI per group inoperable in one or more groups.	B.1 Place the control rods under manual control. AND B.2 Restore inoperable RPIs to OPERABLE status such that a maximum of one RPI per group is inoperable.	Immediately 24 hours
C. One or more RPI inoperable in one or more groups and associated rod has been moved > 24 steps in one direction since the last determination of the rod's position.	C.1 Verify the position of the rods with inoperable RPIs indirectly by using either the movable incore detectors or the PDMS. OR C.2 Reduce THERMAL POWER to ≤ 50% RTP.	4 hours 8 hours
D. One or more demand position indicators per bank inoperable in one or more banks.	D.1.1 Verify by administrative means all RPIs for the affected banks are OPERABLE. AND D.1.2 Verify the most withdrawn rod and the least withdrawn rod of the affected banks are ≤ 12 steps apart. OR D.2 Reduce THERMAL POWER to ≤ 50% RTP.	Once per 8 hours Once per 8 hours 8 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time not met.	E.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.8.1	---------- NOTE ---------- Not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. ---------- Verify each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel.	Once prior to criticality after each removal of the reactor head.

Enclosure

ATTACHMENT 4 - REVISED TS PAGES (FINAL TYPED)
FOR WBN UNIT 2 TS 3.1.8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.8 Rod Position Indication

LCO 3.1.8 The Rod Position Indication (RPI) System and the Demand Position Indication System shall be OPERABLE.

---------- NOTE ----------
Individual RPIs are not required to be OPERABLE for 1 hour following movement of the associated rods.

APPLICABILITY: MODES 1 and 2.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each inoperable RPI and each demand position indicator.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One RPI per group inoperable in one or more groups	A.1	Verify the position of the rods with inoperable RPI indirectly by using the PDMS.	Once per 8 hours
	OR		
	A.2	Verify the position of the rods with the inoperable RPI indirectly by using the PDMS.	8 hours AND Once every 31 EFPD thereafter AND 8 hours after discovery of each unintended rod movement AND (continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)			8 hours after each movement of rod with inoperable RPI > 12 steps AND Prior to THERMAL POWER exceeding 50% RTP AND 8 hours after reaching RTP
	OR		
	A.3	Reduce THERMAL POWER to ≤ 50% RTP	8 hours
B. More than one RPI per group inoperable in one or more groups.	B.1	Place the control rods under manual control.	Immediately
	AND		
	B.2	Restore inoperable RPIs to OPERABLE status such that a maximum of one RPI per group is inoperable.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One or more RPI inoperable in one or more groups and associated rod has been moved > 24 steps in one direction since the last determination of the rod's position.	C.1	Verify the position of the rods with inoperable RPIs indirectly by using the PDMS.	4 hours
	OR		
	C.2	Reduce THERMAL POWER to ≤ 50% RTP.	8 hours
D. One or more demand position indicators per bank inoperable in one or more banks.	D.1.1	Verify by administrative means all RPIs for the affected banks are OPERABLE.	Once per 8 hours
	AND		
	D.1.2	Verify the most withdrawn rod and the least withdrawn rod of the affected banks are ≤ 12 steps apart.	Once per 8 hours
	OR		
	D.2	Reduce THERMAL POWER to ≤ 50% RTP.	8 hours
E. Required Action and associated Completion Time not met.	E.1	Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.8.1	---------- NOTE ---------- Not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. ---------- Verify each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel.	Once prior to criticality after each removal of the reactor head

Enclosure

**ATTACHMENT 5 - PROPOSED TS BASES CHANGES (MARK-UP)
FOR WBN UNIT 1 TS 3.1.8 (FOR INFORMATION ONLY)**

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.8 Rod Position Indication

BASES

BACKGROUND

According to GDC 13 (Ref. 1), instrumentation to monitor variables and systems over their operating ranges during normal operation, anticipated operational occurrences, and accident conditions must be OPERABLE. LCO 3.1.8 is required to ensure OPERABILITY of the control rod position indicators to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

The OPERABILITY, including position indication, of the shutdown and control rods is an initial assumption in all safety analyses that assume rod insertion upon reactor trip. Maximum rod misalignment is an initial assumption in the safety analysis that directly affects core power distributions and assumptions of available SDM. Rod position indication is required to assess OPERABILITY and misalignment.

Mechanical or electrical failures may cause a control rod to become inoperable or to become misaligned from its group. Control rod inoperability or misalignment may cause increased power peaking, due to the asymmetric reactivity distribution and a reduction in the total available rod worth for reactor shutdown. Therefore, control rod alignment and OPERABILITY are related to core operation in design power peaking limits and the core design requirement of a minimum SDM.

Limits on control rod alignment and OPERABILITY have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved.

Rod cluster control assemblies (RCCAs), or rods, are moved out of the core (up or withdrawn) or into the core (down or inserted) by their control rod drive mechanisms. 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 (Shutdown Banks C and D have only one group each).

The axial position of shutdown rods and control rods are determined by two separate and independent systems: the Bank Demand Position Indication System (commonly called group step counters) and the analog ~~Analog~~ Rod Position Indication (~~A~~RPI) System.

(continued)

BASES

BACKGROUND (continued)

The Bank Demand Position Indication System counts the pulses from the Rod Control System that move 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 highly precise (~~±~~± 1 step or ~~±~~± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The ~~A~~RPI System provides an accurate indication of actual control 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 with a center to center distance of 3.75 inches, which is 6 steps. The normal indication accuracy of the ~~A~~RPI System is ~~±~~± 6 steps (~~±~~± 3.75 inches), and the maximum uncertainty is ~~±~~± 12 steps (~~±~~± 7.5 inches). With an indicated deviation of 12 steps between the group step counter and ~~A~~RPI, the maximum deviation between actual rod position and the demand position could be 24 steps, or 15 inches.

APPLICABLE SAFETY ANALYSES

Control and shutdown rod position accuracy is essential during power operation. Power peaking, ejected rod worth, or SDM limits may be violated in the event of a Design Basis Accident (Ref. 2 through 12), with control or shutdown rods operating outside their limits undetected. Therefore, the acceptance criteria for rod position indication is that rod positions must be known with sufficient accuracy in order to verify the core is operating within the group sequence, overlap, design peaking limits, ejected rod worth, and with minimum SDM (LCO 3.1.6, "Shutdown Bank Insertion Limits," and LCO 3.1.7, "Control Bank Insertion Limits"). The rod positions must also be known in order to verify the alignment limits are preserved (LCO 3.1.5, "Rod Group Alignment Limits"). Control rod positions are continuously monitored to provide operators with information that ensures the plant is operating within the bounds of the accident analysis assumptions.

The control rod position indicator channels satisfy Criterion 2 of ~~the NRC Policy Statement~~10 CFR 50.36(c)(2)(ii). The control rod position indicators monitor control rod position, which is an initial condition of the accident.

LCO

LCO 3.1.8 specifies that the ~~A~~RPI System and the Bank Demand Position Indication System be OPERABLE for all control rods. For the control rod position indicators to be OPERABLE requires meeting the SR of the LCO (when required) and the following:

(continued)

BASES

LCO (continued)

a. The ~~A~~RPI System indicates within 12 steps of the group step counter demand position as required by LCO 3.1.5, "Rod Group Alignment Limits;"

b. For the ~~A~~RPI System there are no failed coils; and

c. The Bank Demand Indication System has been calibrated either in the fully inserted position or to the ~~A~~RPI System.

The 12 step agreement limit between the Bank Demand Position Indication System and the ~~A~~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.

A deviation of less than the allowable limit, given in LCO 3.1.5, in position indication for a single control rod, ensures high confidence that the position uncertainty of the corresponding control rod group is within the assumed values used in the analysis (that specified control rod group insertion limits).

These requirements ensure that control rod position indication during power operation and PHYSICS TESTS is accurate, and that design assumptions are not challenged. OPERABILITY of the position indicator channels ensures that inoperable, misaligned, or mispositioned control rods can be detected. –Therefore, power peaking, ejected rod worth, and SDM can be controlled within acceptable limits.

The LCO is modified by a Note stating that the RPI system is not required to be OPERABLE for 1 hour following movement of the associated rods. Control and shutdown rod temperature affects the accuracy of the RPI System. Due to changes in the magnetic permeability of the drive shaft as a function of temperature, the indicated position is expected to change with time as the drive shaft temperature changes. The one hour period allows temperature to stabilize following rod movement in order to ensure the indicated positon is accurate.

APPLICABILITY

The requirements on the ~~A~~RPI and step counters are only applicable in MODES 1 and 2 (consistent with LCO 3.1.5, LCO 3.1.6, and LCO 3.1.7), because these are the only MODES in which power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. In the shutdown MODES, the OPERABILITY of the shutdown and control banks has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the Reactor Coolant System.

(continued)

BASES

ACTIONS

The ACTIONS table is modified by a Note indicating that a separate Condition entry is allowed for each inoperable rod position indicator ~~per group~~ and each demand position indicator ~~per bank~~. This is acceptable because the Required Actions for each Condition provide appropriate compensatory actions for each inoperable position indicator.

A.1 and A.2

When one ~~A~~RPI channel per group in one or more groups fails, the position of the rod can still be determined indirectly by use of incore power distribution measurement information. Incore power distribution measurement information can be obtained from flux traces using the Movable Incore Detector System or from an OPERABLE Power Distribution Monitoring System (PDMS) (ref. 15). The Required Action may also be satisfied by ensuring at least once per 8 hours that F_Q satisfies LCO 3.2.1, $F^N_{\Delta H}$ satisfies LCO 3.2.2, and SHUTDOWN MARGIN is within the limits provided in the COLR, provided the non-indicating rods have not been moved. Based on experience, normal power operation does not require excessive movement of banks. If a bank has been significantly moved, the Required Action of ~~B~~C.1 or ~~B~~C.2 below is required. Therefore, verification of RCCA position within the Completion Time of 8 hours is adequate for allowing continued full power operation, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small.

Required Action A.1 requires verification of the positon of a rod with an inoperable RPI once per 8 hours which may put excessive wear and tear on the moveable incore detector system. Required Action A.2 provides an alternative. Required Action A.2 requires verification of rod position using the incore power distribution measurement information every 31 EFPD, which coincides with the normal measurements to verify core power distribution.

Required Action A.2 includes six distinct requirements for verification of the position of rods associated with an inoperable RPI using incore power distribution measurements information:

a. Initial verification within 8 hours of the inoperability of the RPI;

b. Re-verification once every 31 Effective Full Power Days (EFPD) thereafter;

c. Verification within 8 hours after discovery of each unintended rod movement. An unintended rod movement is defined as the release of the rod's stationary gripper when no action was demanded either manually or automatically from the rod control system, or a rod motion in a direction other than the direction demanded by the rod control system. Verifying that no unintended rod movement has occurred is performed by monitoring the rod control system stationary gripper coil current for indications of rod movement;

(continued)

BASES

ACTIONS (continued)

d. Verification within 8 hours if the rod with an inoperable 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 of reaching 100% RTP if power is reduced to less than 100% power RTP.

Should the rod with the inoperable RPI be moved more than 12 steps, or if reactor power is changed, the position of the rod with the inoperable RPI must be verified.

~~A.2.1, A.2.2~~

~~The control rod drive mechanism (a portion of the rod control system) consists of four separate subassemblies; 1) the pressure vessel, 2) the coil stack assembly, 3) the latch assembly, and 4) the drive rod assembly. The coil stack assembly contains three operating coils; 1) the stationary gripper coil, 2) the moveable gripper coil, and 3) the lift coil. In support of Actions A.2.1 and A.2.2, a Temporary Alteration (TA) to the configuration of the plant is implemented to provide instrumentation for the monitoring of the rod control system parameters in the Main Control Room. The TA creates a circuit that monitors the operation and timing of the lift coil and the stationary gripper coil. Additional details regarding the TA are provided in the FSAR (Ref. 14).~~

~~Required Actions A.2.1 and A.1 are essentially the same. Therefore, the discussion provided above for Required Action A.1 applies to Required Action A.2.1. The options provided by Required Actions A.2.1 and A.2.2 allow for continued operation in a situation where the component causing the ARPI to be inoperable is inaccessible due to operating conditions (adverse radiological or temperature environment). In this situation, repair of the ARPI cannot occur until the unit is in an operating MODE that allows access to the failed components.~~

~~In addition to the initial 8 hour verification, Required Action A.2.1 also requires the following for the rod with the failed ARPI:~~

~~1. Verification of the position of the rod every 31 days using either the incore movable detectors or the PDMS.~~

~~alignments ensure that the assumptions in the safety analysis will remain valid and that the assumed reactivity will be available to be inserted for a unit shutdown. Therefore, this conservative measure ensures LCO 3.1.5 is met whenever the rod with the inoperable ARPI is moved greater than 12 steps. For the second contingency, the reduction of THERMAL POWER to less than or equal to 50% RTP puts the core into a condition where rod position is not significantly~~

(continued)

~~affecting core peaking factors (Ref. 13). Consistent with LCO 3.0.4 and this action, unit startup and operation to less than or equal to 50% RTP may occur with one ARPI per group inoperable. However, prior to escalating THERMAL POWER above 50% RTP, the position of the rod with an inoperable ARPI must be verified by use of either the moveable incore detectors or PDMS. Once 100% RTP is achieved, the position of the rod must be reverified within 8 hours by use of either the moveable incore detectors or PDMS. Monitoring of the rod control system parameters in accordance with Required Action A.2.2 for the rod with an inoperable ARPI may resume upon completion of the verification at 100% RTP.~~

A.3

Reduction of THERMAL POWER to ≤ 50% RTP puts core into a condition where rod position is not significantly affecting core peaking factors (Ref. 4). The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to ≤ 50% RTP from full power conditions without challenging plant systems and allowing for rod positon determination by Required Actions A.1 and A.2 above.

~~Required Action A.3 applies whenever the TA is not utilized. The discussion for Required Action A.2.3 (above) clarified that a reduction of THERMAL POWER to less than or equal to 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factors (Ref. 13). The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to less than or equal to 50% RTP from full power conditions without challenging plant systems and allowing for rod position determination by Required Action A.1 above. Consistent with LCO 3.0.4 and this action, unit startup and operation to less than or equal to 50% RTP may occur with one ARPI per group inoperable. Thermal Power may be escalated to 100% RTP as long as Required Action A.1 is satisfied.~~

B.1 and B.2

When more than one RPI per group in one or more groups fail, additional actions are necessary. Placing the Rod Control System in manual assures unplanned rod motion will not occur. The immediate Completion Time for placing the Rod Control System in manual reflects the urgency with which unplanned rod motion must be prevented while in this Condition.

The inoperable RPIs must be restored, such that a maximum of one RPI per group is inoperable, within 24 hours. The 24 hour Completion Time provides sufficient time to troubleshoot and restore the RPI system to operation while avoiding the plant challenges associated with the shutdown without full rod position indication.

Based on operating experience, normal power operation does not require

(continued)

BASES

excessive rod movement. If one or more rods has been significantly moved, the Required Action of C.1 or C.2 below is required.

ACTIONS (continued)

~~B~~C.1 and ~~B~~C.2

With one or more RPI inoperable in one or more groups and the affected groups have moved greater than 24 steps in one direction since the last determination of rod position, additional actions are needed to verify the position of rods with inoperable RPI. Within 4 hours, the position of the rods with inoperable position indication must be determined using either the moveable incore detectors or PDMS to verify ~~These Required Actions clarify that when one or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction, since the position was last determined, the Required Actions of A.1 and A.2 are still appropriate but must be initiated promptly under Required Action B.1 to begin verifying that~~ these rods are still properly positioned, relative to their group positions.

If, within 4 hours, the rod positions have not been determined, THERMAL POWER must be reduced to ~~≤less than or equal to~~ 50% RTP within 8 hours to avoid undesirable power distributions that could result from continued operation at >~~greater than~~ 50% RTP, if one or more rods are misaligned by more than 24 steps. The allowed Completion Time of 4 hours provides an acceptable period of time to verify the rod positions.

~~C~~D.1.1 and ~~C~~D.1.2

With one or more demand position indicators per bank inoperable in one or more banks, the rod positions can be determined by the ~~A~~RPI System. Since normal power operation does not require excessive movement of rods, verification by administrative means that the rod position indicators are OPERABLE and the most withdrawn rod and the least withdrawn rod are ~~≤less than or equal to~~ 12 steps apart within the allowed Completion Time of once every 8 hours is adequate.

~~C~~D.2

Reduction of THERMAL POWER to ~~≤less than or equal to~~ 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factor limits (Ref. 13). The allowed Completion Time of 8 hours provides an acceptable period of time to verify the rod positions per Required Actions ~~C~~D.1.1 and ~~C~~D.1.2 or reduce power to ~~≤less than or equal to~~ 50% RTP.

~~D~~E.1

If the Required Actions cannot be completed within the associated Completion Time, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be

(continued)

BASES

brought to at least MODE 3 within 6 hours. The allowed Completion Time is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1

Verification that the ~~A~~RPI agrees with the demand position within 12 steps ensures that the ~~A~~RPI is operating correctly.

This Surveillance is performed prior to reactor criticality after each removal of the reactor head, as there is ~~The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and~~ the potential for unnecessary plant transients if the SR were performed with the reactor at power. ~~Operating experience has shown these components usually pass the SR when performed at a Frequency of once every 18 months. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.~~

The Surveillance is modified by a Note which states it is not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. If a rod is known to not be within 12 steps of the group demand position, the ACTIONS of LCO 3.1.5 provide the appropriate Actions.

(continued)

BASES (continued)

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 13, "Instrumentation and Control."

2. Watts Bar FSAR, Section 15.2.1, “Uncontrolled Rod Cluster Control Assembly Bank Withdrawal From a Subcritical Condition."

3. Watts Bar FSAR, Section 15.2.2, “Uncontrolled Rod Cluster Control Assembly Bank Withdrawal At Power."

4. Watts Bar FSAR, Section 15.2.3, “Rod Cluster Control Assembly Misalignment."

5. Watts Bar FSAR, Section 15.2.4, “Uncontrolled Boron Dilution."

6. Watts Bar FSAR, Section 15.2.5, “Partial Loss of Forced Reactor Coolant Flow."

7. Watts Bar FSAR, Section 15.2.13, “Accidental Depressurization of the Main Steam System."

8. Watts Bar FSAR, Section 15.3.4, “Complete Loss of Forced Reactor Coolant Flow."

9. Watts Bar FSAR, Section 15.3.6, “Single Rod Cluster Control Assembly Withdrawal At Full Power."

10. Watts Bar FSAR, Section 15.4.2.1, “Major Rupture of Main Steam Line."

11. Watts Bar FSAR, Section 15.4.4, “Single Reactor Coolant Pump Locked Rotor."

12. Watts Bar FSAR, Section 15.4.6, “Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection)."

13. Watts Bar FSAR, Section 4.3, “Nuclear Design."

14. Watts Bar FSAR, Section 7.7.1.3.2, “Main Control Room Rod Position Indication.”

15. WCAP-12472-P-A,“BEACON Core Monitoring and Operations Support System,” August 1994.

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Enclosure

**ATTACHMENT 6 - PROPOSED TS BASES CHANGES (MARK-UP)
FOR WBN UNIT 2 TS 3.1.8 (FOR INFORMATION ONLY)**

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.8 Rod Position Indication

BASES

BACKGROUND

According to GDC 13 (Ref. 1), instrumentation to monitor variables and systems over their operating ranges during normal operation, anticipated operational occurrences, and accident conditions must be OPERABLE. LCO 3.1.8 is required to ensure OPERABILITY of the control rod position indicators to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

The OPERABILITY, including position indication, of the shutdown and control rods is an initial assumption in all safety analyses that assume rod insertion upon reactor trip. Maximum rod misalignment is an initial assumption in the safety analysis that directly affects core power distributions and assumptions of available SDM. Rod position indication is required to assess OPERABILITY and misalignment.

Mechanical or electrical failures may cause a control rod to become inoperable or to become misaligned from its group. Control rod inoperability or misalignment may cause increased power peaking, due to the asymmetric reactivity distribution and a reduction in the total available rod worth for reactor shutdown. Therefore, control rod alignment and OPERABILITY are related to core operation in design power peaking limits and the core design requirement of a minimum SDM.

Limits on control rod alignment and OPERABILITY have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved.

Rod cluster control assemblies (RCCAs), or rods, are moved out of the core (up or withdrawn) or into the core (down or inserted) by their control rod drive mechanisms. 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 (Shutdown Banks C and D have only one group each).

The axial position of shutdown rods and control rods are determined by two separate and independent systems: the Bank Demand Position Indication System (commonly called group step counters) and the analog Rod Position Indication (RPI) System.

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BASES

BACKGROUND (continued)

The Bank Demand Position Indication System counts the pulses from the Rod Control System that move 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 highly precise (± 1 step or ± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The RPI System provides an accurate indication of actual control 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 with a center-to-center distance of 3.75 inches, which is 6 steps. The normal indication accuracy of the RPI System is ± 6 steps (± 3.75 inches), and the maximum uncertainty is ± 12 steps (± 7.5 inches). With an indicated deviation of 12 steps between the group step counter and RPI, the maximum deviation between actual rod position and the demand position could be 24 steps, or 15 inches.

The Power Distribution Monitoring System (PDMS) as controlled by Technical Requirements Manual Section 3.3.~~3~~ 9 develops a detailed three dimensional power distribution via its nodal code coupled with updates from plant instrumentation, including the fixed incore detectors. The monitored power distribution is compared to the reference power distribution corresponding to all control rods properly aligned. Agreement between the two power distributions can be used to indirectly verify the control rod is aligned.

APPLICABLE SAFETY ANALYSES

Control and shutdown rod position accuracy is essential during power operation. Power peaking, ejected rod worth, or SDM limits may be violated in the event of a Design Basis Accident (Ref. 2 through 12), with control or shutdown rods operating outside their limits undetected. Therefore, the acceptance criteria for rod position indication is that rod positions must be known with sufficient accuracy in order to verify the core is operating within the group sequence, overlap, design peaking limits, ejected rod worth, and with minimum SDM (LCO 3.1.6, "Shutdown Bank Insertion Limits," and LCO 3.1.7, "Control Bank Insertion Limits"). The rod positions must also be known in order to verify the alignment limits are preserved (LCO 3.1.5, "Rod Group Alignment Limits"). Control rod positions are continuously monitored to provide operators with information that ensures the plant is operating within the bounds of the accident analysis assumptions.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The control rod position indicator channels satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii). The control rod position indicators monitor control rod position, which is an initial condition of the accident.

LCO

LCO 3.1.8 specifies that the RPI System and the Bank Demand Position Indication System be OPERABLE for all control rods. For the control rod position indicators to be OPERABLE requires meeting the SR of the LCO (when required) and the following:

a. The RPI System indicates within 12 steps of the group step counter demand position as required by LCO 3.1.5, "Rod Group Alignment Limits;"

b. For the RPI System there are no failed coils; and

c. The Bank Demand Indication System has been calibrated either in the fully inserted position or to the RPI System.

The 12 step agreement limit between the Bank Demand Position Indication System and the 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.

A deviation of less than the allowable limit, given in LCO 3.1.5, in position indication for a single control rod, ensures high confidence that the position uncertainty of the corresponding control rod group is within the assumed values used in the analysis (that specified control rod group insertion limits).

These requirements ensure that control rod position indication during power operation and PHYSICS TESTS is accurate, and that design assumptions are not challenged. OPERABILITY of the position indicator channels ensures that inoperable, misaligned, or mispositioned control rods can be detected. Therefore, power peaking, ejected rod worth, and SDM can be controlled within acceptable limits.

The LCO is modified by a Note stating that the RPI system is not required to be OPERABLE for 1 hour following movement of the associated rods. Control and shutdown rod temperature affects the accuracy of the RPI System. Due to changes in the magnetic permeability of the drive shaft as a function of temperature, the indicated position is expected to change with time as the drive shaft temperature changes. The one hour period allows temperature to stabilize following rod movement in order to ensure the indicated positon is accurate.

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BASES

APPLICABILITY

The requirements on the RPI and step counters are only applicable in MODES 1 and 2 (consistent with LCO 3.1.5, LCO 3.1.6, and LCO 3.1.7), because these are the only MODES in which power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. In the shutdown MODES, the OPERABILITY of the shutdown and control banks has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the Reactor Coolant System.

BASES

ACTIONS

The ACTIONS table is modified by a Note indicating that a separate Condition entry is allowed for each inoperable rod position indicator ~~per group~~ and each demand position indicator ~~per bank~~. This is acceptable because the Required Actions for each Condition provide appropriate compensatory actions for each inoperable position indicator.

A.1 and A.2

When one RPI channel per group in one or more groups fails, the position of the rod can still be determined indirectly by use of incore power distribution measurement information. Incore power distribution measurement information is obtained from an OPERABLE Power Distribution Monitoring System (PDMS) (Ref. 15). The Required Action may also be satisfied by ensuring at least once per 8 hours that F_Q satisfies LCO 3.2.1, $F^N_{\Delta H}$ satisfies LCO 3.2.2, and SHUTDOWN MARGIN is within the limits provided in the COLR, provided the non-indicating rods have not been moved. Based on experience, normal power operation does not require excessive movement of banks. If a bank has been significantly moved, the Required Action of ~~B~~C.1 or ~~B~~C.2 below is required. Therefore, verification of rod position within the Completion Time of 8 hours is adequate for allowing continued full power operation, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small.

Required Action A.1 requires verification of a rod with an inoperable RPI once per 8 hours. Required Action A.2 provides an alternative. Required Action A.2 requires verification of rod position using power distribution measurement information every 31 EFPD, which coincides with the normal measurements to verify core power distribution.

Required Action A.2 includes six distinct requirements for verification of the position of rods associated with an inoperable RPI using incore power distribution measurement information:

a. Initial verification within 8 hours of the inoperability of the RPI;

b. Re-verification once every 31 Effective Full Power Days (EFPD) thereafter;

c. Verification within 8 hours after discovery of each unintended rod movement. An unintended rod movement is defined as the release of the rod's stationary gripper when no action was demanded either manually or automatically from the rod control system, or a rod motion in a direction other than the direction demanded by the rod control system. Verifying that no unintended rod movement has occurred is performed by monitoring the rod control system stationary gripper coil current for indications of rod movement;

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BASES

ACTIONS (continued)

A.1 and A.2 (continued)

d. Verification within 8 hours if the rod with an inoperable 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 of reaching 100% RTP if power is reduced to less than 100% power RTP.

Should the rod with the inoperable RPI be moved more than 12 steps, or if reactor power is changed, the position of the rod with the inoperable RPI must be verified.

~~Required Actions A.2.1 and A.1 are essentially the same. Therefore, the discussion provided above for Required Action A.1 applies to Required Action A.2.1. The options provided by Required Actions A.2.1 and A.2.2 allow for continued operation in a situation where the component causing the RPI to be inoperable is inaccessible due to operating conditions (adverse radiological or temperature environment). In this situation, repair of the RPI cannot occur until the unit is in an operating MODE that allows access to the failed components.~~

~~In addition to the initial 8 hour verification, Required Action A.2.1 also requires the following for the rod with the failed RPI:~~

~~1. Verification of the position of the rod indirectly every 31 days using the PDMS.~~

~~2. Verification of the position of the rod indirectly using the PDMS within 8 hours of the performance of Required Action A.2.2 whenever there is an indication of unintended rod movement based on the parameters of the rod control system.~~

~~Required Action A.2.2 is in lieu of the verification of the position of the rod indirectly using the PDMS every 8 hours as required by Required Action A.1. Once the position of the rod with the failed RPI is confirmed through the use of the PDMS in accordance with Required Action A.2.1, the parameters of the rod control system must be monitored until the failed RPI is repaired. Should the review of the rod control system parameters indicate unintended movement of the rod, the position of the rod must be verified within 8 hours in accordance with Required Action A.2.1. Should there be unintended movement of the rod with the failed RPI, an alarm will be received. Alarms will also be received if the rod steps in a direction other than what was demanded, and if the circuitry of the TA fails. Receipt of any alarm requires the verification of the position of the rod in accordance with Required Action A.2.1.~~Required Actions A.2.1~~, A.2.2 and A.2.3~~ is ~~are~~ modified by a note. The note

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clarifies that rod position monitoring by Required Action~~s~~ A.2.1 ~~and A.2.2~~ shall only be applied to one rod with an inoperable RPI and shall only be allowed until the end of the current cycle. Further, Required Action~~s~~ A.2.1~~, A.2.2 and A.2.3~~ shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable RPI(s) could have safely been performed.

~~As indicated previously, the modifications required for the monitoring of the rod control system will be implemented as a TA. Implementation of the TA includes a review for the impact on plant procedures and training. This ensures that changes are initiated for key issues like the monitoring requirements in the control room, and operator training on the temporary equipment.~~

~~A.2.3~~

~~Required Action A.2.3 addresses two contingency measures when the TA is utilized:~~

~~1. Verification of the position of the rod indirectly with the inoperable RPI by use of the PDMS, whenever the rod is moved greater than 12 steps in one direction.~~

~~2. Operation of the unit when THERMAL POWER is less than or equal to 50% RTP.~~

~~For the first contingency, the rod group alignment limits of LCO 3.1.5 require that all shutdown and control rods be within 12 steps of their group step counter demand position. The limits on shutdown or control rod alignments ensure that the assumptions in the safety analysis will remain valid and that the assumed reactivity will be available to be inserted for a unit shutdown. Therefore, this conservative measure ensures LCO 3.1.5 is met whenever the rod with the inoperable RPI is moved greater than 12 steps. For the second contingency, the reduction of THERMAL POWER to less than or equal to 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factors (Ref. 13). Consistent with LCO 3.0.4 and this action, unit startup and operation to less than or equal to 50% RTP may occur with one RPI per group inoperable. However, prior to escalating THERMAL POWER above 50% RTP, the position of the rod with an inoperable RPI must be verified indirectly by use of the PDMS. Once 100% RTP is achieved, the position of the rod must be re-verified indirectly within 8 hours by use of the PDMS. Monitoring of the rod control system parameters in accordance with Required Action A.2.2 for the rod with an inoperable RPI may resume upon completion of the verification at 100% RTP.~~

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BASES

A.3

Reduction of THERMAL POWER to ≤ 50% RTP puts core into a condition where rod position is not significantly affecting core peaking factors (Ref. 4). ~~Required Action A.3 applies whenever the TA is not utilized or the position of the rod with an inoperable RPI cannot be verified indirectly. The discussion for Required Action A.2.3 (above) clarified that a reduction of THERMAL POWER to less than or equal to 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factors (Ref. 13).~~ The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to ~~≤less than or equal to~~ 50% RTP from full power conditions without challenging plant systems and allowing for rod position determination by Required Actions A.1 and A.2 above.

~~The control rod drive mechanism (a portion of the rod control system) consists of four separate subassemblies; 1) the pressure vessel, 2) the coil stack assembly, 3) the latch assembly, and 4) the drive rod assembly. The coil stack assembly contains three operating coils; 1) the stationary gripper coil, 2) the moveable gripper coil, and 3) the lift coil. In support of Actions A.2.1 and A.2.2, a Temporary Alteration (TA) to the configuration of the plant is implemented to provide instrumentation for the monitoring of the rod control system parameters in the Main Control Room. The TA creates a circuit that monitors the operation and timing of the lift coil and the stationary gripper coil. Additional details regarding the TA are provided in the FSAR (Ref. 14).~~

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BASES

ACTIONS (continued)

~~Consistent with LCO 3.0.4 and this action, unit startup and operation to less than or equal to 50% RTP may occur with one RPI per group inoperable. Thermal Power may be escalated to 100% RTP as long as Required Action A.1 is satisfied.~~

B.1 and B.2

When more than one RPI per group in one or more groups fail, additional actions are necessary. Placing the Rod Control System in manual assures unplanned rod motion will not occur. The immediate Completion Time for placing the Rod Control System in manual reflects the urgency with which unplanned rod motion must be prevented while in this Condition.

The inoperable RPIs must be restored, such that a maximum of one RPI per group is inoperable, within 24 hours. The 24 hour Completion Time provides sufficient time to troubleshoot and restore the RPI system to operation while avoiding the plant challenges associated with the shutdown without full rod position indication.

Based on operating experience, normal power operation does not require excessive rod movement. If one or more rods has been significantly moved, the Required Action of C.1 or C.2 below is required.

~~B~~C.1 and ~~B~~C.2

With one or more RPI inoperable in one or more groups and the affected groups have moved greater than 24 steps in one direction since the last determination of rod position, additional actions are needed to verify the position of rods with inoperable RPI. Within 4 hours, the position of the rods with inoperable position indication must be determined using the PDMS to verify ~~These Required Actions clarify that when one or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction, since the position was last determined, the Required Actions of A.1 and A.2 are still appropriate but must be initiated promptly under Required Action B.1 to begin verifying that~~ these rods are still properly positioned, relative to their group positions.

If, within 4 hours, the rod positions have not been verified, THERMAL POWER must be reduced to ~~≤less than or equal to~~ 50% RTP within 8 hours to avoid undesirable power distributions that could result from continued operation at ~~>greater than~~ 50% RTP, if one or more rods are misaligned by more than 24 steps. The allowed Completion Time of 4 hours provides an acceptable period of time to verify the rod positions.

~~C~~D.1.1 and ~~C~~D.1.2

With one or more demand position indicators per bank inoperable in one or more banks, the rod positions can be determined by the RPI System. Since normal power operation does not require excessive movement of

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BASES

rods, verification by administrative means that the rod position indicators are OPERABLE and the most withdrawn rod and the least withdrawn rod are ~~≤less than or equal to~~ 12 steps apart within the allowed Completion Time of once every 8 hours is adequate.

ACTIONS (continued)

~~C~~D.2

Reduction of THERMAL POWER to ~~≤less than or equal to~~ 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factor limits (Ref. 13). The allowed Completion Time of 8 hours provides an acceptable period of time to verify the rod positions per Required Actions ~~C~~D.1.1 and ~~C~~D.1.2 or reduce power to ~~≤less than or equal to~~ 50% RTP.

~~D~~E.1

If the Required Actions cannot be completed within the associated Completion Time, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. The allowed Completion Time is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1

Verification that the RPI agrees with the demand position within 12 steps ensures that the RPI is operating correctly.

This Surveillance is performed prior to reactor criticality after each removal of the reactor head, as there is ~~The 18-month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and~~ the potential for unnecessary plant transients if the SR were performed with the reactor at power. ~~Operating experience has shown these components usually pass the SR when performed at a Frequency of once every 18 months. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.~~

The Surveillance is modified by a Note which states it is not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. If a rod is known to not be within 12 steps of the group demand position, the ACTIONS of LCO 3.1.5 provide the appropriate Actions.

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BASES (continued)

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 13, "Instrumentation and Control."

2. Watts Bar FSAR, Section 15.2.1, "Uncontrolled Rod Cluster Control Assembly Bank Withdrawal From a Subcritical Condition."

3. Watts Bar FSAR, Section 15.2.2, "Uncontrolled Rod Cluster Control Assembly Bank Withdrawal At Power."

4. Watts Bar FSAR, Section 15.2.3, "Rod Cluster Control Assembly Misalignment."

5. Watts Bar FSAR, Section 15.2.4, "Uncontrolled Boron Dilution."

6. Watts Bar FSAR, Section 15.2.5, "Partial Loss of Forced Reactor Coolant Flow."

7. Watts Bar FSAR, Section 15.2.13, "Accidental Depressurization of the Main Steam System."

8. Watts Bar FSAR, Section 15.3.4, "Complete Loss of Forced Reactor Coolant Flow."

9. Watts Bar FSAR, Section 15.3.6, "Single Rod Cluster Control Assembly Withdrawal At Full Power."

10. Watts Bar FSAR, Section 15.4.2.1, "Major Rupture of Main Steam Line."

11. Watts Bar FSAR, Section 15.4.4, "Single Reactor Coolant Pump Locked Rotor."

12. Watts Bar FSAR, Section 15.4.6, "Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection)."

13. Watts Bar FSAR, Section 4.3, "Nuclear Design."

14. Watts Bar FSAR, Section 7.7.1.3.2, “Main Control Room Rod Position Indication.”

15. WCAP-12472-P-A, “BEACON™ Core Monitoring and Operations Support System,” August 1994 (Addendum 2, April 2002).

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Enclosure

**ATTACHMENT 7 - REVISED TS BASES CHANGES (FINAL TYPED)
FOR WBN UNIT 1 TS 3.1.8 (FOR INFORMATION ONLY)**

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.8 Rod Position Indication

BASES

BACKGROUND

According to GDC 13 (Ref. 1), instrumentation to monitor variables and systems over their operating ranges during normal operation, anticipated operational occurrences, and accident conditions must be OPERABLE. LCO 3.1.8 is required to ensure OPERABILITY of the control rod position indicators to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

The OPERABILITY, including position indication, of the shutdown and control rods is an initial assumption in all safety analyses that assume rod insertion upon reactor trip. Maximum rod misalignment is an initial assumption in the safety analysis that directly affects core power distributions and assumptions of available SDM. Rod position indication is required to assess OPERABILITY and misalignment.

Mechanical or electrical failures may cause a control rod to become inoperable or to become misaligned from its group. Control rod inoperability or misalignment may cause increased power peaking, due to the asymmetric reactivity distribution and a reduction in the total available rod worth for reactor shutdown. Therefore, control rod alignment and OPERABILITY are related to core operation in design power peaking limits and the core design requirement of a minimum SDM.

Limits on control rod alignment and OPERABILITY have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved.

Rod cluster control assemblies (RCCAs), or rods, are moved out of the core (up or withdrawn) or into the core (down or inserted) by their control rod drive mechanisms. 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 (Shutdown Banks C and D have only one group each).

The axial position of shutdown rods and control rods are determined by two separate and independent systems: the Bank Demand Position Indication System (commonly called group step counters) and the analog Rod Position Indication (RPI) System.

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BASES

BACKGROUND (continued)

The Bank Demand Position Indication System counts the pulses from the Rod Control System that move 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 highly precise (± 1 step or ± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The RPI System provides an accurate indication of actual control 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 with a center to center distance of 3.75 inches, which is 6 steps. The normal indication accuracy of the RPI System is ± 6 steps (± 3.75 inches), and the maximum uncertainty is ± 12 steps (± 7.5 inches). With an indicated deviation of 12 steps between the group step counter and RPI, the maximum deviation between actual rod position and the demand position could be 24 steps, or 15 inches.

APPLICABLE SAFETY ANALYSES

Control and shutdown rod position accuracy is essential during power operation. Power peaking, ejected rod worth, or SDM limits may be violated in the event of a Design Basis Accident (Ref. 2 through 12), with control or shutdown rods operating outside their limits undetected. Therefore, the acceptance criteria for rod position indication is that rod positions must be known with sufficient accuracy in order to verify the core is operating within the group sequence, overlap, design peaking limits, ejected rod worth, and with minimum SDM (LCO 3.1.6, "Shutdown Bank Insertion Limits," and LCO 3.1.7, "Control Bank Insertion Limits"). The rod positions must also be known in order to verify the alignment limits are preserved (LCO 3.1.5, "Rod Group Alignment Limits"). Control rod positions are continuously monitored to provide operators with information that ensures the plant is operating within the bounds of the accident analysis assumptions.

The control rod position indicator channels satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii). The control rod position indicators monitor control rod position, which is an initial condition of the accident.

LCO

LCO 3.1.8 specifies that the RPI System and the Bank Demand Position Indication System be OPERABLE for all control rods. For the control rod position indicators to be OPERABLE requires meeting the SR of the LCO (when required) and the following:

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BASES

LCO (continued)

a. The RPI System indicates within 12 steps of the group step counter demand position as required by LCO 3.1.5, "Rod Group Alignment Limits;"

b. For the RPI System there are no failed coils; and

c. The Bank Demand Indication System has been calibrated either in the fully inserted position or to the RPI System.

The 12 step agreement limit between the Bank Demand Position Indication System and the 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.

A deviation of less than the allowable limit, given in LCO 3.1.5, in position indication for a single control rod, ensures high confidence that the position uncertainty of the corresponding control rod group is within the assumed values used in the analysis (that specified control rod group insertion limits).

These requirements ensure that control rod position indication during power operation and PHYSICS TESTS is accurate, and that design assumptions are not challenged. OPERABILITY of the position indicator channels ensures that inoperable, misaligned, or mispositioned control rods can be detected. Therefore, power peaking, ejected rod worth, and SDM can be controlled within acceptable limits.

The LCO is modified by a Note stating that the RPI system is not required to be OPERABLE for 1 hour following movement of the associated rods. Control and shutdown rod temperature affects the accuracy of the RPI System. Due to changes in the magnetic permeability of the drive shaft as a function of temperature, the indicated position is expected to change with time as the drive shaft temperature changes. The one hour period allows temperature to stabilize following rod movement in order to ensure the indicated positon is accurate.

APPLICABILITY

The requirements on the RPI and step counters are only applicable in MODES 1 and 2 (consistent with LCO 3.1.5, LCO 3.1.6, and LCO 3.1.7), because these are the only MODES in which power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. In the shutdown MODES, the OPERABILITY of the shutdown and control banks has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the Reactor Coolant System.

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BASES

ACTIONS

The ACTIONS table is modified by a Note indicating that a separate Condition entry is allowed for each inoperable rod position indicator and each demand position indicator. This is acceptable because the Required Actions for each Condition provide appropriate compensatory actions for each inoperable position indicator.

A.1 and A.2

When one RPI channel per group in one or more groups fails, the position of the rod can still be determined indirectly by use of incore power distribution measurement information. Incore power distribution measurement information can be obtained from flux traces using the Movable Incore Detector System or from an OPERABLE Power Distribution Monitoring System (PDMS) (ref. 15). The Required Action may also be satisfied by ensuring at least once per 8 hours that F_Q satisfies LCO 3.2.1, $F^N_{\Delta H}$ satisfies LCO 3.2.2, and SHUTDOWN MARGIN is within the limits provided in the COLR, provided the non-indicating rods have not been moved. Based on experience, normal power operation does not require excessive movement of banks. If a bank has been significantly moved, the Required Action of C.1 or C.2 below is required. Therefore, verification of RCCA position within the Completion Time of 8 hours is adequate for allowing continued full power operation, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small.

Required Action A.1 requires verification of the positon of a rod with an inoperable RPI once per 8 hours which may put excessive wear and tear on the moveable incore detector system. Required Action A.2 provides an alternative. Required Action A.2 requires verification of rod position using the incore power distribution measurement information every 31 EFPD, which coincides with the normal measurements to verify core power distribution.

Required Action A.2 includes six distinct requirements for verification of the position of rods associated with an inoperable RPI using incore power distribution measurements information:

a. Initial verification within 8 hours of the inoperability of the RPI;

b. Re-verification once every 31 Effective Full Power Days (EFPD) thereafter;

c. Verification within 8 hours after discovery of each unintended rod movement. An unintended rod movement is defined as the release of the rod's stationary gripper when no action was demanded either manually or automatically from the rod control system, or a rod motion in a direction other than the direction demanded by the rod control system. Verifying that no unintended rod movement has occurred is performed by monitoring the rod control system stationary gripper coil current for indications of rod movement;

(continued)

BASES

ACTIONS (continued)

d. Verification within 8 hours if the rod with an inoperable 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 of reaching 100% RTP if power is reduced to less than 100% power RTP.

Should the rod with the inoperable RPI be moved more than 12 steps, or if reactor power is changed, the position of the rod with the inoperable RPI must be verified.

A.3

Reduction of THERMAL POWER to ≤ 50% RTP puts core into a condition where rod position is not significantly affecting core peaking factors (Ref. 4). The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to ≤ 50% RTP from full power conditions without challenging plant systems and allowing for rod positon determination by Required Actions A.1 and A.2 above.

B.1 and B.2

When more than one RPI per group in one or more groups fail, additional actions are necessary. Placing the Rod Control System in manual assures unplanned rod motion will not occur. The immediate Completion Time for placing the Rod Control System in manual reflects the urgency with which unplanned rod motion must be prevented while in this Condition.

The inoperable RPIs must be restored, such that a maximum of one RPI per group is inoperable, within 24 hours. The 24 hour Completion Time provides sufficient time to troubleshoot and restore the RPI system to operation while avoiding the plant challenges associated with the shutdown without full rod position indication.

Based on operating experience, normal power operation does not require excessive rod movement. If one or more rods has been significantly moved, the Required Action of C.1 or C.2 below is required.

(continued)

BASES

ACTIONS (continued)

C.1 and C.2

With one or more RPI inoperable in one or more groups and the affected groups have moved greater than 24 steps in one direction since the last determination of rod position, additional actions are needed to verify the position of rods with inoperable RPI. Within 4 hours, the position of the rods with inoperable position indication must be determined using either the moveable incore detectors or PDMS to verify these rods are still properly positioned, relative to their group positions.

If, within 4 hours, the rod positions have not been determined, THERMAL POWER must be reduced to ≤ 50% RTP within 8 hours to avoid undesirable power distributions that could result from continued operation at > 50% RTP, if one or more rods are misaligned by more than 24 steps. The allowed Completion Time of 4 hours provides an acceptable period of time to verify the rod positions.

D.1.1 and D.1.2

With one or more demand position indicators per bank inoperable in one or more banks, the rod positions can be determined by the RPI System. Since normal power operation does not require excessive movement of rods, verification by administrative means that the rod position indicators are OPERABLE and the most withdrawn rod and the least withdrawn rod are ≤ 12 steps apart within the allowed Completion Time of once every 8 hours is adequate.

D.2

Reduction of THERMAL POWER to ≤ 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factor limits (Ref. 13). The allowed Completion Time of 8 hours provides an acceptable period of time to verify the rod positions per Required Actions D.1.1 and D.1.2 or reduce power to ≤ 50% RTP.

E.1

If the Required Actions cannot be completed within the associated Completion Time, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. The allowed Completion Time is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1

Verification that the RPI agrees with the demand position within 12 steps ensures that the RPI is operating correctly.

This Surveillance is performed prior to reactor criticality after each removal of the reactor head, as there is the potential for unnecessary plant transients if the SR were performed with the reactor at power.

The Surveillance is modified by a Note which states it is not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. If a rod is known to not be within 12 steps of the group demand position, the ACTIONS of LCO 3.1.5 provide the appropriate Actions.

(continued)

BASES (continued)

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 13, "Instrumentation and Control."

2. Watts Bar FSAR, Section 15.2.1, “Uncontrolled Rod Cluster Control Assembly Bank Withdrawal From a Subcritical Condition."

3. Watts Bar FSAR, Section 15.2.2, “Uncontrolled Rod Cluster Control Assembly Bank Withdrawal At Power."

4. Watts Bar FSAR, Section 15.2.3, “Rod Cluster Control Assembly Misalignment."

5. Watts Bar FSAR, Section 15.2.4, “Uncontrolled Boron Dilution."

6. Watts Bar FSAR, Section 15.2.5, “Partial Loss of Forced Reactor Coolant Flow."

7. Watts Bar FSAR, Section 15.2.13, “Accidental Depressurization of the Main Steam System."

8. Watts Bar FSAR, Section 15.3.4, “Complete Loss of Forced Reactor Coolant Flow."

9. Watts Bar FSAR, Section 15.3.6, “Single Rod Cluster Control Assembly Withdrawal At Full Power."

10. Watts Bar FSAR, Section 15.4.2.1, “Major Rupture of Main Steam Line."

11. Watts Bar FSAR, Section 15.4.4, “Single Reactor Coolant Pump Locked Rotor."

12. Watts Bar FSAR, Section 15.4.6, “Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection)."

13. Watts Bar FSAR, Section 4.3, “Nuclear Design."

14. Watts Bar FSAR, Section 7.7.1.3.2, “Main Control Room Rod Position Indication.”

15. WCAP-12472-P-A,“BEACON Core Monitoring and Operations Support System,” August 1994.

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Enclosure

**ATTACHMENT 8 - REVISED TS BASES CHANGES (FINAL TYPED)
FOR WBN UNIT 2 TS 3.1.8 (FOR INFORMATION ONLY)**

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.8 Rod Position Indication

BASES

BACKGROUND

According to GDC 13 (Ref. 1), instrumentation to monitor variables and systems over their operating ranges during normal operation, anticipated operational occurrences, and accident conditions must be OPERABLE. LCO 3.1.8 is required to ensure OPERABILITY of the control rod position indicators to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

The OPERABILITY, including position indication, of the shutdown and control rods is an initial assumption in all safety analyses that assume rod insertion upon reactor trip. Maximum rod misalignment is an initial assumption in the safety analysis that directly affects core power distributions and assumptions of available SDM. Rod position indication is required to assess OPERABILITY and misalignment.

Mechanical or electrical failures may cause a control rod to become inoperable or to become misaligned from its group. Control rod inoperability or misalignment may cause increased power peaking, due to the asymmetric reactivity distribution and a reduction in the total available rod worth for reactor shutdown. Therefore, control rod alignment and OPERABILITY are related to core operation in design power peaking limits and the core design requirement of a minimum SDM.

Limits on control rod alignment and OPERABILITY have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved.

Rod cluster control assemblies (RCCAs), or rods, are moved out of the core (up or withdrawn) or into the core (down or inserted) by their control rod drive mechanisms. 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 (Shutdown Banks C and D have only one group each).

The axial position of shutdown rods and control rods are determined by two separate and independent systems: the Bank Demand Position Indication System (commonly called group step counters) and the analog Rod Position Indication (RPI) System.

(continued)

BASES

BACKGROUND (continued)

The Bank Demand Position Indication System counts the pulses from the Rod Control System that move 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 highly precise (± 1 step or ± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The RPI System provides an accurate indication of actual control 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 with a center-to-center distance of 3.75 inches, which is 6 steps. The normal indication accuracy of the RPI System is ± 6 steps (± 3.75 inches), and the maximum uncertainty is ± 12 steps (± 7.5 inches). With an indicated deviation of 12 steps between the group step counter and RPI, the maximum deviation between actual rod position and the demand position could be 24 steps, or 15 inches.

The Power Distribution Monitoring System (PDMS) as controlled by Technical Requirements Manual Section 3.3.9 develops a detailed three dimensional power distribution via its nodal code coupled with updates from plant instrumentation, including the fixed incore detectors. The monitored power distribution is compared to the reference power distribution corresponding to all control rods properly aligned. Agreement between the two power distributions can be used to indirectly verify the control rod is aligned.

APPLICABLE SAFETY ANALYSES

Control and shutdown rod position accuracy is essential during power operation. Power peaking, ejected rod worth, or SDM limits may be violated in the event of a Design Basis Accident (Ref. 2 through 12), with control or shutdown rods operating outside their limits undetected. Therefore, the acceptance criteria for rod position indication is that rod positions must be known with sufficient accuracy in order to verify the core is operating within the group sequence, overlap, design peaking limits, ejected rod worth, and with minimum SDM (LCO 3.1.6, "Shutdown Bank Insertion Limits," and LCO 3.1.7, "Control Bank Insertion Limits"). The rod positions must also be known in order to verify the alignment limits are preserved (LCO 3.1.5, "Rod Group Alignment Limits"). Control rod positions are continuously monitored to provide operators with information that ensures the plant is operating within the bounds of the accident analysis assumptions.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The control rod position indicator channels satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii). The control rod position indicators monitor control rod position, which is an initial condition of the accident.

LCO

LCO 3.1.8 specifies that the RPI System and the Bank Demand Position Indication System be OPERABLE for all control rods. For the control rod position indicators to be OPERABLE requires meeting the SR of the LCO (when required) and the following:

a. The RPI System indicates within 12 steps of the group step counter demand position as required by LCO 3.1.5, "Rod Group Alignment Limits;"

b. For the RPI System there are no failed coils; and

c. The Bank Demand Indication System has been calibrated either in the fully inserted position or to the RPI System.

The 12 step agreement limit between the Bank Demand Position Indication System and the 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.

A deviation of less than the allowable limit, given in LCO 3.1.5, in position indication for a single control rod, ensures high confidence that the position uncertainty of the corresponding control rod group is within the assumed values used in the analysis (that specified control rod group insertion limits).

These requirements ensure that control rod position indication during power operation and PHYSICS TESTS is accurate, and that design assumptions are not challenged. OPERABILITY of the position indicator channels ensures that inoperable, misaligned, or mispositioned control rods can be detected. Therefore, power peaking, ejected rod worth, and SDM can be controlled within acceptable limits.

The LCO is modified by a Note stating that the RPI system is not required to be OPERABLE for 1 hour following movement of the associated rods. Control and shutdown rod temperature affects the accuracy of the RPI System. Due to changes in the magnetic permeability of the drive shaft as a function of temperature, the indicated position is expected to change with time as the drive shaft temperature changes. The one hour period allows temperature to stabilize following rod movement in order to ensure the indicated positon is accurate.

(continued)

BASES

APPLICABILITY

The requirements on the RPI and step counters are only applicable in MODES 1 and 2 (consistent with LCO 3.1.5, LCO 3.1.6, and LCO 3.1.7), because these are the only MODES in which power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. In the shutdown MODES, the OPERABILITY of the shutdown and control banks has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the Reactor Coolant System.

(continued)

BASES

ACTIONS

The ACTIONS table is modified by a Note indicating that a separate Condition entry is allowed for each inoperable rod position indicator and each demand position indicator. This is acceptable because the Required Actions for each Condition provide appropriate compensatory actions for each inoperable position indicator.

A.1 and A.2

When one RPI channel per group in one or more groups fails, the position of the rod can still be determined indirectly by use of incore power distribution measurement information. Incore power distribution measurement information is obtained from an OPERABLE Power Distribution Monitoring System (PDMS) (Ref. 15). The Required Action may also be satisfied by ensuring at least once per 8 hours that F_Q satisfies LCO 3.2.1, $F^N_{\Delta H}$ satisfies LCO 3.2.2, and SHUTDOWN MARGIN is within the limits provided in the COLR, provided the non-indicating rods have not been moved. Based on experience, normal power operation does not require excessive movement of banks. If a bank has been significantly moved, the Required Action of C.1 or C.2 below is required. Therefore, verification of rod position within the Completion Time of 8 hours is adequate for allowing continued full power operation, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small.

Required Action A.1 requires verification of a rod with an inoperable RPI once per 8 hours. Required Action A.2 provides an alternative. Required Action A.2 requires verification of rod position using power distribution measurement information every 31 EFPD, which coincides with the normal measurements to verify core power distribution.

Required Action A.2 includes six distinct requirements for verification of the position of rods associated with an inoperable RPI using incore power distribution measurement information:

a. Initial verification within 8 hours of the inoperability of the RPI;

b. Re-verification once every 31 Effective Full Power Days (EFPD) thereafter;

c. Verification within 8 hours after discovery of each unintended rod movement. An unintended rod movement is defined as the release of the rod's stationary gripper when no action was demanded either manually or automatically from the rod control system, or a rod motion in a direction other than the direction demanded by the rod control system. Verifying that no unintended rod movement has occurred is performed by monitoring the rod control system stationary gripper coil current for indications of rod movement;

(continued)

BASES

ACTIONS (continued)

A.1 and A.2 (continued)

d. Verification within 8 hours if the rod with an inoperable 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 of reaching 100% RTP if power is reduced to less than 100% power RTP.

Should the rod with the inoperable RPI be moved more than 12 steps, or if reactor power is changed, the position of the rod with the inoperable RPI must be verified.

Required Action A.2.1 is modified by a note. The note clarifies that rod position monitoring by Required Action A.2.1 shall only be applied to one rod with an inoperable RPI and shall only be allowed until the end of the current cycle. Further, Required Action A.2.1 shall not be allowed after the plant has been in MODE 5 or other plant condition, for a sufficient period of time, in which the repair of the inoperable RPI(s) could have safely been performed.

A.3

Reduction of THERMAL POWER to ≤ 50% RTP puts core into a condition where rod position is not significantly affecting core peaking factors (Ref. 4). The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to ≤ 50% RTP from full power conditions without challenging plant systems and allowing for rod position determination by Required Actions A.1 and A.2 above.

(continued)

BASES

ACTIONS
(continued)

B.1 and B.2

When more than one RPI per group in one or more groups fail, additional actions are necessary. Placing the Rod Control System in manual assures unplanned rod motion will not occur. The immediate Completion Time for placing the Rod Control System in manual reflects the urgency with which unplanned rod motion must be prevented while in this Condition.

The inoperable RPIs must be restored, such that a maximum of one RPI per group is inoperable, within 24 hours. The 24 hour Completion Time provides sufficient time to troubleshoot and restore the RPI system to operation while avoiding the plant challenges associated with the shutdown without full rod position indication.

Based on operating experience, normal power operation does not require excessive rod movement. If one or more rods has been significantly moved, the Required Action of C.1 or C.2 below is required.

C.1 and C.2

With one or more RPI inoperable in one or more groups and the affected groups have moved greater than 24 steps in one direction since the last determination of rod position, additional actions are needed to verify the position of rods with inoperable RPI. Within 4 hours, the position of the rods with inoperable position indication must be determined using the PDMS to verify these rods are still properly positioned, relative to their group positions.

If, within 4 hours, the rod positions have not been verified, THERMAL POWER must be reduced to ≤ 50% RTP within 8 hours to avoid undesirable power distributions that could result from continued operation at > 50% RTP, if one or more rods are misaligned by more than 24 steps. The allowed Completion Time of 4 hours provides an acceptable period of time to verify the rod positions.

D.1.1 and D.1.2

With one or more demand position indicators per bank inoperable in one or more banks, the rod positions can be determined by the RPI System. Since normal power operation does not require excessive movement of rods, verification by administrative means that the rod position indicators are OPERABLE and the most withdrawn rod and the least withdrawn rod are ≤ 12 steps apart within the allowed Completion Time of once every 8 hours is adequate.

(continued)

BASES

ACTIONS (continued)

D.2

Reduction of THERMAL POWER to ≤ 50% RTP puts the core into a condition where rod position is not significantly affecting core peaking factor limits (Ref. 13). The allowed Completion Time of 8 hours provides an acceptable period of time to verify the rod positions per Required Actions D.1.1 and D.1.2 or reduce power to ≤ 50% RTP.

E.1

If the Required Actions cannot be completed within the associated Completion Time, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. The allowed Completion Time is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1

Verification that the RPI agrees with the demand position within 12 steps ensures that the RPI is operating correctly.

This Surveillance is performed prior to reactor criticality after each removal of the reactor head, as there is the potential for unnecessary plant transients if the SR were performed with the reactor at power.

The Surveillance is modified by a Note which states it is not required to be met for RPIs associated with rods that do not meet LCO 3.1.5. If a rod is known to not be within 12 steps of the group demand position, the ACTIONS of LCO 3.1.5 provide the appropriate Actions.

(continued)

BASES (continued)

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 13, "Instrumentation and Control."

2. Watts Bar FSAR, Section 15.2.1, "Uncontrolled Rod Cluster Control Assembly Bank Withdrawal From a Subcritical Condition."

3. Watts Bar FSAR, Section 15.2.2, "Uncontrolled Rod Cluster Control Assembly Bank Withdrawal At Power."

4. Watts Bar FSAR, Section 15.2.3, "Rod Cluster Control Assembly Misalignment."

5. Watts Bar FSAR, Section 15.2.4, "Uncontrolled Boron Dilution."

6. Watts Bar FSAR, Section 15.2.5, "Partial Loss of Forced Reactor Coolant Flow."

7. Watts Bar FSAR, Section 15.2.13, "Accidental Depressurization of the Main Steam System."

8. Watts Bar FSAR, Section 15.3.4, "Complete Loss of Forced Reactor Coolant Flow."

9. Watts Bar FSAR, Section 15.3.6, "Single Rod Cluster Control Assembly Withdrawal At Full Power."

10. Watts Bar FSAR, Section 15.4.2.1, "Major Rupture of Main Steam Line."

11. Watts Bar FSAR, Section 15.4.4, "Single Reactor Coolant Pump Locked Rotor."

12. Watts Bar FSAR, Section 15.4.6, "Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection)."

13. Watts Bar FSAR, Section 4.3, "Nuclear Design."

14. Watts Bar FSAR, Section 7.7.1.3.2, “Main Control Room Rod Position Indication.”

15. WCAP-12472-P-A, “BEACON™ Core Monitoring and Operations Support System,” August 1994 (Addendum 2, April 2002).

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