



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
WASHINGTON, D.C. 20555-0001

June 26, 2018

Mr. J. W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 4A
Chattanooga, TN 37402-2801

**SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 – ISSUANCE OF
AMENDMENTS REGARDING ADOPTION OF TSTF-547, CLARIFICATION
OF ROD POSITION REQUIREMENTS (CAC NOS. MF8912 AND MF8913;
EPID L-2016-LLA-0034)**

Dear Mr. Shea:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 120 to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant (Watts Bar), Unit 1, and Amendment No. 20 to Facility Operating License No. NPF-96 for Watts Bar, Unit 2. The amendments are in response to your application dated November 23, 2016, as supplemented by letters dated September 29, November 16, and December 27, 2017, and May 11, 2018.

These amendments revise the Technical Specification (TS) requirements on control and shutdown rods, and rod and bank position indication in the Watts Bar, Units 1 and 2, TS 3.1.5, "Rod Group Alignment Limits," TS 3.1.6, "Shutdown Bank Insertion Limits," TS 3.1.7, "Control Bank Insertion Limits," and TS 3.1.8, "Rod Position Indication." The amendments provide time to repair rod movement failures that do not affect rod operability, provide time for position indication instruments to read accurately after rod movement, correct conflicts among the TSs, and increase consistency and improve presentation.

J. Shea

- 2 -

A copy of the related safety evaluation is also enclosed. Notice of issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert G. Schaaf". The signature is fluid and cursive, with a long horizontal stroke at the end.

Robert G. Schaaf, Senior Project Manager
Special Projects and Process Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-390 and 50-391

Enclosures:

1. Amendment No. 120 to NPF-90
2. Amendment No. 20 to NPF-96
3. Safety Evaluation

cc: Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 120
License No. NPF-90

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (TVA, the licensee) dated November 23, 2016, as supplemented by letters dated September 29, November 16, and December 27, 2017, and May 11, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-90 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 120 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented no later than 60 days from the date of its issuance. Implementation shall include revision of the Core Operating Limits Report (COLR) for Watts Bar Nuclear Plant, Units 1 and 2, to relocate the shutdown margin limit in Technical Specifications 3.1.5, 3.1.6, and 3.1.7 to the COLR, as stated in the application for amendment, as supplemented.

FOR THE NUCLEAR REGULATORY COMMISSION



Booma Venkataraman, Acting Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License
and Technical Specifications

Date of Issuance: June 26, 2018

ATTACHMENT TO AMENDMENT NO. 120

WATTS BAR NUCLEAR PLANT, UNIT 1

FACILITY OPERATING LICENSE NO. NPF-90

DOCKET NO. 50-390

Replace Page 3 of Facility Operating License No. NPF-90 with the attached revised Page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

3.1-8
3.1-9
3.1-10
3.1-11
3.1-12
3.1-13
3.1-14
3.1-15
3.1-16
3.1-17
3.1-18
--
3.1-19

INSERT

3.1-8
3.1-9
3.1-10
3.1-11
3.1-12
3.1-13
3.1-14
3.1-15
3.1-16
3.1-17
3.1-18
3.1-18a
3.1-19

- (4) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required, any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis, instrument calibration, or other activity associated with radioactive apparatus or components; and
 - (5) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.
- (1) Maximum Power Level
TVA is authorized to operate the facility at reactor core power levels not in excess of 3459 megawatts thermal.
 - (2) Technical Specifications and Environmental Protection Plan
The Technical Specifications contained in Appendix A as revised through Amendment No. 120 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.
 - (3) Safety Parameter Display System (SPDS) (Section 18.2 of SER Supplements 5 and 15)
Prior to startup following the first refueling outage, TVA shall accomplish the necessary activities, provide acceptable responses, and implement all proposed corrective actions related to having the Watts Bar Unit 1 SPDS operational.
 - (4) Vehicle Bomb Control Program (Section 13.6.9 of SSER 20)
During the period of the exemption granted in paragraph 2.D.(3) of this license, in implementing the power ascension phase of the approved initial test program, TVA shall not exceed 50% power until the requirements of 10 CFR 73.55(c)(7) and (8) are fully implemented. TVA shall submit a letter under oath or affirmation when the requirements of 73.55(c)(7) and (8) have been fully implemented.

3.1 REACTIVITY CONTROL SYSTEMS

3.1.5 Rod Group Alignment Limits

LCO 3.1.5 All shutdown and control rods shall be OPERABLE.

AND

Individual indicated rod positions shall be within 12 steps of their group step counter demand position.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more rod(s) inoperable.	A.1.1 Verify SDM to be within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Be in MODE 3.	6 hours
B. One rod not within alignment limits.	B.1.1 Verify SDM to be within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	B.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
		(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2 Reduce THERMAL POWER to \leq 75% RTP. <u>AND</u> B.3 Verify SDM is within the limits specified in the COLR. <u>AND</u> B.4 Perform SR 3.2.1.1, SR 3.2.1.2, and SR 3.2.2.1. <u>AND</u> B.5 Re-evaluate safety analyses and confirm results remain valid for duration of operation under these conditions.	2 hours Once per 12 hours 72 hours 5 days
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 3.	6 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. More than one rod not within alignment limit.	D.1.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	D.1.2 Initiate boration to restore required SDM to within limit.	1 hour
	<u>AND</u>	
	D.2 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.1.5.1</p> <p style="text-align: center;">----- NOTES -----</p> <p>1. Not required to be performed for rods associated with inoperable rod position indicator or demand position indicator</p> <p>2. Not required to be performed until 1 hour after associated rod motion</p> <p style="text-align: center;">-----</p> <p>Verify position of individual rods within alignment limit.</p>	<p>12 hours</p> <p><u>AND</u></p> <p>Once within 4 hours and every 4 hours thereafter when the rod position deviation monitor is inoperable</p>
<p>SR 3.1.5.2</p> <p>Verify rod freedom of movement (trippability) by moving each rod not fully inserted in the core ≥ 10 steps in either direction.</p>	<p>92 days</p>

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.1.5.3 Verify rod drop time of each rod, from the fully withdrawn position, is ≤ 2.7 seconds from the beginning of decay of stationary gripper coil voltage to dashpot entry, with:</p> <p> a. $T_{avg} \geq 551^{\circ}\text{F}$; and</p> <p> b. All reactor coolant pumps operating.</p>	<p>Prior to criticality after each removal of the reactor head</p>

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 Shutdown Bank Insertion Limits

LCO 3.1.6 Each shutdown bank shall be within insertion limits specified in the COLR.

----- NOTE -----
Not applicable to shutdown banks inserted while performing SR 3.1.5.2.

APPLICABILITY: MODES 1 and 2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One shutdown bank inserted \leq 10 steps beyond the insertion limits specified in the COLR.	A.1 Verify all control banks are within the insertion limits specified in the COLR.	1 hour
	<u>AND</u>	
	A.2.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	A.2.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.3 Restore shutdown bank to within the insertion limits specified in the COLR.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>B. One or more shutdown banks not within limits for reasons other than Condition A.</p>	<p>B.1.1 Verify SDM is within the limits specified in the COLR.</p> <p style="text-align: center;"><u>OR</u></p> <p>B.1.2 Initiate boration to restore SDM to within limit.</p> <p style="text-align: center;"><u>AND</u></p> <p>B.2 Restore shutdown banks to within limits.</p>	<p>1 hour</p> <p>1 hour</p> <p>2 hours</p>
<p>C. Required Action and associated Completion Time not met.</p>	<p>C.1 Be in MODE 3.</p>	<p>6 hours</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p style="text-align: center;">----- NOTE ----- Not required to be performed until 1 hour after associated rod motion. -----</p> <p>SR 3.1.6.1 Verify each shutdown bank is within the insertion limits specified in the COLR.</p>	<p>12 hours</p>

3.1 REACTIVITY CONTROL SYSTEMS

3.1.7 Control Bank Insertion Limits

LCO 3.1.7 Control banks shall be within the insertion, sequence, and overlap limits specified in the COLR.

-----NOTE-----
Not applicable to control banks inserted while performing SR 3.1.5.2.

APPLICABILITY: MODE 1,
MODE 2 with $k_{eff} \geq 1.0$.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Control bank A, B, or C inserted ≤ 10 steps beyond the insertion, sequence, or overlap limits specified in the COLR.	A.1 Verify all shutdown banks are within the insertion limits specified in the COLR.	1 hour
	<u>AND</u>	
	A.2.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	A.2.2 Initiate boration to restore SDM to within limits.	1 hour
	<u>AND</u>	
	A.3 Restore the control bank to within the insertion, sequence, and overlap limits specified in the COLR.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>B. Control bank insertion limits not met for reasons other than Condition A.</p>	<p>B.1.1 Verify SDM is within the limits specified in the COLR.</p> <p style="text-align: center;"><u>OR</u></p> <p>B.1.2 Initiate boration to restore SDM to within limit.</p> <p style="text-align: center;"><u>AND</u></p> <p>B.2 Restore control bank(s) to within limits.</p>	<p>1 hour</p> <p>1 hour</p> <p>2 hours</p>
<p>C. Control bank sequence or overlap limits not met for reasons other than Condition A.</p>	<p>C.1.1 Verify SDM is within the limits specified in the COLR.</p> <p style="text-align: center;"><u>OR</u></p> <p>C.1.2 Initiate boration to restore SDM to within limit.</p> <p style="text-align: center;"><u>AND</u></p> <p>C.2 Restore control bank sequence and overlap to within limits.</p>	<p>1 hour</p> <p>1 hour</p> <p>2 hours</p>
<p>D. Required Action and associated Completion Time not met.</p>	<p>D.1 Be in MODE 2 with $k_{\text{eff}} < 1.0$.</p>	<p>6 hours</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.7.1	Verify estimated critical control bank position is within the limits specified in the COLR.	Within 4 hours prior to achieving criticality
SR 3.1.7.2	<p>----- NOTE ----- Not required to be performed until 1 hour after associated rod motion. -----</p> <p>Verify each control bank insertion is within the limits specified in the COLR.</p>	<p>12 hours</p> <p><u>AND</u></p> <p>Once within 4 hours and every 4 hours thereafter when the rod insertion limit monitor is inoperable</p>
SR 3.1.7.3	<p>----- NOTE ----- Not required to be performed until 1 hour after associated rod motion. -----</p> <p>Verify sequence and overlap limits specified in the COLR are met for control banks not fully withdrawn from the core.</p>	12 hours

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

ACTIONS (continued)

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

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
<p>SR 3.1.8.1</p> <p style="text-align: center;">----- NOTE -----</p> <p>Not required to be met for RPIs associated with rods that do not meet LCO 3.1.5.</p> <p>-----</p> <p>Verify each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel.</p>	<p>Once prior to criticality after each removal of the reactor head.</p>



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-391

WATTS BAR NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 20
License No. NPF-96

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (TVA, the licensee) dated November 23, 2016, as supplemented by letters dated September 29, November 16, and December 27, 2017, and May 11, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-96 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 20 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented no later than 60 days from the date of its issuance. Implementation shall include revision of the Core Operating Limits Report (COLR) for Watts Bar Nuclear Plant, Units 1 and 2, to relocate the shutdown margin limit in Technical Specifications 3.1.5, 3.1.6, and 3.1.7 to the COLR, as stated in the application for amendment, as supplemented.

FOR THE NUCLEAR REGULATORY COMMISSION



Booma Venkataraman, Acting Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License
and Technical Specifications

Date of Issuance: June 26, 2018

ATTACHMENT TO AMENDMENT NO. 20
WATTS BAR NUCLEAR PLANT, UNIT 2
FACILITY OPERATING LICENSE NO. NPF-96
DOCKET NO. 50-391

Replace Page 3 of Facility Operating License No. NPF-96 with the attached revised Page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages and insert the attached new pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

<u>REMOVE</u>	<u>INSERT</u>
3.1-7	3.1-7
3.1-8	3.1-8
3.1-9	3.1-9
3.1-10	3.1-10
3.1-11	3.1-11
3.1-12	3.1-12
3.1-13	3.1-13
3.1-14	3.1-14
--	3.1-14a
3.1-15	3.1-15
3.1-16	3.1-16
3.1-17	3.1-17
--	3.1-17a

C. The license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act, and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.

(1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3411 megawatts thermal.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 20 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) TVA shall implement permanent modifications to prevent overtopping of the embankments of the Fort Loudon Dam due to the Probable Maximum Flood by June 30, 2018.

(4) PAD4TCD may be used to establish core operating limits for Cycles 1 and 2 only. PAD4TCD may not be used to establish core operating limits for subsequent reload cycles.

(5) By December 31, 2018, the licensee shall report to the NRC that the actions to resolve the issues identified in Bulletin 2012-01, "Design Vulnerability in Electrical Power System," have been implemented.

(6) The licensee shall maintain in effect the provisions of the physical security plan, security personnel training and qualification plan, and safeguards contingency plan, and all amendments made pursuant to the authority of 10 CFR 50.90 and 50.54(p).

(7) TVA shall fully implement and maintain in effect all provisions of the Commission approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The TVA approved CSP was discussed in NUREG-0847, Supplement 28, as amended by changes approved in License Amendment No. 7.

(8) TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as described in NUREG-0847, Supplement 29, subject to the following provision:

3.1 REACTIVITY CONTROL SYSTEMS

3.1.5 Rod Group Alignment Limits

LCO 3.1.5 All shutdown and control rods shall be OPERABLE.

AND

Individual indicated rod positions shall be within 12 steps of their group step counter demand position.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more rod(s) inoperable.	A.1.1 Verify SDM to be within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Be in MODE 3.	6 hours
B. One rod not within alignment limits.	B.1.1 Verify SDM to be within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	B.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2 Reduce THERMAL POWER to $\leq 75\%$ RTP. <u>AND</u> B.3 Verify SDM is within the limits specified in the COLR. <u>AND</u> B.4 Perform SR 3.2.1.1, SR 3.2.1.2, and SR 3.2.2.1. <u>AND</u> B.5 Re-evaluate safety analyses and confirm results remain valid for duration of operation under these conditions.	2 hours Once per 12 hours 72 hours 5 days
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 3.	6 hours
D. More than one rod not within alignment limit.	D.1.1 Verify SDM is within the limits specified in the COLR. <u>OR</u> D.1.2 Initiate boration to restore required SDM to within limit. <u>AND</u> D.2 Be in MODE 3.	1 hour 1 hour 6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.5.1	<p>----- NOTES -----</p> <ol style="list-style-type: none"> 1. Not required to be performed for rods associated with inoperable rod position indicator or demand position indicator. 2. Not required to be performed until 1 hour after associated rod motion. <p>-----</p> <p>Verify position of individual rods within alignment limit.</p>	<p>12 hours</p> <p><u>AND</u></p> <p>Once within 4 hours and every 4 hours thereafter when the rod position deviation monitor is inoperable</p>
SR 3.1.5.2	<p>Verify rod freedom of movement (trippability) by moving each rod not fully inserted in the core ≥ 10 steps in either direction.</p>	<p>92 days</p>
SR 3.1.5.3	<p>Verify rod drop time of each rod, from the fully withdrawn position, is ≤ 2.7 seconds from the beginning of decay of stationary gripper coil voltage to dashpot entry, with:</p> <ol style="list-style-type: none"> a. $T_{avg} \geq 551^{\circ}\text{F}$; and b. All reactor coolant pumps operating. 	<p>Prior to criticality after each removal of the reactor head</p>

3.1 REACTIVITY CONTROL SYSTEMS

3.1.6 Shutdown Bank Insertion Limits

LCO 3.1.6 Each shutdown bank shall be within insertion limits specified in the COLR.

----- NOTE -----
Not applicable to shutdown banks inserted while performing SR 3.1.5.2.

APPLICABILITY: MODES 1 and 2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One shutdown bank inserted \leq 10 steps beyond the insertion limits specified in the COLR.	A.1 Verify all control banks are within the insertion limits specified in the COLR.	1 hour
	<u>AND</u>	
	A.2.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	A.2.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.3 Restore shutdown bank to within the insertion limits specified in the COLR.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more shutdown banks not within limits for reasons other than Condition A.	B.1.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	B.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	B.2 Restore shutdown banks to within limits.	2 hours
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.6.1 ----- NOTE ----- Not required to be performed until 1 hour after associated rod motion. -----	
Verify each shutdown bank is within the insertion limits specified in the COLR	12 hours

3.1 REACTIVITY CONTROL SYSTEMS

3.1.7 Control Bank Insertion Limits

LCO 3.1.7 Control banks shall be within the insertion, sequence, and overlap limits specified in the COLR

----- NOTE -----
Not applicable to control banks inserted while performing SR 3.1.5.2.

APPLICABILITY: MODE 1,
MODE 2 with $k_{eff} \geq 1.0$.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Control bank A, B, or C inserted ≤ 10 steps beyond the insertion, sequence, or overlap limits specified in the COLR.	A.1 Verify all shutdown banks are within the insertion limits specified in the COLR.	1 hour
	<u>AND</u>	
	A.2.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	A.2.2 Initiate boration to restore SDM to within limits.	1 hour
	<u>AND</u>	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Restore the control bank to within the insertion, sequence, and overlap limits specified in the COLR.	24 hours
B. Control bank insertion limits not met for reasons other than Condition A.	B.1.1 Verify SDM is within the limits specified in the COLR. <u>OR</u> B.1.2 Initiate boration to restore SDM to within limit. <u>AND</u> B.2 Restore control bank(s) to within limits.	1 hour 1 hour 2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Control bank sequence or overlap limits not met for reasons other than Condition A.	C.1.1 Verify SDM is within the limits specified in the COLR.	1 hour
	<u>OR</u>	
	C.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	C.2 Restore control bank sequence and overlap to within limits.	2 hours
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 2 with $k_{eff} < 1.0$.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.7.1 Verify estimated critical control bank position is within the limits specified in the COLR.	Within 4 hours prior to achieving criticality

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.1.7.2</p> <p>----- NOTE ----- Not required to be performed until 1 hour after associated rod motion. -----</p> <p>Verify each control bank insertion is within the limits specified in the COLR.</p>	<p>12 hours</p> <p><u>AND</u></p> <p>Once within 4 hours and every 4 hours thereafter when the rod insertion limit monitor is inoperable</p>
<p>SR 3.1.7.3</p> <p>----- NOTE ----- Not required to be performed until 1 hour after associated rod motion. -----</p> <p>Verify sequence and overlap limits specified in the COLR are met for control banks not fully withdrawn from the core.</p>	<p>12 hours</p>

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
	<u>OR</u> A.2 Verify the position of the rods with the inoperable RPI indirectly by using the PDMS.	8 hours <u>AND</u> Once every 31 EFPD thereafter <u>AND</u> 8 hours after discovery of each unintended rod movement <u>AND</u>
		(continued)

ACTIONS (continued)

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

(continued)

SURVEILLANCE REQUIREMENTS

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



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 120 AND 20

TO FACILITY OPERATING LICENSE NOS. NPF-90 AND NPF-96

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-390 AND 50-391

1.0 INTRODUCTION

By application dated November 23, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16335A179), as supplemented by letters dated September 29, November 16, December 27, 2017, and May 11, 2018 (ADAMS Accession Nos. ML17272A955, ML17321A033, ML17362A052, and ML18135A340, respectively), the Tennessee Valley Authority (TVA, the licensee) requested changes to the Technical Specifications (TSs) for Watts Bar Nuclear Plant (WBN, Watts Bar), Units 1 and 2. On March 14, 2017, the Nuclear Regulatory Commission (NRC or the Commission) staff published a proposed no significant hazards consideration (NSHC) determination in the *Federal Register* (82 FR 13672) for the proposed amendment. Subsequently, by letters dated September 29, November 16, and December 27, 2017, the licensee provided additional information that expanded the scope of the amendment request as originally noticed in the *Federal Register*. Accordingly, the NRC published a second proposed NSHC determination in the *Federal Register* on February 21, 2018 (83 FR 7500), which superseded the original notice in its entirety. The supplement dated May 11, 2018, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC, the Commission) staff's proposed no significant hazards consideration determination as published in the *Federal Register* on February 21, 2018 (83 FR 7500).

The proposed changes would revise the Watts Bar, Units 1 and 2, TSs to provide time to correct rod movement failures that do not affect operability, provide an alternative to frequent verification of rod position using the movable incore detectors, and allow time for thermal equilibrium of analog rod position indication. The proposed changes would also align requirements of TS 3.1.5, "Rod Group Alignment Limits," and TS 3.1.8, "Rod Position Indication," eliminate an unnecessary Required Action (RA) from TS 3.1.8, and make some editorial improvements to TSs 3.1.5, 3.1.6, "Shutdown Bank Insertion Limits," 3.1.7, "Control Bank Insertion Limits," and 3.1.8. The changes are in accordance with the NRC-approved Technical Specifications Task Force (TSTF) Traveler TSTF-547, Revision 1, "Clarification of Rod Position Requirements," dated March 4, 2016 (ADAMS Package Accession No. ML16012A126). Variations are editorial in nature or align the Watts Bar TSs with previously

approved changes to the Standard Technical Specifications (STs) and are discussed in this safety evaluation (SE).

2.0 REGULATORY EVALUATION

2.1 Description of Rod Cluster Control Assemblies

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

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

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

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

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

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

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

2.2 Description of Proposed Changes

This SE addresses proposed changes to the TSs governing rod group alignment limits (TS 3.1.5), shutdown bank insertion limits (TS 3.1.6), control bank insertion limits (TS 3.1.7), and rod position indication instrumentation (TS 3.1.8). The specific proposed changes are described in the following subsections.

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

The limiting condition for operation (LCO) 3.1.6 requires that each shutdown bank shall be within insertion limits specified in the COLR. Current Condition A for "One or more shutdown banks not within limits," requires:

A.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$ within 1 hour.

OR

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

AND

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

LCO 3.1.7 requires that each control bank shall be within the insertion, sequence, and overlap limits specified in the COLR. Current Condition A for "Control bank insertion limits not met" requires:

A.1.1 Verify SDM is $\geq 1.6\% \Delta k/k$ within 1 hour.

OR

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

AND

- A.2 Restore control bank(s) to within limits within 2 hours.

The proposed change would add a new Condition A to LCO 3.1.6 that would require, with "One shutdown bank inserted ≤ 10 steps beyond the insertion limits specified in the COLR":

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

AND

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

OR

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

AND

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

The existing Condition A would be renumbered as Condition B and would be modified to apply for one or more shutdown banks not within limits for reasons other than Condition A. The existing RAs A.1.1, A.1.2, and A.2 would be renumbered B.1.1, B.1.2, and B.2. Renumbered RA B.1.1 would be modified from " $\geq 1.6\% \Delta k/k$ " to "within the limits specified in the COLR," as discussed in Sections 2.2.7 and 3.7 of this SE. The existing Condition B and RA B.1 would be renumbered Condition C and RA C.1.

The proposed change would add a new Condition A to LCO 3.1.7 that would require, with "Control bank A, B, or C inserted ≤ 10 steps beyond the insertion, sequence, or overlap limits specified in the COLR":

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

AND

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

OR

- A.2.2 Initiate boration to restore SDM to within limits within one hour.

AND

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

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

would be modified from " $\geq 1.6\% \Delta k/k$ " to "within the limits specified in the COLR," as discussed in Sections 2.2.7 and 3.7 of this SE.

The existing Condition B would be renumbered as Condition C and would be modified to apply for "Control bank sequence or overlap limits not met for reasons other than Condition A." The existing RAs B.1.1, B.1.2, and B.2 would be renumbered C.1.1, C.1.2, and C.2. The existing Condition C and RA C.1 would be renumbered Condition D and RA D.1. Renumbered RA C.1.1 would be modified from " $\geq 1.6\% \Delta k/k$ " to "within the limits specified in the COLR," as discussed in Sections 2.2.7 and 3.7 of this SE.

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

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

2.2.2 Provide an Alternative to Frequent Verification of Rod Position Using the Movable Incore Detectors or Power Distribution Monitoring System

The Watts Bar, Unit 1, TSs refer to the "Analog Rod Position Indication," or "ARPI," System. In its application, the licensee included an editorial change to delete "Analog" and replace "ARPI" with "RPI." In describing the existing TS requirements, this SE uses "Rod Position Indication" or "RPI" to refer to both Units' TS requirements.

LCO 3.1.8 requires that the RPI and the Demand Position Indication Systems shall be operable in Modes 1 and 2. Condition A applies for "One RPI per group inoperable for one or more groups." The associated RAs are:

- A.1 Verify the position of the rods with inoperable position indicators by using [Unit 1: either the movable incore detectors or the PDMS [power distribution monitoring system]; Unit 2: the PDMS] once per 8 hours.

OR

- A.2.1 Verify the position of the rod with the inoperable position indicator by using [Unit 1: either the movable incore detectors or the PDMS; Unit 2: the PDMS] once within 8 hours, once every 31 days thereafter, AND within 8 hours, if rod control system parameters indicate unintended movement.

AND

- 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 within 16 hours AND once per 8 hours thereafter.

AND

- A.2.3 Verify the position of the rod with an inoperable position indicator by using [Unit 1: either the moveable incore detectors or the PDMS; Unit 2: the PDMS]

within 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 [rated thermal power] and within 8 hours of reaching 100% RTP.

OR

A.3 Reduce THERMAL POWER to less than or equal to 50% RTP within 8 hours.

Existing Condition A is modified by a note which states:

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.

The proposed change would modify the RAs of Condition A and delete the Note modifying Condition A. The revised RAs would be:

A.1 Verify the position of the rods with inoperable RPI indirectly by using [Unit 1: either the moveable incore detectors or the PDMS; Unit 2: the PDMS] once per 8 hours.

OR

A.2 Verify the position of the rods with the inoperable RPI indirectly by using [Unit 1: either the moveable incore detectors or the PDMS; Unit 2: the PDMS] within 8 hours, AND once every 31 EFPD [effective full-power days (days of full power operation)] thereafter, AND within 8 hours after discovery of each unintended rod movement, AND within 8 hours after each movement of rod with inoperable RPI > 12 steps, AND prior to THERMAL POWER exceeding 50% RTP, AND within 8 hours after reaching RTP.

OR

A.3 Reduce THERMAL POWER to \leq 50% RTP within 8 hours.

LCO 3.1.5 requires, in part, that all individual indicated rod positions shall be within 12 steps of their group step counter demand position. 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. When one RPI channel per group fails, the position of the rod may still be determined indirectly by use of the movable incore detectors for Unit 1 or the PDMS for either unit.

Current Surveillance Requirement (SR) 3.1.5.1 requires the licensee to "Verify individual rod positions within alignment limit" every 12 hours, and once within 4 hours and every 4 hours thereafter when the rod position deviation monitor is inoperable. This SR is proposed to be modified by adding the following Note: "Not required to be performed for rods associated with

inoperable rod position indicator or demand position indicator,” meaning that the SR is not applicable for rods with an inoperable RPI.

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

2.2.3 Allow Time for Thermal Equilibrium of Analog RPI

The accuracy of the analog RPI System is affected by rod temperatures. With this effect, movement of associated rods may make the indications of the analog RPI System inaccurate. The proposed revision would allow a 1-hour period for the drive shaft to reach thermal equilibrium following rod movement to ensure the accuracy of the analog RPI indications, prior to requiring verification of compliance with TS limits. This change would affect SR 3.1.5.1, SR 3.1.6.1, SR 3.1.7.2, SR 3.1.7.3, and LCO 3.1.8.

SR 3.1.5.1 requires the licensee verification that individual rods are within the alignment limits every 12 hours, AND once within 4 hours and every 4 hours thereafter when the rod position deviation monitor is inoperable. The proposed change would add the following Note to the SR: “Not required to be performed until 1 hour after associated rod motion.”

SR 3.1.6.1 requires verification that each shutdown bank is within the insertion limits specified in the COLR every 12 hours. The proposed change would add the following note to the SR: “Not required to be performed until 1 hour after associated rod motion.”

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

SR 3.1.7.2 requires verification that each control bank is within the insertion limits specified in the COLR every 12 hours, AND once within 4 hours and every 4 hours thereafter when the rod insertion limit monitor is inoperable. The proposed change would add the following Note to the SR: “Not required to be performed until 1 hour after associated rod motion.”

Verification of the control bank insertion limits at a frequency of 12 hours is sufficient to detect control banks that may be approaching the insertion limits since, normally, very little rod motion occurs in 12 hours.

SR 3.1.7.3 requires verification that the sequence and overlap limits specified in the COLR are met for control banks not fully withdrawn from the core every 12 hours. The proposed change would add the following Note to the SR: “Not required to be performed until 1 hour after associated rod motion.”

When control banks are maintained within their insertion limits as verified by SR 3.1.7.2, it is unlikely that their sequence and overlap will not be in accordance with requirements provided in the COLR. A frequency of 12 hours is consistent with the insertion limit verification in SR 3.1.7.2.

LCO 3.1.8 requires that the RPI and the Demand Position Indication Systems shall be operable in Modes 1 and 2. LCO 3.1.8 would be revised to add the following Note: "Individual RPIs are not required to be OPERABLE for 1 hour following movement of the associated rods."

2.2.4 Clarify SRs in TS 3.1.5 and TS 3.1.8

LCO 3.1.5 specifies that "All shutdown and control rods shall be OPERABLE, with all individual indicated rod positions within 12 steps of their group step counter demand position."

SR 3.1.5.1 requires verifying individual rod positions are within the alignment limits once per 12 hours, and once within 4 hours and every 4 hours thereafter when the rod position deviation monitor is inoperable. The proposed change is the addition of a Note to SR 3.1.5.1 stating that the SR is not required to be performed for rods associated with an inoperable rod position indicator or demand position indicator. This Note would be added because SR 3.1.5.1 cannot be performed for rods with an inoperable demand position indicator.

SR 3.1.8.1 requires verification that each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel. The proposed change is the addition of a Note to SR 3.1.8.1 stating that the SR would not be required to be met for RPIs associated with rods that do not meet LCO 3.1.5.

2.2.5 Other Proposed Changes

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

1. LCO 3.1.5, Condition B, would be revised to eliminate RA B.1 and to combine RAs B.2.4 and B.2.5. Condition B applies when one rod is not within the alignment limits and RA B.1 requires restoring the rod to within limits within 1 hour. An alternative set of RAs is provided in the RA section, and will continue to be required when Condition B is applicable. RA B.1 is an Action that requires restoration of equipment such that the Condition does not apply. Restoring equipment to operable status is understood to be an option. Therefore, stating this as an RA is not necessary.

Combining RAs B.2.4 and B.2.5 is editorial and has no technical implications.

2. LCO 3.1.6 and LCO 3.1.7 contain a note modifying their Applicability that states "This LCO is not applicable while performing SR 3.1.5.2." The proposed change moves the LCO 3.1.6 and LCO 3.1.7 Applicability Notes to LCO Notes and revises the Notes to state, "Not applicable to shutdown banks inserted while performing SR 3.1.5.2," for LCO 3.1.6 and "Not applicable to control banks inserted while performing SR 3.1.5.2," for LCO 3.1.7. This change clarifies the note and does not alter its meaning.
3. TS 3.1.8 would be revised to consistently use the defined abbreviation "RPI." This affects the LCO (Unit 1 only), Actions Note, Condition A (Unit 1 only), RA A.1, RA A.2.1, Condition C, RA C.1, and RA D.1.1 (Unit 1 only).
4. TS 3.1.8, Condition A, would be revised from "for one or more groups" to the more standard terminology "in one or more groups," and TS 3.1.8, new Condition B, would include the phrase "in one or more groups" to be consistent with the wording of Condition A.

5. TS 3.1.8, Condition C (current Watts Bar Condition B) would be revised to contain similar terminology to Condition A and new Condition B. The current Condition B states, "One or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction since the last determination of the rod's position." Condition A and new Condition B are worded such that the condition describing the inoperable equipment (e.g., "One RPI per group inoperable...") is listed first. The proposed change rewords renumbered Condition C to state, "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."
6. TS 3.1.8, Condition D (current Watts Bar Condition C) would be revised from "One demand position indicator per bank inoperable for one or more banks" to "One or more demand position indicators per bank inoperable in one or more banks." The proposed change makes the terminology consistent with the Note modifying the RAs.

TS 3.1.8 would be modified by a Note which states, "Separate Condition entry is allowed for each inoperable RPI and each demand position indicator." The Bases for the Note state that the Note is acceptable because the RAs for each condition provide appropriate compensatory actions for each inoperable indicator.

There is one demand position indicator per group of rods. For banks with two groups of rods, there are two demand indicators per bank. The separate condition entry Note modifying the TS 3.1.8 Actions states that separate condition entry is allowed for inoperable demand position indicators, which means that the Condition D is applicable to more than one inoperable demand position indicator per bank. The proposed change makes the existing Condition D terminology consistent with the Note.

2.2.6 Variations from TSTF-547

The licensee identified several variations from the TS changes contained in TSTF-547, Revision 1:

1. The WBN, Units 1 and 2, TSs utilize different numbering than the STSs on which TSTF-547, Revision 1, was based. The following table summarizes the differences between the WBN, Units 1 and 2, TS numbering and the TSTF-547, Revision 1, numbering.

TSTF-547, Rev. 1	WBN Unit 1	WBN Unit 2
TS 3.1.4, "Rod Group Alignment Limits"	TS 3.1.5, "Rod Group Alignment Limits"	TS 3.1.5, "Rod Group Alignment Limits"
TS 3.1.5, "Shutdown Bank Insertion Limits"	TS 3.1.6, "Shutdown Bank Insertion Limits"	TS 3.1.6, "Shutdown Bank Insertion Limits"
TS 3.1.6, "Control Bank Insertion Limits"	TS 3.1.7, "Control Bank Insertion Limits"	TS 3.1.7, "Control Bank Insertion Limits"
TS 3.1.7, "Rod Position Indication"	TS 3.1.8, "Rod Position Indication"	TS 3.1.8, "Rod Position Indication"

The use of different numbering does not affect the applicability of TSTF-547, Revision 1, to the WBN, Units 1 and 2, TSs.

2. TSTF-547, Revision 1, TS 3.1.7, "Rod Position Indication," Required Actions A.1 and C.1 discuss indirect verification of rod position by using movable incore detectors when the rod position indication system is inoperable. As described in Section 7.7.1.9 of the WBN Dual Unit Updated Final Safety Analysis Report, WBN, Units 1 and 2, have a PDMS that can be utilized to obtain a three-dimensional power distribution measurement to indirectly provide rod position verification.

WBN Unit 1 has the ability to indirectly verify rod position utilizing either a movable incore system or the PDMS (NRC letters to TVA dated September 20, 2005, and October 27, 2009 (ADAMS Accession Nos. ML052300162 and ML092710381, respectively)). WBN Unit 2 uses the fixed incore system as input to PDMS to indirectly verify rod position (Watts Bar Nuclear Plant Unit 2, Technical Specification 3.1.8, "Rod Position Indication," Facility Operating License No. NPF-96, dated October 22, 2015 (ADAMS Accession No. ML15251A587)). Accordingly, the proposed WBN, Units 1 and 2, TSs 3.1.8, "Rod Position Indication," and associated TS Bases refer to utilizing the PDMS or moveable incore detectors for WBN Unit 1 and the PDMS for WBN Unit 2 in order to provide indirect verification of rod position for an inoperable rod indicator.

TVA states that the variation from TSTF-547 to continue allowing the use of the PDMS to indirectly verify rod position does not affect the applicability of TSTF-547, Revision 1, to the WBN, Units 1 and 2, TSs.

3. TSTF-547, Revision 1, SR 3.1.4.3 contains a value for T_{avg} of 500°F, whereas the current WBN value (in SR 3.1.5.3) is 551°F. The temperature of 551°F represents a WBN Unit 1 plant-specific historical artifact of the licensing evolution process as the WBN Unit 1 TS transitioned from NUREG-0452, Revision 4, to NUREG-1431, Revision 0 (the Westinghouse STSs), which kept the value at 551°F. The SR to demonstrate rod drop time was initially based on performing the test with all reactor coolant pumps operating and the average moderator temperature $\geq 551^\circ\text{F}$ to simulate a reactor trip under actual conditions. WBN Unit 2 also specifies the 551°F temperature.

TVA states that the variation of the temperature specified in SR 3.1.4.3 (TVA proposed SR 3.1.5.3) is consistent with the current licensing basis of the plants and does not affect the applicability of TSTF-547, Revision 1, to the WBN, Units 1 and 2, TSs.

4. Incorporation of specific WBN minor format variations:
 - Indentation of "OR" between TS 3.1.5, RAs B.1.1 and B.1.2.
 - Addition of the word "overlap" in TS 3.1.7, RA A.3, which was inadvertently left out of the TSTF-547 template. Note that the word "overlap" is correctly contained in and consistent with LCO 3.1.7, TS 3.1.7, Conditions A and C, TS 3.1.7 RA C.2, and SR 3.1.7.3.

These differences are administrative and do not affect the applicability of TSTF-547, Revision 1, to the WBN, Units 1 and 2, TSs.

5. The proposed changes to the TS pages for Condition A of WBN, Units 1 and 2, TSs 3.1.6 and TS 3.1.7 replace the bracketed “inserted \leq 16 steps” with “inserted \leq 10 steps.” As noted in TSTF-547, Revision 1, and the NRC Safety Evaluation (NRC letter to TSTF dated March 4, 2016 (ADAMS Accession Nos. ML16012A130 and ML15328A350)), the number 16 is bracketed and it is to be replaced with the plant-specific minimum number of steps that the rods must be moved to perform SR 3.1.5.2. As noted in Item 1, TS 3.1.4 in TSTF-547, Revision 1, corresponds to WBN, Units 1 and 2, TSs 3.1.5. Correspondingly, WBN, Units 1 and 2, SRs 3.1.5.2 state “Verify rod freedom of movement (trippability) by moving each rod not fully inserted in the core \geq 10 steps in either direction.” Therefore, the proposed changes to WBN, Units 1 and 2, TSs 3.1.6 and 3.1.7 are consistent with WBN, Units 1 and 2, SRs 3.1.5.2. As noted in the Bases for WBN, Units 1 and 2, SRs 3.1.5.2, moving each control rod by 10 steps will not cause radial or axial power tilts, or oscillations, to occur. The number of steps in WBN, Units 1 and 2, SRs 3.1.5.2 is also consistent with SR 3.1.4.2 in the Westinghouse STSs in NUREG-1431, Revision 4, “Standard Technical Specifications Westinghouse Plants” (ADAMS Accession No. ML12100A222).
6. The following proposed WBN TS changes are consistent with the Westinghouse STSs, but are not identified as changes in TSTF-547, Revision 1.

WBN, Units 1 and 2, TSs	Description of Proposed Change	Licensee’s Justification for Proposed Change
3.1.5 LCO	<p>Changed “All shutdown and control rods shall be OPERABLE, with all individual indicated rod positions within 12 steps of their group step counter demand position” to</p> <p>“All shutdown and control rods shall be OPERABLE</p> <p><u>AND</u></p> <p>Individual indicated rod positions shall be within 12 steps of their group step counter demand position”</p>	This change is consistent with the Westinghouse STS and is editorial in nature to clarify the applicability of the LCO.
3.1.5, Condition A	Changed “one or more rod(s) untrippable” to “one or more rod(s) inoperable”	This change is consistent with the Westinghouse STS and TSTF-9-A, Revision 1 (ADAMS Accession No. ML040400130), which was approved by NRC in NRC letter to the Nuclear Energy Institute (NEI) dated September 27, 1996 (Legacy Accession No. 9610030183).

WBN, Units 1 and 2, TSs	Description of Proposed Change	Licensee's Justification for Proposed Change
3.1.5, RA B.4	Added SR 3.2.1.2	This change is consistent with the Westinghouse STS and the current WBN TS Bases B3.1.5, and RAs B.2.2, B.2.3, B.2.4, B.2.5, and B.2.6.
<p>3.1.5, RAs A.1.1, B.1.1, B.3, and D.1.1</p> <p>3.1.6, RA B.1.1</p> <p>3.1.7, RA B.1.1 and C.1.1</p>	<p>"Verify SDM is $\geq 1.6\% \Delta k/k$" was changed to "Verify SDM to be within the limits specified in the COLR."</p>	<p>This change is consistent with the Westinghouse STS and TSTF-9-A, Revision 1.</p> <p>The COLR process reduces the burden on the licensees and the NRC from processing changes to cycle-specific parameter limits in TSs for each fuel cycle, provided the limits are developed using an NRC-approved methodology. TVA will revise the COLR for WBN, Units 1 and 2, to relocate the SDM limits in the following TSs to the COLR:</p> <ul style="list-style-type: none"> • 3.1.5, "Rod Group Alignment Limits" • 3.1.6, "Shutdown Bank Insertion Limits" • 3.1.7, "Control Bank Insertion Limits"
SR 3.1.5.3	<p>Revised the frequency from:</p> <p>"Prior to reactor criticality after initial fuel loading and each removal of the reactor head"</p> <p>to</p> <p>"Prior to criticality after each removal of the reactor head"</p>	This change is consistent with the Westinghouse STS. Initial fuel loading has been completed for WBN, Units 1 and 2.

WBN, Units 1 and 2, TSs	Description of Proposed Change	Licensee's Justification for Proposed Change
3.1.6	<p>The Applicability Statement was revised from:</p> <p>"MODE 1, MODE 2 with any control bank not fully inserted."</p> <p>to</p> <p>"MODES 1 and 2"</p>	<p>This change is consistent with the Westinghouse STS and TSTF-239-A, Revision 0, "Correct shutdown bank insertion limits applicability" (ADAMS Accession No. ML040611057). As noted in TSTF-239, "the Applicability is changed to simply 'Mode 1 and Mode 2.' This does not result in any actual change to the requirements but simplifies the specifications. Appropriate Bases changes were also made."</p>
SR 3.1.6.1 (Unit 1 only)	<p>The surveillance was revised to add "insertion" between "the" and "limits"</p>	<p>This change is consistent with the WBN, Unit 2, TS and the Westinghouse STS.</p>
3.1.7, RA D.1	<p>Revised "Be in MODE 3" to "Be in MODE 2 with $k_{eff} < 1.0$."</p>	<p>This change is consistent with the current Applicability Statement for TS 3.1.7 and the Westinghouse STS.</p>
3.1.8, Condition A	<p>The Note for Condition A has been deleted.</p>	<p>The Note for Condition A was added in the WBN, Unit 1, TS in NRC License Amendment 58 (NRC Letter to TVA dated September 20, 2005 (ADAMS Accession No. ML052300162)) and was subsequently incorporated into the initial WBN, Unit 2, TS (ADAMS Accession No. ML15251A587). The Note currently states:</p> <p>"Rod position monitoring by Required Actions A.2.1 and A.2.2 may only be applied to one inoperable [Unit 1: ARPI; Unit 2: 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 [Unit 1: ARPI; Unit 2: 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</p>

WBN, Units 1 and 2, TSs	Description of Proposed Change	Licensee's Justification for Proposed Change
		<p>the inoperable [Unit 1: ARPI; Unit 2: RPI] could have safely been performed.”</p> <p>As noted in the licensee's May 11, 2018, supplement, LCO 3.0.4 a. permits entry into Mode 2 with an inoperable RPI by entering existing or revised TS 3.1.8, RAs A.1 or A.3, making the Note irrelevant. Furthermore, the portion of the Note that states “Rod position monitoring by Required Actions A.2.1 and A.2.2 may only be applied to one inoperable [Unit 1: ARPI; Unit 2: RPI]” is encompassed by the new TS 3.1.8, Condition B, that applies when more than one RPI per group is inoperable in one or more groups and requires restoration of the inoperable RPIs to operable status such that a maximum of one RPI per group is inoperable.</p>

WBN, Units 1 and 2, TSs	Description of Proposed Change	Licensee's Justification for Proposed Change
3.1.8, Condition B	Added new Condition B	<p>This change is consistent with TSTF-234-A, Revision 1, "Add Action for More Than One [D]RPI Inoperable," dated November 18, 1998 (ADAMS Accession No. ML040580468) that was approved by the NRC in NRC letter to NEI dated January 13, 1999 (Legacy Accession No. 9901210038), the Westinghouse STS, and TSTF-547, Revision 1. As noted in TSTF-234-A, Revision 1, the purpose of TSTF-234-A, Revision 1, was to:</p> <p>"Add new Action B to allow 24 hours to restore inoperability of more than one [D]RPI in a group."</p> <p>TSTF-234-A, Revision 1, further states:</p> <p>"The additional time to restore an inoperable [D]RPI is appropriate because the proposed Action would require that the control rods be under manual control, that RCS [Reactor Coolant System] T_{avg} be monitored and recorded hourly, and that rod position be verified indirectly every 8 hours using the moveable incore detectors, thereby assuring that the rod alignment and rod insertion LCOs are met. Therefore, the required shutdown margin will be maintained.</p> <p>Given the alternate position monitoring requirement, and other indirect means of monitoring changes in rod position (e.g., alarms on $T_{avg} - T_{ref}$ deviation), a 24 hour Completion Time to restore all but one [D]RPI per group provides sufficient time to restore Operability while minimizing shutdown transients during the time that the position indication system is degraded."</p>

WBN, Units 1 and 2, TSs	Description of Proposed Change	Licensee's Justification for Proposed Change
SR 3.1.8.1	<p>The SR frequency was revised from:</p> <p>“18 months”</p> <p>to</p> <p>“Once prior to criticality after each removal of the reactor head.”</p>	<p>This change is consistent with TSTF-89, “Change to Frequency of SR 3.1.8.1,” dated April 2, 1998 (ADAMS Accession No. ML040480046) that was approved by the NRC in NRC letter to NEI dated September 27, 1996 (Legacy Accession No. 9610030183), and the Westinghouse STS. As noted in TSTF-89:</p> <p>“SR 3.1.8.1 verifies that each DRPI agrees within 12 steps of the group demand position for the full indicated range of rod travel. This surveillance is performed during a plant outage or plant startup since there is potential for unnecessary plant transients if the SR is performed with the reactor at power. By not specifying a fixed frequency for this SR, any unit shutdown and reactor vessel head removal would require that the SR be performed again to verify that the operability of the rod position indicator systems has not been affected.”</p>

2.3 Regulatory Review

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

The NRC staff's guidance for the review of TSs is in Chapter 16, “Technical Specifications,” of NUREG-0800, Revision 3, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition” (March 2010) (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STSs for each of the LWR nuclear designs. NUREG-1431 contains the STSs for Westinghouse-designed plants.

3.0 TECHNICAL EVALUATION

As noted in Section 1.0 of this SE, the licensee's proposed changes are in accordance with TSTF-547, Revision 1. During the review of TSTF-547, the NRC staff reviewed the proposed changes to NUREG-1431 and the technical justification for the changes provided in Traveler TSTF-547. The NRC staff reviewed the technical justification for the proposed changes to ensure that the reasoning was logical, complete, and clearly written as described in Chapter 16 of NUREG-0800. The NRC staff also reviewed the proposed changes for continued compliance with the requirements of 10 CFR 50.36 and for consistency with conventional terminology and with the format and usage rules embodied in the STSs. In its SE for TSTF 547, Revision 1, the NRC staff did not specify any limitations or conditions for adoption of the Traveler by future applicants.

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

The proposed new Condition A of TSs 3.1.6 and 3.1.7 for shutdown and control bank insertion limits would allow 24 hours to restore a single bank to be within its insertion limit when inserted below the insertion limit. With one shutdown or control bank inserted a maximum of 10 steps below the rod insertion limit, the RAs associated with new Condition A would also require verification that all other shutdown (LCO 3.1.6, Condition A) and control (LCO 3.1.7, Condition A) banks are within the insertion limits; and verification that the reactor can be shut down using control rods or boration. The Completion Time for these RAs would be 1 hour.

The new conditions define limits of both duration and insertion if a bank is immovable due to failures external to the CRDM. A maximum of one control or shutdown bank may be inserted beyond the limits for a maximum of 24 hours provided all other banks are within the insertion limits and that the reactor could be shut down using control rods or boration. The new Condition A imposes a limit on the insertion of 10 steps less than the insertion limit. The licensee stated that the value of 10 steps corresponds to the minimum number of steps that the rods must be moved to ensure correct performance of SR 3.1.5.2.

The NRC staff reviewed the justification for the proposed addition of Condition A to TS 3.1.6 and TS 3.1.7 provided in the Technical Evaluation Section of Traveler TSTF-547, to ensure that the reasoning is logical, complete, and clearly written. The justification in Traveler TSTF-547 states:

1. All control and shutdown rod assemblies are required to be Operable. If a rod is untrippable (i.e., inoperable), then a plant shutdown is required in accordance with LCO 3.1.4 [Watts Bar LCO 3.1.5], Condition A.
2. Only one control bank and shutdown bank may be inserted beyond insertion limits by no more than [16] steps. If one or more control banks or shutdown banks exceed the insertion limit, a brief time period is permitted to correct the condition and then a plant shutdown is required.
3. If one rod is not within the alignment limits, adequate SDM is verified and a power reduction is required by LCO 3.1.4 [Watts Bar LCO 3.1.5], Condition B. If more than one rod is not within the alignment limit as defined in LCO 3.1.4 [Watts Bar LCO 3.1.5], adequate SDM is verified and a plant shutdown is required.

The insertion limits are established to ensure a sufficient amount of negative reactivity can be rapidly inserted to shut down the reactor. In accordance with the TSTF, the bracketed value in the TSTF was replaced in the licensee's proposal with the plant-specific minimum number of steps the rods must be moved to perform SR 3.1.5.2. The NRC staff finds that allowing continued full-power operations for 24 hours with a rod movement failure is acceptable for the following reasons:

1. the Shutdown Margin continues to be met;
2. all control and shutdown rods are trippable (i.e., capable of being rapidly inserted into the core);
3. only one bank may exceed insertion limits by no more than a specified number of steps;
4. all immovable rod assemblies are aligned; and
5. the rods must be restored to within the insertion limits within 24 hours.

The change to TS 3.1.6 and TS 3.1.7 to provide time to correct rod movement failures that do not affect operability will allow sufficient time for diagnosis and repairs while maintaining the safety function of the control rods since the affected rods are still trippable. The thermal margins may be affected by power distribution changes due to control rod bank insertion, both during the insertion and during the resulting local xenon transient. However, insertions at or near the typical value of 10 steps from fully withdrawn, as provided in the proposed changes to TSs 3.1.6 and 3.1.7, would result in a very small negative reactivity impact at the top of active fuel. The resulting effect on the axial power distribution is not expected to be significant. In addition, alignment of all rods with the rod bank position (as per LCO 3.1.5) must be maintained and it will be verified that the reactor can still be shutdown. Therefore, the NRC staff has determined that the proposed 24-hour completion time for Condition A in LCOs 3.1.6 and 3.1.7 specifying shutdown bank and control bank insertion limits is acceptable.

The NRC staff concludes that TS 3.1.6 and TS 3.1.7, as modified by the addition of Condition A, continue to specify the minimum performance level of equipment needed for safe operation of the facility as an LCO; and continue to specify the appropriate remedial measures if the LCO is not met. SRs are not being changed by the addition of Condition A. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) continue to be met because the minimum performance level of equipment needed for safe operation of the facility is contained in the LCO and the appropriate remedial measures are specified if the LCO is not met.

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

LCO 3.1.8 requires that the RPI and the Demand Position Indication Systems be operable in Modes 1 and 2. When one or more RPI per group are inoperable for one or more groups, current TS 3.1.8 requires verification of rod position once per 8 hours using the movable incore detector system or PDMS for Unit 1, or the PDMS for Unit 2, or reduce thermal power to less than or equal to 50 percent RTP within 8 hours. The proposed change would provide an alternative set of RAs.

New RA A.2 would require the use of the movable detector system or PDMS for Unit 1, or the PDMS for Unit 2, to verify indirectly the position of the rod within 8 hours of the inoperability of

RPI, 8 hours after discovery of each unintended rod movement, 8 hours after each greater than 12 step movement of a rod with inoperable RPI, prior to exceeding 50 percent RTP, 8 hours after reaching RTP, and once per 31 EFPDs thereafter.

The implementation of new RA A.2 would allow the use of an alternative monitoring scheme. The NRC staff finds that the new RA A.2 and Completion Time is appropriate because it requires verification of rod position following circumstances in which rod motion could occur. This is a more tailored approach than current TS 3.1.8 RA A.1, which requires verification of rod position using the movable incore detection system or PDMS for Unit 1, or the PDMS for Unit 2, once per 8 hours, regardless of whether the rods have moved.

If the rod position indication is failed for an individual rod, its position is determined indirectly by the use of the movable incore detectors or PDMS for Unit 1, or the PDMS for Unit 2. The NRC staff has determined that this change, which verifies rod position using the movable incore detectors or PDMS for Unit 1, or the PDMS for Unit 2, based on the occurrence of events requiring rod motion, rather than determining position on a specified frequency, is acceptable because events requiring rod motion of the shutdown banks and control banks A, B, and C are relatively infrequent during steady state operation. Events involving significant movement of rods in control bank D are also relatively infrequent. The indirect determination of rod position is required after significant changes in power level or following substantial rod motion.

The addition of the Note to SR 3.1.5.1 stating that the SR is not required to be performed for rods associated with an inoperable RPI is appropriate because the RAs of TS 3.1.8 for an inoperable RPI provide the appropriate actions for indirectly determining the position of the affected rods.

The NRC staff concludes that the addition of an alternative monitoring scheme to indirectly determine the position of rods associated with an inoperable RPI is acceptable. TS 3.1.8, as modified, continues to specify the minimum performance level of equipment needed for safe operation of the facility as an LCO and continues to specify the appropriate remedial measures if the LCO is not met. The revised SR 3.1.5.1, which has been clarified to specify when it is required to be performed, continues to be an appropriate test to ensure that the necessary quality of systems is maintained. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) continue to be met because the minimum performance level of equipment needed for safe operation of the facility is contained in the LCO and the appropriate remedial measures are specified if the LCO is not met. The NRC staff finds that the requirements of 10 CFR 50.36(c)(3) continue to be met because the revised SR provides the appropriate testing to ensure the necessary quality of components is maintained and that the LCO will be met.

3.3 Allow Time for Thermal Equilibrium of Analog RPI Review

Several changes are proposed to allow a 1-hour period for the drive shaft to reach thermal equilibrium following rod movement to ensure accuracy of the RPI analog indications to verify TS limits. LCO 3.1.8 would be revised with a Note that individual RPIs are not required to be operable for 1 hour following rod motion. SRs 3.1.5.1, 3.1.6.1, 3.1.7.2 and 3.1.7.3 would be revised so that they are not required to be performed until 1 hour after the associated rod motion.

The 1-hour period is based on the necessary time to allow the rod drive shaft to reach thermal equilibrium following rod motion. There are thermal effects that cause the analog position indicators to drift following rod motion. During this period prior to establishment of thermal equilibrium, the indicators could be unstable and could indicate an inaccurate rod position. The

provision to allow a 1-hour period to reach thermal equilibrium ensures that actions are not taken based on an inaccurate indication of rod position, which could lead to unnecessary transients. During this 1-hour period, the Demand Position Indication System would be available to indicate the demand position of the rods.

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

The NRC staff concludes that TS 3.1.8, as modified by the addition of a Note, continues to specify the minimum performance level of equipment needed for safe operation of the facility, and continues to specify the appropriate remedial measures if the LCO is not met. The changes to the SRs ensure that the SRs are performed when the position indication system has achieved thermal stability following rod motion. Therefore, the SRs would continue to ensure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) and 10 CFR 50.36(c)(3) continue to be met.

3.4 Clarify SRs in TS 3.1.5 and TS 3.1.8 Review

3.4.1 Clarification of SR 3.1.5.1

LCO 3.1.5 requires that all shutdown and control rods shall be operable and individual indicated rod positions shall be within 12 steps of their group step counter demand position. SR 3.1.5.1 requires verification of the individual rod positions within the alignment limit periodically. SR 3.1.5.1 cannot be performed for rods with an inoperable bank demand position indicator. Failure to meet an SR is considered a failure to meet an LCO requirement. Therefore, if SR 3.1.5.1 cannot be performed, entry into LCO 3.1.5 Condition D is required. LCO 3.1.5 Condition D applies when more than one rod is not within the alignment limit. The RA associated with Condition D requires, in part, that the reactor be in Mode 3 (Hot Standby) within 6 hours.

LCO 3.1.8 requires the RPI and the Demand Position Indication Systems to be operable. Renumbered LCO 3.1.8 Condition D applies if one demand position indicator per bank is inoperable for one or more banks. The Condition D RAs require verification that all RPIs for the affected banks are operable and require verification that the most withdrawn rod and least withdrawn rod of the affected banks are less than or equal to 12 steps apart once per 8 hours. Alternatively, thermal power must be reduced to less than or equal to 50 percent RTP.

A Note would be added to SR 3.1.5.1 stating that this SR is not required to be performed for rods associated with an inoperable RPI or demand position indicator. The alignment limit is based on the demand position indicator. If the bank demand position indicator is inoperable, the SR cannot be performed.

Following the proposed modification of SR 3.1.5.1, Condition D of LCO 3.1.8 would be the applicable Condition to be entered in the event of inoperable demand position indicators. The RAs associated with Condition D of LCO 3.1.8 provide the appropriate actions in this situation by requiring that the RPIs are operable and that the individual rods in the bank are not misaligned by more than 12 steps.

3.4.2 Clarification of SR 3.1.8.1

LCO 3.1.5 requires that all shutdown and control rods shall be operable and individual indicated rod positions shall be within 12 steps of their group step counter demand position.

LCO 3.1.8 requires the RPI and the Demand Position Indication Systems to be operable.

SR 3.1.8.1 requires verification that each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel. This SR is performed once prior to criticality after each removal of the reactor head. Failure to meet an SR is considered a failure to meet the LCO per SR 3.0.1. The requirements of SRs must be satisfied in between performances of the surveillance test itself. Therefore, if a control or shutdown rod is not within 12 steps of its bank demand position indication, then the requirements of both LCO 3.1.5 and LCO 3.1.8 are not met.

A Note would be added to SR 3.1.8.1 stating that this SR is not required to be performed for RPIs associated with rods that do not meet LCO 3.1.5. If a rod is known not to be within 12 steps of the group demand position, LCO 3.1.5 provides the appropriate RAs. With one rod not within the alignment limit, LCO 3.1.5 Condition B requires verification of SDM or boration until SDM is met; a reduction in RTP, periodic re-verification of SDM, verification that heat flux and nuclear enthalpy rise hot channel factors are within limits, and safety analyses must be re-evaluated to confirm results remain valid for the duration of operation under these conditions. If more than one rod is not within the alignment limit, the SDM must be determined by verifying that the SDM is within limits or by initiating boration to restore required SDM and plant shutdown is required.

3.4.3 Evaluation of SR 3.1.5.1 and SR 3.1.8.1 Changes

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

TS 3.1.5 provides limits on rod alignment to ensure acceptable power peaking factors and local linear heat rates and an acceptable shutdown margin, all of which are initial conditions in the applicable safety analyses. It is appropriate to consolidate requirements associated with rod misalignments in this TS. TS 3.1.8 provides requirements for instrumentation to monitor rod position. The instrumentation is used to verify that the rod alignment limits in TS 3.1.5 are satisfied. Similarly, it is appropriate to consolidate requirements associated with instrumentation operability in this TS.

The NRC staff concludes that the clarifications to SRs 3.1.5.1 and 3.1.8.1 to specify configurations in which performance of the SRs is not required are appropriate. The TSs, as modified, continue to specify the minimum performance level of equipment needed for safe operation of the facility as an LCO, and continue to specify the appropriate remedial measures if the LCO is not met. The revised SRs 3.1.5.1 and 3.1.8.1 continue to be appropriate, because they ensure the necessary quality of systems is maintained and that the LCOs will be met. The NRC staff finds that the requirements of 10 CFR 50.36(c)(2) and 10 CFR 50.36(c)(3) continue to be met.

3.5 Other Proposed Changes Review

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

1. LCO 3.1.5, Condition B, would be revised to eliminate RA B.1 and to combine RAs B.2.4 and B.2.5. Condition B applies when one rod is not within the alignment limits and RA B.1 requires restoring the rod to within limits within 1 hour. An alternative set of RAs is provided in the RA section, and will continue to be required when Condition B is applicable. RA B.1 is an Action that requires restoration of equipment such that the Condition does not apply. Restoring equipment to operable status is understood to be an option. Therefore, stating this as an RA is not necessary. Also, combining RAs B.2.4 and B.2.5 is editorial and has no technical implications.
2. LCO 3.1.6 and LCO 3.1.7 contain a note modifying their Applicability that states "This LCO is not applicable while performing SR 3.1.5.2." The proposed change moves the LCO 3.1.6 and LCO 3.1.7 Applicability Notes to LCO Notes and revises the Notes to state, "Not applicable to shutdown banks inserted while performing SR 3.1.5.2" for LCO 3.1.6 and "Not applicable to control banks inserted while performing SR 3.1.5.2" for LCO 3.1.7. This change clarifies the note and does not alter its meaning.
3. TS 3.1.8 would be revised to consistently use the defined abbreviation "RPI." This affects the LCO (Unit 1 only), Actions Note, Condition A (Unit 1 only), RA A.1, RA A.2.1, Condition C, RA C.1, and RA D.1.1 (Unit 1 only).
4. TS 3.1.8, Condition A, would be revised from "for one or more groups" to the more standard terminology "in one or more groups," and TS 3.1.8, new Condition B, would include the phrase "in one or more groups" to be consistent with the wording of Condition A.
5. TS 3.1.8, Condition C (current Watts Bar Condition B), would be revised to contain similar terminology to Condition A and new Condition B. The existing Condition B states, "One or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction since the last determination of the rod's position." Conditions A and new Condition B are worded such that the condition describing the inoperable equipment (e.g., "One RPI per group inoperable...") is listed first. The proposed change rewords renumbered Condition C to state, "One or more RPI inoperable in one or more groups and associated rods have been moved > 24 steps in one direction since the last determination of the rod's position."
6. LCO 3.1.8, Condition D (current Condition C), would be revised from "One demand position indicator per bank inoperable for one or more banks" to "One or more demand position indicators per bank inoperable in one or more banks." The proposed change makes the terminology consistent with the Note modifying the RAs.

The current TS 3.1.8 would be modified by a Note which states, "Separate Condition entry is allowed for each inoperable RPI and each demand position indicator." The Bases for the Note state that the Note is acceptable because the RAs for each condition provide appropriate compensatory actions for each inoperable indicator.

There is one demand position indicator per group of rods, two demand indicators per bank in those banks with two groups. The separate condition entry Note modifying the

TS 3.1.8 Actions states that separate condition entry is allowed for inoperable demand position indicators which means that Condition D is applicable to more than one inoperable demand position indicator per bank. The proposed change makes the Condition D terminology consistent with the Note.

The regulation at 10 CFR 50.36(a)(1) states, in part: "A summary statement of the bases or reasons for such specifications ... shall also be included in the application, but shall not become part of the technical specifications." Accordingly, along with the proposed changes, the licensee also submitted TS Bases changes that corresponded to the proposed TS changes for information only. The NRC staff verified that the licensee had included in the application TS Bases changes, but did not review the TS Bases changes.

3.6 Variations from TSTF-547 Review

The NRC staff reviewed the variations from TSTF-547 proposed by the licensee. Most of the variations are editorial in nature; however, TVA proposed some variations that are intended to align the Watts Bar, Units 1 and 2, TSs with previously approved changes to the STSs as discussed below.

TVA proposed a variation to revise TS 3.1.5, TS 3.1.6, and TS 3.1.7 to reference the COLR for the SDM limit in lieu of specifying the limit in the TS. The proposed change represents a partial adoption of TSTF-9-A, Revision 1, "Relocate value for shutdown margin to COLR." However, the licensee did not propose a complete relocation of the cycle-specific SDM to the COLR in accordance with the TSTF. The cycle-specific value is still specified in the following TSs:

- TS 3.1.1, "Shutdown Margin (SDM) - $T_{avg} > 200^{\circ}\text{F}$ "
- TS 3.1.2, "Shutdown Margin (SDM) - $T_{avg} \leq 200^{\circ}\text{F}$ "
- TS 3.1.9, "PHYSICS TESTS Exceptions – MODE 1"
- TS 3.1.10, "PHYSICS TESTS Exceptions – MODE 2"

The proposed change aligns TS 3.1.5, TS 3.1.6, and TS 3.1.7 with the STSs. TVA will revise the COLR for Watts Bar, Units 1 and 2, to include the SDM limits for the purpose of referencing from the revised TSs. However, because the SDM value remains in the TSs listed above, a license amendment will be required prior to implementing any changes in the SDM limit. Therefore, the proposed change to reference the COLR for the SDM in TS 3.1.5, TS 3.1.6, and TS 3.1.7 is an editorial change.

TVA proposed a variation to revise the Applicability for TS 3.1.6. This change is consistent with TSTF-239, "Correct shutdown bank insertion limits applicability." Current TS 3.1.6 is applicable in Mode 1, and Mode 2 with any control bank not fully inserted. The reactivity condition in Mode 2 is defined as $k_{eff} \geq 0.99$ and, since the control banks must be withdrawn for k_{eff} to exceed 0.99, the qualification on the Mode 2 Applicability is meaningless and potentially confusing. To clarify the TS, the Applicability is changed to "MODES 1 and 2." This does not result in any actual change to the requirements, but simplifies the TSs. Therefore, the proposed change to the TS 3.1.6 Applicability is an editorial change that eliminates potential confusion.

In its supplement dated May 11, 2018, TVA revised the amendment request to address a recently identified issue in TSTF-547. Consequently, TVA is not requesting to add RA A.2.2 to TS 3.1.7 (Watts Bar TS 3.1.8) as proposed in TSTF-547. RA A.2.2 in TSTF-547 states "Restore inoperable RPI to OPERABLE status," with a Completion Time of "Prior to entering MODE 2 from MODE 3." The licensee stated that this RA was included in TSTF-547 in error. Because RAs A.1 and A.3 permit continued operation in the Applicability of TS 3.1.8 for an unlimited

period of time, LCO 3.0.4 a. may be used to enter Mode 2 from Mode 3. As RAs A.1, A.2, and A.3 are joined by a logical OR, a licensee could choose to follow RA A.2 (which includes A.2.1 and A.2.2). TSTF-547 did not propose to add a Note requiring the RA to be followed as an "otherwise stated" allowance in LCO 3.0.2, so RA A.2.2 would not apply in Mode 3 and would not be restrictive after Mode 2 is entered. For these reasons, the RA A.2.2 proposed in TSTF-547 is moot. Further, the RA is not needed to protect plant safety. As noted in Section 3.2 of this SE, the new RA A.2 and its Completion Time is a more tailored approach than the current Watts Bar TS 3.1.8 RA A.1, which requires verification of rod position once per 8 hours, regardless of whether the rods have moved. Therefore, the NRC staff finds it acceptable for the licensee to not add the RA A.2.2 proposed in TSTF-547.

TVA proposed a variation to add a new Condition B to TS 3.1.8 to allow additional time to restore an inoperable RPI. Watts Bar LCO 3.1.8 proposed new Condition B applies when more than one RPI per group is inoperable in one or more groups. New RA B.1 requires that the control rods be placed under manual control immediately and new RA B.2 requires restoring the inoperable position indicators to operable status such that a maximum of one RPI per group is inoperable within 24 hours.

This change is consistent with TSTF-234-A, "Add Action for More Than One [D]RPI Inoperable," as modified by TSTF-547. The proposed actions in TSTF-234-A require that the control rods be under manual control, that RCS T_{avg} be monitored and recorded hourly, that rod position be verified indirectly every 8 hours thereafter (thereby assuring that the rod alignment and rod insertion LCOs are met), and that position indicators be restored to operable status such that a maximum of one RPI per group is inoperable within 24 hours. These actions are intended to ensure that the required shutdown margin will be maintained. TSTF-547 proposed to delete the requirements proposed in TSTF-234-A to monitor and record RCS T_{avg} and to indirectly verify rod position every 8 hours; therefore, TVA is not proposing to adopt those required actions as proposed in TSTF-234-A.

The NRC staff determined that the requirement to monitor and record RCS T_{avg} provides no safety benefit for identifying trends in RCS T_{avg} . This requirement, proposed in TSTF-234-A, was intended to help assure that significant changes in power distribution and SDM are avoided. During normal steady state power operation, there is very little rod motion. LCO 3.1.8 new RA B.1 and new RA B.2 apply when more than one RPI per group is inoperable. LCO 3.1.5 and LCO 3.1.8 provide the appropriate requirements for monitoring rod position and alignment and provide the appropriate actions, if a rod is misaligned. This provides the necessary verification that SDM is maintained. The nuclear instrumentation monitors neutron flux in the core providing indication of changes in power distribution. Therefore, the NRC staff concludes that the requirement to monitor and record RCS T_{avg} , as proposed in TSTF-234-A, is unnecessary and does not need to be included in the licensee's proposed addition of LCO 3.1.8 new Condition B.

The proposed requirement in TSTF-234-A to indirectly verify rod position every 8 hours is redundant to LCO 3.1.8 RA A.1. Condition A applies when one RPI per group is inoperable and new Condition B applies when more than one RPI per group is inoperable. Each entry into Condition B also requires entry into Condition A. Therefore, restating the RA to indirectly verify rod position in new Condition B is not necessary.

Given the alternate position monitoring requirement, and other indirect means of monitoring changes in rod position (e.g., alarms on average versus reference temperature deviation), a 24-hour completion time to restore all but one RPI per group provides sufficient time to restore operability while minimizing shutdown transients during the time that the position indication

system is degraded. The proposed change to add Condition B to TS 3.1.8 is also consistent with the STSs.

TVA proposed a variation to revise the frequency of SR 3.1.8.1 from 18 months to "Once prior to criticality after each removal of the reactor head." This change is consistent with TSTF-89, "Change to Frequency of SR 3.1.8.1." SR 3.1.8.1 verifies that each RPI agrees within 12 steps of the group demand position for the full indicated range of rod travel. This surveillance is performed during a plant outage or plant startup since there is potential for unnecessary plant transients if the SR is performed with the reactor at power. By not specifying a fixed frequency for this SR, any unit shutdown and reactor vessel head removal would require that the SR be performed again to verify that the operability of the rod position indication systems has not been affected. The proposed change to the frequency for performing SR 3.1.8.1 is consistent with the STSs.

As summarized above, the staff determined that the proposed variations are editorial in nature or align the Watts Bar, Units 1 and 2, TSs with previously approved changes to the STSs, and do not impact the applicability or the conclusions presented in the SE of TSTF-547. The changes are, therefore, acceptable.

3.7 Summary of NRC Staff Conclusions

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

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendments on April 12, 2018. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on this finding published in the *Federal Register* on February 21, 2018 (83 FR 7500). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Robert Schaaf

Date: June 26, 2018

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 – ISSUANCE OF AMENDMENTS REGARDING ADOPTION OF TSTF-547, CLARIFICATION OF ROD POSITION REQUIREMENTS (CAC NOS. MF8912 AND MF8913; EPID L-2016-LLA-0034) DATED JUNE 26, 2018

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