



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

January 25, 2018

Mr. Joseph W. Shea
Vice President, Nuclear Regulatory Affairs
and Support Services
Tennessee Valley Authority
1101 Market Street, LP 4A
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – ISSUANCE OF AMENDMENT
REGARDING APPLICATION TO ALLOW INOPERABLE REACTOR COOLANT
SYSTEM LOOP 3 TEMPERATURE INDICATION FOR OPERATING CYCLE 2
(EPID L-2018-LLA-0003)

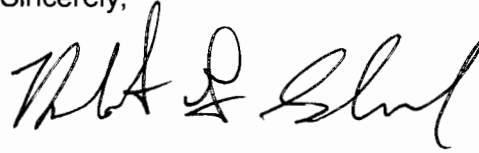
Dear Mr. Shea:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 19 to Facility Operating License No. NPF-96 for the Watts Bar Nuclear Plant, Unit 2. This amendment is in response to your application dated January 10, 2018, as supplemented by your letter dated January 17, 2018. The amendment revises the Facility Operating License and Technical Specification (TS) Table 3.3.4-1, "Remote Shutdown System." The amendment authorizes a one-time change to allow TS Table 3.3.4-1, Function 4a, Reactor Coolant System (RCS) hot leg Temperature Indication for RCS Loop 3 to be inoperable for the remainder of Watts Bar Unit 2 Operating Cycle 2.

The Tennessee Valley Authority requested this proposed TS change under exigent circumstances in accordance with Title 10 of the *Code of Federal Regulations* Section 50.91(a)(6). The finding of exigent circumstances and determination that the amendment involves no significant hazards considerations are addressed in Sections 4.0 and 5.0, respectively, of the enclosed safety evaluation.

Notice of issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in black ink, appearing to read "R. G. Schaaf", written in a cursive style.

Robert G. Schaaf, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

Enclosures:

1. Amendment No. 19 to NPF-96
2. Safety Evaluation

cc w/enclosures: Listserv



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. 19
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 January 10, 2018, as supplemented by letter dated January 17, 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 Operating License and 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. 19 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 January 28, 2018.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink, appearing to read 'Undine Shoop', followed by the word 'For' in a smaller, less distinct script.

Undine Shoop, 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: January 25, 2018

ATTACHMENT TO AMENDMENT NO. 19
WATTS BAR NUCLEAR PLANT, UNIT 2
FACILITY OPERATING LICENSE NO. NPF-96
DOCKET NO. 50-391

Replace the following pages of Operating License NPF-96 with the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

Remove Page

3
4

Insert Page

3
4

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

Remove Page

3.3-50
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Insert Page

3.3-50
3.3-50a

- 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. 19 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, 2017, 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:

TVA may make changes to the approved fire protection program without prior approval of the Commission, only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

- (9) By May 31, 2018, TVA shall report that a listing organization acceptable to the NRG (as the Authority Having Jurisdiction) has determined that the fire detection monitoring panel in the main control room either meets the appropriate designated standards or has been tested and found suitable for the specified purpose.
- (10) TVA will verify for each core reload that the actions taken if $F_Q^W(Z)$ is not within limits will assure that the limits on core power peaking $F_Q(Z)$ remain below the initial total peaking factor assumed in the accident analyses.
- (11) TVA will implement the compensatory measures described in Section 3.4, "Additional Compensatory Measures," of TVA letter CNL-18-012, dated January 17, 2018, during the timeframe the temperature indicator for RCS hot leg 3 is not required to be operable for the remainder of Cycle 2. If the RCS hot leg 3 temperature indicator is returned to operable status prior to the end of Cycle 2, then these compensatory measures are no longer required.

- D. The licensee shall have and maintain financial protection of such types and in such amounts as the Commission shall require in accordance with Section 170 of the Atomic Energy Act of 1954, as amended, to cover public liability claims.
- F. This license is effective as of the date of issuance and shall expire at midnight on October 21, 2055.

FOR THE NUCLEAR REGULATORY COMMISSION
original signed by

William M. Dean, Director
Office of Nuclear Reactor Regulation

- Appendices:
- 1. Appendix A –
Technical Specifications
 - 2. Appendix B –
Environmental Protection Plan

Date of Issuance: October 22, 2015

Table 3.3.4-1 (page 1 of 2)
Remote Shutdown System Instrumentation and Controls

FUNCTION/INSTRUMENT OR CONTROL PARAMETER	REQUIRED NUMBER OF FUNCTIONS
1. Reactivity Control	
a. Source Range Neutron Flux	1
b. Reactor Trip Breaker Position Indication	1 per trip breaker
2. Reactor Coolant System (RCS) Pressure Control	
a. Pressurizer Pressure Indication or RCS Wide Range Pressure Indication	1
b. Pressurizer Power Operated Relief Valve (PORV) Control and Pressurizer Block Valve Control	1 each per relief path
c. Pressurizer Heater Control	1
3. RCS Inventory Control	
a. Pressurizer Level Indication	1
b. Charging and Letdown Flow Control and Indication	1
4. Decay Heat Removal via Steam Generators (SGs)	
a. RCS Hot Leg Temperature Indication	1 per loop (Refer to Note A on page 2 of 2)
b. AFW Controls	1
c. SG Pressure Indication and Control	1 per SG
d. SG Level Indication and AFW Flow Indication	1 per SG
e. SG T_{sat} Indication	1 per SG
5. Decay Heat Removal via RHR System	
a. RHR Flow Control	1
b. RHR Temperature Indication	1

Table 3.3.4-1 (page 2 of 2)
Remote Shutdown System Instrumentation and Controls

Note A:

For Function 4a, the temperature indicator for RCS hot leg 3 is not required to be operable for the remainder of Cycle 2. If WBN Unit 2 enters Mode 3 or 4 prior to the Unit 2 Cycle 2 refueling outage, TVA will determine the cause of the inoperability of the temperature indicator for RCS hot leg 3 and the following actions will be taken:

1. If the problem is with the temperature modifier circuit, the temperature modifier circuit will be repaired or replaced, and the temperature indicator for RCS hot leg 3 will be restored to OPERABLE status prior to plant startup.
2. If the problem is with the thermocouple, the thermocouple will be repaired or replaced, if WBN Unit 2 enters Mode 5 prior to the Unit 2 Cycle 2 refueling outage, and the temperature indicator for RCS hot leg 3 will be restored to OPERABLE status prior to plant startup.

Regardless of the above actions, the temperature indicator for RCS hot leg 3 will be restored to OPERABLE status no later than the end of the Unit 2 Cycle 2 refueling outage.



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 19 TO FACILITY OPERATING LICENSE NO. NPF-96
TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT, UNIT 2
DOCKET NO. 50-391

1.0 INTRODUCTION

By letter dated January 10, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18010B043), as supplemented by a letter dated January 17, 2018 (ADAMS Accession No. ML18017A782), Tennessee Valley Authority (TVA), the licensee, submitted an exigent license amendment request to revise the Watts Bar Nuclear Plant (WBN or Watts Bar), Unit 2, Facility Operating License and Technical Specification (TS) 3.3.4, "Remote Shutdown System," to allow a one-time change to TS Table 3.3.4-1, Function 4a, "RCS [Reactor Coolant System] Hot Leg Temperature Indication," to allow the RCS Loop 3 hot leg temperature indication to be inoperable for the remainder of Operating Cycle 2.

On December 30, 2017, TVA declared temperature indicator (TI) 2-TI-68-43C inoperable and entered Condition A of TS 3.3.4. The current limiting condition for operation (LCO) has a 30-day completion time that expires on January 29, 2018. The temperature indicator provides indication in the Auxiliary Control Room (ACR) for the hot leg temperature of RCS Loop 3. After troubleshooting, the licensee determined that the problem has been isolated to either the temperature modifier circuit or the associated thermocouple, both of which are located inside the reactor building polar crane wall. Due to high radiation and challenging environmental conditions (temperature and humidity) in the area where the repair of the affected components needs to be performed, and the availability of redundant means to accomplish the required safety function, TVA requested the proposed TS change be approved by January 28, 2018. The licensee stated that approval of the proposed change would prevent an unnecessary plant shutdown.

The supplemental letter dated January 17, 2018, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in *The Rhea Herald-News* and *The Advocate & Democrat* on January 21, 2018, and *The Daily Post-Athenian*, on January 22 and January 23, 2018.

2.0 REGULATORY EVALUATION

2.1 System Description

The proposed TS change concerns indicators and parameters for the Remote Shutdown System Functions listed in Table 3.3.4-1 of the Watts Bar Unit 2 TSs. The Remote Shutdown System (also referred to as the Auxiliary Control System (ACS)) provides the control room operator with sufficient instrumentation and controls to place and maintain the unit in hot standby (Mode 3) from a location other than the main control room (MCR). Hot standby is a stable plant condition, automatically reached following a plant shutdown. In the event that access to the MCR is restricted, the plant can be safely kept at hot standby with the use of the indicators and controls of the ACS available in the ACR.

The ACS is required in the event that the MCR must be evacuated, either due to a control building fire that causes loss of safe shutdown control from the MCR or some other unspecified reason. With the unit in hot standby (Mode 3), the auxiliary feedwater (AFW) system and the steam generator (SG) safety valves or the SG atmospheric dump valves can be used to remove core decay heat to ensure that the plant remains in a safe condition in this mode. The RCS $T_{(hot)}$ indicators, as well as the other remote shutdown system indicators listed in TS Table 3.3.4-1 in the ACR, are used to ensure decay heat removal via the SGs and are used to set the reactor cooldown rate during safe shutdown.

2.2 Description of Proposed Change

LCO 3.3.4 specifies that "The Remote Shutdown System Functions in Table 3.3.4-1 shall be OPERABLE." Table 3.3.4-1 "Remote Shutdown System Instrumentation and Controls" lists the "Function/Instrument or Control Parameter" and the associated "Required Number of Functions." For "Decay Heat Removal via Steam Generators (SGs)," line 4.a. of Table 3.3.4-1 requires "1 per loop" for "RCS Hot Leg Temperature Indication."

The proposed change would add Note A to item 4.a. in Table 3.3.4-1, which states:

For Function 4a, the temperature indicator for RCS hot leg 3 is not required to be operable for the remainder of Cycle 2. If WBN Unit 2 enters Mode 3 or 4 prior to the Unit 2 Cycle 2 refueling outage, TVA will determine the cause of the inoperability of the temperature indicator for RCS hot leg 3 and the following actions will be taken:

1. If the problem is with the temperature modifier circuit, the temperature modifier circuit will be repaired or replaced, and the temperature indicator for RCS hot leg 3 will be restored to OPERABLE status prior to plant startup.
2. If the problem is with the thermocouple, the thermocouple will be repaired or replaced, if WBN Unit 2 enters Mode 5 prior to the Unit 2 Cycle 2 refueling outage, and the temperature indicator for RCS hot leg 3 will be restored to OPERABLE status prior to plant startup.

Regardless of the above actions, the temperature indicator for RCS hot leg 3 will be restored to OPERABLE status no later than the end of the Unit 2 Cycle 2 refueling outage.

The proposed change would also add a new License Condition 2.C.(11), which states:

TVA will implement the compensatory measures described in Section 3.4, "Additional Compensatory Measures," of TVA letter CNL-18-012, dated January 17, 2018, during the timeframe the temperature indicator for RCS hot leg 3 is not required to be operable for the remainder of Cycle 2. If the RCS hot leg 3 temperature indicator is returned to operable status prior to the end of Cycle 2, then these compensatory measures are no longer required.

The proposed change would remove the RCS Loop 3 T_(hot) indicator in the ACR from the set of instruments required to be operable for the remainder of the current operating cycle. Thus, rather than having to shut down the unit after exceeding the completion time of 30 days, the proposed change would allow continued operation for the remainder of the operating cycle, which ends in spring 2019.

The licensee compared the impact of not having the RCS Loop 3 T_(hot) indicator available to the potential consequences of shutting down the reactor in order to perform repairs. The licensee described shutting down the plant to repair the indicator as an unnecessary operational transient which could induce or require a plant trip that could challenge important safety systems, while the impact on safety of continued operation without the RCS Loop 3 T_(hot) indication was qualitatively assessed to be very low. The safety significance of the inoperable indicator is described and evaluated in Section 3.0 of this safety evaluation.

2.3 Applicable Regulatory Requirements

The Nuclear Regulatory Commission's (NRC's) requirements related to the content of the TSs are contained in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 36(c). The regulations at 10 CFR 50.36 require that the TSs include items in the following categories: (1) safety limits, limiting safety systems settings, and limiting control settings; (2) LCOs; (3) surveillance requirements; (4) design features; and (5) administrative controls. As specified in 10 CFR 50.36(c)(2)(i), LCOs are the lowest functional capability or performance levels of equipment required for safe operation of the facility. 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.

Watts Bar Updated Final Safety Analysis Report (UFSAR) Section 7.4, "Systems Required for Safe Shutdown," describes monitoring indicators and controls needed to achieve and maintain safe shutdown in the event an evacuation of the control room is required. Applicable General Design Criteria (GDC) are described in Watts Bar UFSAR Section 3.1.2, "WBNP Conformance with GDCs."

GDC 13, "Instrumentation and control," requires, in part, that instrumentation be provided to monitor variables and systems, and controls be provided to maintain these variables and systems within prescribed operating ranges.

GDC 19, "Control room," requires, in part, that "a control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident condition, including loss-of-coolant accidents.... Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and

controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.”

GDC 34, “Residual heat removal,” requires, in part, that a system be provided to remove residual heat and “to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded.” Suitable redundant components shall be provided for accomplishing the safety functions in case of a single failure.

As required by 10 CFR 50.48, “Fire protection,” each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A to 10 CFR Part 50. The regulation in 10 CFR Part 50.48(b) requires nuclear power plants licensed to operate prior to January 1, 1979, to implement Section III.G of 10 CFR Part 50, Appendix R, “Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979.” For plants, including Watts Bar Unit 2, that were licensed after January 1, 1979, the applicable requirements were incorporated into the operating license for the facility. TVA committed to meeting Section III.G of 10 CFR Part 50, Appendix R, requirements at the time of initial licensing, as documented in “Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2,” NUREG-0847, Supplement No. 29, October 2015 (ADAMS Accession No. ML15282A051).

The NRC staff reviews the human performance aspects of license amendment applications utilizing the review guidance in Standard Review Plan (SRP) Chapter 18 and NUREG-1764 Revision 1, “Guidance for the Review of Changes to Human Actions” (ADAMS Accession No. ML072640413). NUREG-1764, Revision 1, Appendix A, Table A.2, “Generic PWR [pressurized water reactor] Human Actions That Are Risk-Important,” lists categories of human actions associated with PWR plant operations that are deemed to be risk-important or potentially risk-important.

3.0 TECHNICAL EVALUATION

3.1 10 CFR Part 50, Section 50.36(c)

The TS LCO 3.3.4 requires that the Remote Shutdown System Functions in Table 3.3.4-1, Remote Shutdown System Instrumentation and Controls, to be operable in Modes 1 (power operation), 2 (startup) and 3 (hot standby). This is required so that the unit can be placed and maintained in Mode 3 for an extended period of time from a location other than the control room. The licensee proposed to modify one function/instrument that is contained in Table 3.3.4-1. For RCS Hot Leg Temperature Indication, Table 3.3.4-1 requires one indication per loop. The proposed modification would allow the $T_{(hot)}$ indicator for RCS Loop 3 to be inoperable for the remainder of Operating Cycle 2.

The regulations at 10 CFR 50.36 define the broad categories of information that is contained in the TSs, but do not specify the content requirements for individual specifications. The proposed change modifies the number of instruments required to be operable to provide RCS hot leg temperature indication. The requirement to maintain the other three $T_{(hot)}$ indications and the remedial measures to be taken if one of these instruments becomes inoperable is maintained. As explained below, with the proposed change to TS 3.3.4 and the associated LCO, the LCO will continue to provide the lowest functional capability or performance levels of equipment required for safe operation of the facility, and remain in compliance with 10 CFR 50.36 requirements.

3.2 10 CFR Part 50, Appendix A, GDC 13

Adequate instrumentation indications and controls are provided in the ACR to provide orderly control of plant operation and cooldown, if needed. The RCS $T_{(hot)}$ indication is one of five parameters used in the ACR to ensure decay heat removal via the SGs per TS Table 3.3.4-1. The other indications include SG pressure, SG level, AFW flow, and SG saturation temperature (SG $T_{(sat)}$). The ACR RCS $T_{(hot)}$ indicators are not safety-related equipment, they are not part of the reactor protection system, and they do not provide input to any safety-related shutdown system. The licensee stated that, provided the parameters other than the RCS $T_{(hot)}$ indicators on the operable loops (Loops 1, 2, and 4) are comparable to the corresponding parameters on Loop 3, and the $T_{(hot)}$ indicators on the operable loops are consistent, it is reasonable to conclude that Loop 3 is adequately removing decay heat.

Based on the above, the NRC staff has determined that the requirements of 10 CFR Part 50, Appendix A, GDC 13 are met without the use of the RCS Loop 3 $T_{(hot)}$ indicator in the ACR since there is adequate instrumentation to monitor variables and systems to ensure adequate safety of the plant during scenarios where the MCR is evacuated.

3.3 10 CFR Part 50, Appendix A, GDC 19

Normal plant operations are carried out from the MCR and are not impacted by the inoperable RCS $T_{(hot)}$ indicator on Loop 3. However, there are certain scenarios where the MCR may need to be evacuated. These scenarios include fire and smoke in the control room, flooding in the control room, and some other non-fire-related, but unspecified reason. For such MCR evacuation, the plant operator is required to trip the reactor before abandoning the control room and the safe shutdown will continue to be controlled from the ACR. It is reasonable to conclude that the $T_{(hot)}$ indicator in Loop 3 would be comparable to the other loops with operating $T_{(hot)}$ indicators. Thus, the other operable loops' $T_{(hot)}$ indicators can be monitored to ensure safe shutdown. Additionally, adequate redundancy is provided by the operable parameters on Loop 3 (SG pressure, SG level, AFW flow, and SG $T_{(sat)}$ indications) that could be monitored to ensure decay heat removal in Loop 3. The controls and indications used in the ACR are not subject to control room fire and will remain functional in case of a control room fire.

The overall operating conditions can be monitored from the MCR without this inoperable RCS Loop 3 $T_{(hot)}$ indicator. In the event of an MCR evacuation (e.g., fire/smoke in the MCR), the plant conditions during a safe shutdown mode can be monitored from the ACR except for the unavailable $T_{(hot)}$ indication in RCS Loop 3. All other indications in the remaining three RCS loops (e.g., $T_{(hot)}$, AFW controls, SG pressure indication and control, SG level, and SG $T_{(sat)}$ indication) will be available. In addition, during a shutdown where the residual heat removal (RHR) system is activated to remove decay heat from the reactor, the plant operator can monitor the remaining three loops (Loops 1, 2, and 4) to achieve the intended purpose of monitoring decay heat removal and RCS temperature. If the operable three loops are consistent relative to $T_{(hot)}$ and the remaining parameters in all four loops are not contradictory, then it is reasonable to conclude that Loop 3 is performing its function to remove decay heat via the SG. Hence, the absence of RCS Loop 3 $T_{(hot)}$ indication in the ACR will not interfere with safe shutdown of the plant. Based on the above, the NRC staff finds that the MCR and the ACR continue to meet the requirements of GDC 19 if the RCS Loop 3 $T_{(hot)}$ indicator is inoperable.

3.4 10 CFR Part 50, Appendix A, GDC 34

The Watts Bar Unit 2 TS 3.3.4, "Remote Shutdown System," Action A requires the RCS hot leg temperature indication be restored in 30 days if one or more indications is found inoperable. Otherwise, the plant must be shut down in accordance with the timeframe prescribed in Required Action B.1 and B.2 for Condition B of the LCO for TS 3.3.4. The $T_{(hot)}$ temperature instruments on each of the four loops provide indication in the ACR. They are not part of the reactor protection system and do not provide any input to any safety-related shutdown system. The only component affected by the inoperable RCS Loop 3 $T_{(hot)}$ indicator is the corresponding hot leg temperature recorder as indicated in the licensee's application.

If the plant moves to a configuration where the RHR system is removing decay heat, the plant operator can monitor one of the operable $T_{(hot)}$ indications (Loops 1, 2, and 4) to ensure adequate decay heat removal, thus the inoperable RCS Loop 3 $T_{(hot)}$ indicator has no impact on the safe operation and shutdown of the plant in this configuration. Based on the above, the NRC staff has determined that the licensee continues to meet the requirements of 10 CFR Part 50, Appendix A, GDC 34.

3.5 10 CFR Part 50.48 and 10 CFR Part 50, Appendix R

Watts Bar Unit 2 was granted its operating license on October 22, 2015. Therefore, the need to meet 10 CFR Part 50, Appendix R requirements (e.g., Section III. G "Fire Protection of Safe Shutdown Capability") has been incorporated into the operating license.

The licensee has identified that an indicator for the RCS Loop 3 hot leg temperature in the alternate control room is reading off-scale low. This indicator is considered failed. Based on the evaluation of the location of the failed component, a plant shutdown would have to occur to repair the indicator. This instrument is only required in the event of an MCR evacuation, which would be due to fire or smoke in the MCR, evacuation of the MCR for some other reason, or a design basis flood. If the MCR were abandoned, the ACR would not have the RCS Loop 3 $T_{(hot)}$ indicator available, therefore this means of determining decay heat removal would not be available.

The component is considered failed, but the component is only relied upon in the event of an MCR evacuation. The likelihood of MCR evacuation is considered very low. In the history of U.S. nuclear power plant operations there has not been a control room evacuation due to fire. There have been hazardous environments that have caused operators to wear self-contained breathing apparatuses, but even in these cases the operators were able to remain in the MCR and rely on the MCR indicators and controls.

The licensee stated that the remaining RCS loop hot leg temperature indications available in the ACR are adequate to safely shutdown the unit should an emergency arise (involving evacuation of the MCR) and maintain the unit in a safe shutdown condition from the ACR using other available operable components.

The NRC staff has reviewed the scenarios where the failed component would be relied upon. The scenarios are considered unlikely. Furthermore, the remaining operable indications in the ACR are adequate to safely shutdown the unit in the event of an MCR evacuation. Also, the licensee will have compensatory measures in place to ensure operations personnel are cognizant of the out-of-service instrument and to reduce the likelihood of a situation that would involve control room evacuation or challenge the availability of relied-upon plant equipment.

Based on the limited impact of the loss of the RCS Loop 3 T_(hot) indicator the compensatory actions are reasonable. Therefore, allowing Watts Bar Unit 2 to continue Operating Cycle 2 with the inoperable RCS Loop 3 T_(hot) indicator is acceptable and all fire protection program requirements continue to be met.

3.6 Evaluation of Compensatory Actions

The licensee described the compensatory measures in Section 3.4 of the Enclosure to its application. The proposed compensatory actions are described below:

- Operating procedures affected by the inoperable instrument will be revised in accordance with established practice.
- The inoperable instrument will be appropriately tagged.
- The inoperable instrument will be incorporated in the re-qualification training and the required reading (i.e., Night Orders) for licensed operators.

Additional programmatic actions are proposed to be implemented in order to enhance existing fire protection and operations program requirements as follows:

- Plant operations personnel will perform shiftly walkdowns of the control building to ensure new transient combustibles have been evaluated.
- Operational and maintenance activities conducted within the safety-related areas of the control building that require "hot work" permits will be reviewed by a licensed operator to ensure unnecessary hot work is precluded, prior to commencement of the activity.
- The power supplies for the other RCS hot leg temperature indicators are being protected to preclude loss of additional indication.

The TVA application does not propose new operator actions to mitigate the inoperable RCS Loop 3 hot leg temperature indication. Rather, compensatory actions are proposed that support the use of existing instruments and parameters, controlled by the Watts Bar Unit 2 TSs, that currently provide defense-in-depth and alternate indication for the Loop 3 hot leg temperature indicator function. The proposed TS revision does not involve any of the items listed in NUREG-1764, Revision 1, Appendix A, Table A.2, and the proposed compensatory actions do not involve new or complicated human actions. Therefore, the NRC staff has determined that the application will receive the lowest level of human factors engineering review (i.e., Level III) per the guidance in NUREG-1764, Revision 1.

3.6.1 General Deterministic Review

Section 3.1.1, "Remote Shutdown System [RSS]," of the Enclosure to the licensee's application, describes the purpose of the RSS as providing the operator with sufficient instrumentation and controls to place and maintain the unit in a safe shutdown condition from a location outside the MCR. RCS hot leg temperature indication is one of the indicated parameters for Watts Bar Unit 2 required to perform this function from the ACR. However, the inoperable RCS hot leg 3 temperature indicator, 2-TI-68-43C, is only one of the four RCS hot leg temperature indicators. The corresponding temperature indicators for RCS hot legs 1, 2, and 4 remain operable. Plant

operators can choose one of the three remaining operable hot leg temperature indication loops to assess decay heat removal from the ACR.

Furthermore, Section 3.2, "Technical Specification Change Evaluation," of the Enclosure to the licensee's application, notes that RCS hot leg temperature is only one of five parameters used to assess decay heat removal via the SGs. The other four parameters are:

- SG $T_{(sat)}$
- SG pressure
- SG level
- AFW flow

The above four parameters, in addition to the three remaining RCS hot leg temperature indicators will remain available during the remainder of Operating Cycle 2 to provide assessment in the ACR of decay heat removal.

Section 2.3, "Justification for the Change," of the Enclosure to the licensee's application noted that the inoperable RCS Loop 3 hot leg temperature indicator (2-TI-68-43C) is only displayed in the ACR, not in the MCR. Furthermore, 2-TI-68-43C is not connected to the reactor protection system and does not provide an input to any safety-related shutdown system. Therefore, the equipment impact of the inoperability of the 2-TI-68-43C indicator extends only to the indicator's corresponding recorder.

Therefore, the NRC staff concludes that the human actions associated with implementation of the compensatory actions described in the licensee's application will not adversely impact the RSS function to place and maintain the unit in a safe shutdown condition from a location outside the MCR. Furthermore, the NRC staff finds that the licensee's proposed compensatory actions support existing defense-in-depth measures to enable operators to reliably assess decay heat removal from the ACR.

3.6.2 Human Action Analysis

The licensee's application does not propose new operator actions to mitigate the inoperable RCS Loop 3 hot leg temperature indicator, 2-TI-68-43C. Rather, compensatory actions are proposed that support the use of existing indicating instruments and parameters, controlled by the Watts Bar Unit 2 TSSs, which currently provide defense-in-depth and alternate indication for the Loop 3 hot leg temperature indicator function.

The compensatory measures include tagging the inoperable 2-TI-68-43C indicator and revising the affected operating procedures. The compensatory measures will provide operations personnel with the point-of-use knowledge and instructions needed to recognize that 2-TI-68-43C is out of service and that existing parameters remain available to assess decay heat removal at the ACR.

The licensee has also proposed a compensatory measure to incorporate information regarding the inoperable instrument in operations requalification training and required operator reading. This compensatory measure will provide plant operations personnel with sufficient foreknowledge regarding the inoperable 2-TI-68-43C in the ACR and that existing parameters remain available to assess decay heat removal.

The NRC staff finds that operations personnel will be capable of understanding the impact of the 2-TI-68-43C inoperability and effectively implement alternate means to assess RCS decay heat removal from the ACR and fulfil the RSS function.

3.6.3 Design of Human System-Interfaces, Procedures and Training

The inoperable 2-TI-68-43C provides RCS Loop 3 hot leg temperature indication only in the ACR. The ACR would be manned in a circumstance where the plant must be shutdown from an alternate location from the MCR, such as a fire in the MCR. Therefore, operations personnel do not normally interface with the 2-TI-68-43C indicator on a daily basis. This can present a challenge to operation personnel's continued cognizance of the inoperable 2-TI-68-43C indicator in the ACR during the remaining months of the Watts Bar Unit 2 Operating Cycle 2.

Section 3.4, "Additional Compensatory Measures," of the Enclosure to the licensee's application includes a proposed compensatory action to revise the operating procedures that are affected by the inoperable 2-TI-68-43C indicator. A compensatory action is also proposed to tag the 2-TI-68-43C indicator as inoperable. These compensatory measures will provide operations staff with the direction required to use alternate RCS hot leg temperature indicators and assess RCS decay heat removal progression when the ACR is manned in an emergency circumstance.

A compensatory action is proposed to incorporate information regarding the inoperable 2-TI-68-43C indicator in operations requalification training and required reading such as Night Orders. This action will also enhance operation personnel's cognizance of the inoperable instrument. In addition, programmatic actions are also proposed to add robustness to fire protection barriers and protection of the power supplies for the remaining RCS hot leg temperature indicators.

The NRC staff finds that appropriate and adequate procedure revisions, human-system interfaces, and training will enable operation's personnel to remain cognizant of the 2-TI-68-43C inoperability and effectively implement alternate means to assess RCS decay heat removal from the ACR and fulfil the RSS function.

3.6.4 Human Action Verification

The proposed compensatory actions will be implemented utilizing existing procedures and procedure revision processes as well as the existing plant equipment tagging controls. The RCS decay heat assessment will continue to be performed with the evaluation techniques and other plant parameters that are currently used for this purpose. The proposed programmatic actions will be implemented within the existing Watts Bar Unit 2 fire protection and work control programs.

Furthermore, the new license condition 2.C.(11) proposed by the licensee will ensure that the compensatory and programmatic actions are implemented by the licensee and remain active for the duration of the 2-TI-68-43C indicator inoperability.

The NRC staff finds that the compensatory and programmatic actions proposed in Section 3.4 of the Enclosure to the licensee's application are feasible and can be reliably implemented.

4.0 EXIGENT CIRCUMSTANCES

Background

The NRC's regulations contain provisions for issuance of amendments when the usual 30-day public comment period cannot be met. These provisions are applicable when both exigent circumstances exist and the amendment involves no significant hazards consideration.

Consistent with the requirements in 10 CFR 50.91(a)(6), exigent circumstances exist when a licensee and the NRC must act quickly and time does not permit the NRC to publish a *Federal Register* notice allowing 30 days for prior public comment. As discussed in the licensee's application, the licensee requested that the proposed amendment be processed by the NRC on an exigent basis.

On December 30, 2017, TVA discovered that Temperature Indicator (TI) 2-TI-68-43C was not operable. Upon the discovery of this condition, TVA entered TS 3.3.4, "Remote Shutdown System," Condition A. Condition A requires restoration of the TI within 30 days. TVA isolated the problem to two components of the TI (modifier circuit or thermocouple) that are both located inside the Reactor Building Polar Crane Wall. The location of the affected instrumentation presents challenging working conditions due to high dose rates and environmental conditions (e.g., temperature, humidity) during power operations.

Although TVA had experienced failures of the Watts Bar Unit 1 Loop 4 hot leg instrumentation in 2004 and 2015, TVA stated that 2-TI-68-43C was replaced in 2014 as part of refurbishment activities associated with Watts Bar Unit 2 initial startup. Furthermore, TVA stated that the temperature indicator had successfully completed monthly channel checks and 18-month channel calibrations from April 2015 to December 2017. Based on the recent replacement of the TI and the successful completion of channel checks and calibrations, TVA could not have reasonably anticipated the current failure. The exigent circumstance for the amendment request is due to the 30-day completion time for Condition A.1 of TS 3.3.4, which expires on January 29, 2018, at approximately 3:43 a.m. EST, at which point a plant shutdown would be required. Consequently, the licensee and the commission must act quickly because the 30-day completion time will require a plant shutdown at that time. This also leaves insufficient time to publish a *Federal Register* notice allowing 30 days for prior public comment. TVA has acted quickly by diagnosing the issue and submitting an amendment request soon after the equipment was declared inoperable.

Summary

Based on the above circumstances, the NRC staff finds that the licensee made a timely application for the proposed amendment following identification of the issue. In addition, the NRC staff finds that the licensee could not avoid the exigency because failure of the instrumentation could not be anticipated, and the licensee acted quickly upon discovery of the condition. Therefore, TVA has not failed to use its best efforts to make a timely application for an amendment in order to create an exigency and take advantage of the exigency procedure in 10 CFR 50.91(a)(6). Based on these findings, and the determination that the amendment involves no significant hazards consideration as discussed in Section 5.0 below, the NRC staff has determined that a valid need exists for issuance of the license amendment using the exigent provisions of 10 CFR 50.91(a)(6).

5.0 NO SIGNIFICANT HAZARDS CONSIDERATION

Under the provisions in 10 CFR 50.91(a)(6), the NRC notifies the public in one of two ways: (1) by issuing a *Federal Register* notice providing notice of an opportunity for hearing and allowing at least 2 weeks from the date of the notice for prior public comment; or (2) by using local media to provide reasonable notice to the public in the area surrounding the licensee's facility. In this case, a notice was published on January 21, 2018, in *The Advocate & Democrat* and *The Rhea Herald-News* as well as on January 22 and January 23, 2018, in *The Daily Post-Athenian*, requesting comment by January 24, 2018.

As required by 10 CFR 50.91(a)(1), when a licensee requests an amendment, it must provide to the Commission its analysis about the issue of no significant hazards consideration using the standards in 10 CFR 50.92. Under 10 CFR 50.92(c), a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

The licensee's determination of no significant hazards consideration is presented below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed TS change to allow operation with only three of four loop remote shutdown indications for RCS hot leg temperature until the Cycle 2 refueling outage is only applicable to the following conditions:

- fire or smoke in the main control room (MCR)
- an evacuation of the MCR due to some other (non-fire) unspecified reason
- the design basis flood

The inoperability of the one $T_{(hot)}$ indicator does not change the probability of occurrence for these events because the indicator is not an accident initiator. The $T_{(hot)}$ indicators on the four loops are used for indication only and have no automatic control functions. During safe shutdown for an MCR evacuation event, design basis flood or fire related event, no fuel damage is postulated to occur, nor is the integrity of the reactor coolant pressure boundary or containment barriers postulated to be lost. Sufficient redundancy exists with the operational instrumentation to ensure that decay heat removal functions are not adversely affected by this change. Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed TS change does not alter the function of the remote shutdown system (RSS), which is to achieve and maintain safe reactor shutdown from outside the MCR. The TS instrumentation and controls required are such that sufficient capability is retained for decay heat removal via the steam generators (SGs) to provide the indication required for safe shutdown capabilities. The change does not result in the installation of any new equipment or system. The $T_{(hot)}$ instrument is used for indication only and has no automatic control functions. No new operations procedures are created by this change. Appropriate operational procedures will be updated to clarify that the Loop 3 $T_{(hot)}$ indication in the auxiliary control room (ACR) is not available during the remainder of Cycle 2. No new operating conditions or modes are created by this proposed change. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The radiological dose consequences are not affected, because this change is only applicable to the following conditions.

- fire or smoke in the main control room (MCR)
- an evacuation of the MCR due to some other (non-fire) unspecified reason
- the design basis flood

During safe shutdown for an MCR evacuation event, design basis flood or fire related event, no fuel damage is postulated to occur, nor is the integrity of the reactor coolant pressure boundary or containment barriers postulated to be lost. Sufficient redundancy exists with the operational instrumentation to ensure that decay heat removal functions are not adversely affected by this change. Because the conduit, cables, and equipment that provide $T_{(hot)}$ indication in the ACR are routed outside the control building, removal of the Loop 3 $T_{(hot)}$ indication is acceptable due to the redundant paths not being affected by the control building fire. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above evaluation, the NRC staff concludes that the three standards of 10 CFR 50.92(c) are satisfied. Therefore, the NRC staff has made a determination that no significant hazards consideration is involved for the proposed amendment and that the amendment should be issued as allowed by the criteria contained in 10 CFR 50.91.

6.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendment on January 22, 2018. The State official had no comments.

7.0 PUBLIC COMMENTS

On January 21, 2018, in *The Rhea County Herald-News* and *The Advocate & Democrat*, and on January 22 and January 23, 2018, in *The Daily Post Athenian*, the NRC staff published a public notice associated with the proposed amendment request. In accordance with the requirements in 10 CFR 50.91 for an exigent amendment, the notice provided until January 24, 2018, for public comment on the proposed no significant hazards consideration (NSHC) determination. No comments were received.

8.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves 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 amendment involves NSHC. Accordingly, the amendment meets 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 amendment.

9.0 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: January 25, 2018

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 - ISSUANCE OF AMENDMENT
REGARDING APPLICATION TO ALLOW INOPERABLE REACTOR COOLANT
SYSTEM LOOP 3 TEMPERATURE INDICATION FOR OPERATING CYCLE 2
(EPID L-2018-LLA-0003) DATED JANUARY 25, 2018

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