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

CNL-18-012

January 17, 2018

10 CFR 50.90
10 CFR 50.91

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

Watts Bar Nuclear Plant, Unit 2
Facility Operating License No. NPF-96
NRC Docket No. 50-391

Subject: **Response to Request for Additional Information and Revision 1 to Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01)**

References:
1. TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01)," dated January 10, 2018 (ML18010B043)

2. NRC Electronic Mail to TVA, "Watts Bar Unit 2 - Draft Request for Additional Information Re: Exigent Amendment Request for Inoperable Reactor Coolant Temperature Indication," dated January 12, 2018 (ML18016A011)

In Reference 1, Tennessee Valley Authority (TVA) submitted an exigent request for an amendment to Facility Operating License No. NPF-96 for Watts Bar Nuclear Plant (WBN) Unit 2. This exigent license amendment request (LAR) requested Nuclear Regulatory Commission (NRC) approval of a one-time change to WBN Unit 2 Technical Specification (TS) Table 3.3.4-1, Function 4a, "RCS Hot Leg Temperature Indication," to permit the temperature indication for reactor coolant system (RCS) Loop 3 to be inoperable for the remainder of the WBN Unit 2 Operating Cycle 2. WBN Unit 2 is scheduled to start the Cycle 2 refueling outage in Spring 2019. Reference 1 also contained a new WBN Unit 2 license condition regarding implementation of the compensatory measures described in Section 3.4 of the enclosure to Reference 1.

In Reference 2, the NRC transmitted a draft request for additional information (RAI) and requested a response by January 17, 2018. Enclosure 1 to this letter provides the TVA response to the RAI. Enclosure 2 provides a revision to the exigent LAR based on the information provided in Enclosure 1. The revised exigent LAR supersedes the one provided in Reference 1. Accordingly, the proposed license condition provided in Reference 1 has also been revised to reflect the revised exigent LAR and is provided in Enclosure 2.

The WBN Plant Operations Review Committee and TVA Nuclear Safety Review Board have reviewed this revised exigent LAR and concluded that operation of WBN Unit 2 in accordance with the proposed change will not endanger the health and safety of the public.

As noted in Reference 1, TVA requests approval of the exigent LAR by January 28, 2018, and that the implementation of the revised TS be effective immediately to avoid an unnecessary operational transient to initiate a plant shutdown.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Ed Schrull at 423-751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 17th day of January 2018.

Respectfully,

J. W. Shea

Digitally signed by J. W. Shea
DN: cn=J. W. Shea, o=Tennessee Valley Authority, ou=Nuclear Licensing, email=jwshea@tva.gov, c=US
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J. W. Shea
Vice President, Nuclear Regulatory Affairs and Support Services

Enclosures:

1. Response to Request for Additional Information Regarding Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01)
2. Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01), Revision1

cc (Enclosures):

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

Response to Request for Additional Information Regarding Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01)

Nuclear Regulatory Commission (NRC) Introduction

"By letter dated Jan 10, 2018, the Tennessee Valley Authority (TVA) submitted a license amendment request under exigent circumstances for a one time change to Table 3.3.4-1, Function 4a, "RCS Hot Leg Temperature Indication,' of the Watts Bar Nuclear Plant, Unit 2, Technical Specifications (TSs). The purpose of the change is to permit the temperature indicator in the alternate control room for reactor coolant system (RCS) Loop 3, only relied upon in the event of a main control room evacuation, to be inoperable for the remainder of the current Unit 2 operating cycle. TVA indicated that to return the temperature indicator to operability would either involve significant challenges to plant staff attempting to repair the components while the plant remains at power, or a shutdown to Mode 3, 4 or 5.

The U.S. Nuclear Regulatory Commission (NRC) staff has determined that additional information, as described in the below request for additional information (RAI), is required for the staff to complete its review of the subject request."

NRC RAI-1

"*TVA's proposed amendment included the following note:*

> *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, the temperature modifier will be replaced. If the problem is not with the temperature modifier, entry into Mode 5 would be required to replace the thermocouple. If the thermocouple requires replacement, this repair will be performed if Unit 2 enters Mode 5. These repairs would occur prior to startup following a shutdown.*

a. *As written, the note presents an apparent conflict between the statements 'entry into Mode 5 would be required to replace the thermocouple' and 'If the thermocouple requires replacement, this repair will be performed if Unit 2 enters Mode 5.' Please address this apparent conflict with respect to 'entry into Mode 5 would be required' vs. 'if Unit 2 enters Mode 5.'*

b. *As justification for the proposed change, TVA stated that shutdown to repair the temperature indication is not necessary because the remaining loop hot leg temperature indications available in the auxiliary control room are adequate to support safe shutdown of the unit and maintain the unit in a safe shutdown condition. Depending upon the interpretation of the conflicting statements noted in a. above, this note may permit returning to power operation following a shutdown to Mode 3 or 4 with the RCS Loop 3 hot leg temperature indication remaining inoperable, if it is determined that the circuit inoperability is due to an inoperable thermocouple. Please address the operational considerations associated with either:*

   - *Returning the plant to Mode 1 from Mode 3 or 4 with an inoperable RCS Loop 3 hot leg temperature indication due to an inoperable thermocouple.*

   vs.

- *Establishing the necessary plant conditions to repair the thermocouple (i.e., continuing to Mode 5) to restore the indication to operable once the plant has been shutdown to Mode 3 or 4.*

c. *The proposed Note describes the corrective actions that will be taken in future plant shutdowns, but does not explicitly state that the RCS Loop 3 hot leg indication will be restored to operable status following repair of the modifier circuit or thermocouple, as applicable. LCO 3.0.4.b states, in part:*

> *When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made…*
>
> *After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications.*

TVA is requested to propose a modification to the proposed note to explicitly require the RCS Loop 3 hot leg indication function be restored to operable status prior to startup following repair of the modifier circuit or thermocouple, as applicable, or to include a statement that the provisions of LCO 3.0.4 are not applicable."

TVA Response to RAI-1.a.

To avoid ambiguity, the term "entry into Mode 5 would be required" has been removed from the proposed Note to Watts Bar Nuclear Plant (WBN) Unit 2 TS Table 3.3.4-1, Function 4a. The proposed Note has been revised as follows:

> "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 exigent license amendment request (LAR) submitted in the referenced letter has been revised in total in Enclosure 2 to reflect the revised Note. Attachment 1 to Enclosure 2 provides the existing WBN Unit 2 TS pages marked-up to show the proposed changes. Attachment 2 to Enclosure 2 provides the proposed WBN Unit 2 TS pages retyped to show the changes incorporated. Enclosure 2 supersedes the information provided in the referenced letter.

Reference

TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBNTS-2018-01)," dated January 10, 2018 (ML18010B043)

TVA Response to RAI-1.b.

As noted in the TVA response to RAI, RAI-1.a., 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. The problem has been isolated to either the temperature modifier circuit or the thermocouple, both of which are located inside the reactor building polar crane wall. As noted in Section 2.3 of the exigent LAR provided in Enclosure 2 to this letter, if the temperature modifier circuit requires replacement, the repairs would be performed in Mode 3 or Mode 4. Following repairs, the plant would be returned to normal power operation (Mode 1). Returning the plant to Mode 1 from Mode 3 or 4 with an inoperable RCS Loop 3 hot leg thermocouple is acceptable based on the technical information provided in Sections 3.1.5, 3.2, and 3.3 of Enclosure 2 and the compensatory measures described in Section 3.4 of Enclosure 2 (Note: in Section 3.2 of Enclosure 2, the term "RCS cold leg" was changed to "SG $T_{(sat)}$ indication" consistent with WBN Unit 2 TS Table 3.3.4-1).

If the thermocouple requires replacement, this maintenance would require a unit shutdown to Mode 5, because elevated RCS piping temperatures in Mode 3 or 4 would make such a replacement unsafe for personnel to perform without a Mode 5 entry. Transitioning the unit from Mode 3 or Mode 4 to Mode 5 to repair or replace the RCS Loop 3 hot leg thermocouple is not a desirable evolution and poses a significant operational transient to the unit as described below.

While WBN does not have a risk model for the transition from Mode 3 to Mode 5 and back to Mode 3, the precise maneuvering of the nuclear unit involves many operator evolutions and must be carefully performed. A plant mode change from Mode 3 at near 550°F and 2250 psig (the expected condition for repair of the temperature modifier) to Mode 5 at less than 200°F and less than 400 psig and subsequently back to Mode 3 is a significant plant maneuver. This evolution involves plant boration to cold shutdown conditions, a controlled cool down within RCS pressure and temperature limits using auxiliary feedwater and a transition to operation on residual heat removal in Mode 4. With the transition from Mode 4 to Mode 5, the cold overpressure mitigation system is engaged, emergency core cooling system (ECCS) injection capability is inhibited and the cool down is continued until the plant is less than 200°F.

After the unit has entered Mode 5, the replacement of the RCS thermocouple would occur, as required. The return of the plant to normal operating temperature and pressure would require the completion of numerous plant surveillances during plant heatup and subsequent mode changes. The approach to full temperature and pressure would be slowed to allow the pressurizer safety valves and power operated valves (PORVs) to become thermally stable to prevent leakage. The entire evolution to take the plant from Mode 3 to Mode 5 and back to Mode 3 at normal operating pressure and temperature would take approximately four to five days, not including the time required to repair the thermocouple.

Section 3.1.2 of Enclosure 2 contains the information in this RAI response. As noted above, Enclosure 2 supersedes the information provided in the referenced letter.

Reference

> TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01)," dated January 10, 2018 (ML18010B043)

TVA Response to RAI-1.c.

As noted in the TVA response to RAI-1.a., the proposed Note to WBN Unit 2 TS Table 3.3.4-1, Function 4a has been revised to address the NRC concern.

Enclosure 2

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT, UNIT 2

EVALUATION OF PROPOSED CHANGE

Subject: **Watts Bar Nuclear Plant Unit 2 - Technical Specification Change - Reactor Coolant Temperature Indicator Inoperable - Exigent Amendment (391-WBN-TS-2018-01), Revision 1**

Contents

ATTACHMENTS
1. Proposed TS Changes (Mark-Ups) for WBN Unit 2
2. Proposed TS Changes (Final Typed) for WBN Unit 2
3. Proposed License Condition (Mark-Ups) for WBN Unit 2
4. Proposed License Condition (Final Typed) for WBN Unit 2

1.0 SUMMARY DESCRIPTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.90, "Application for amendment of license, construction permit, or early site permit," and 10 CFR 50.91(a)(6), “Notice for public comment; State consultation, Tennessee Valley Authority (TVA) is requesting an exigent license amendment to amend the Watts Bar Nuclear Plant (WBN) Unit 2 Technical Specifications (TS). The proposed exigent license amendment request (LAR) submits a one-time change to WBN Unit 2 TS Table 3.3.4-1, Function 4a, "RCS Hot Leg Temperature Indication,” for Nuclear Regulatory Commission (NRC) approval. The proposed exigent LAR permits the temperature indication for reactor coolant system (RCS) Loop 3 to be inoperable for the remainder of the WBN Unit 2 Operating Cycle 2. WBN Unit 2 is scheduled to start the Cycle 2 refueling outage in Spring 2019.

WBN Unit 2 TS Table 3.3.4-1, Function 4a, requires at least one RCS hot leg temperature indication function per loop to be operable. With one or more required Functions inoperable, WBN Unit 2 TS 3.3.4, “Remote Shutdown System,” Condition A, requires the inoperable Function to be restored to operable status within 30 days. Furthermore, WBN Unit 2 Surveillance Requirement (SR) 3.3.1 requires a monthly channel check be performed for the instrumentation in TS Table 3.3.4-1. SR 3.3.1 is performed in accordance with surveillance instruction (SI) 2-SI-0-4, “Monthly Surveillances.”

On December 30, 2017, while performing SI 2-SI-0-4, TVA identified that temperature indicator (TI) 2-TI-68-43C, Reactor Coolant Loop 3 Hot Leg Temperature Indicator, in the auxiliary control room (ACR) was inoperable. The 30-day completion time for Condition A of TS 3.3.4 expires on January 29, 2018, at 0343 eastern standard time (EST). After that expiration, TS 3.3.4, Condition B requires the plant to be in Mode 3 within 6 hours and Mode 4 in 12 hours. Accordingly, TVA requests approval of the TS change by January 28, 2018, and that the implementation of the revised TS be effective immediately to avoid an unnecessary operational transient to initiate a plant shutdown. TI 2-TI-68-43C is one of four instruments that provide indication in the ACR of the hot leg temperature for each RCS loop. There is one indicator per loop. The hot leg indication for the other RCS hot legs remains operable.

The problem has been isolated to either the temperature modifier circuit or the thermocouple, both of which are located inside the reactor building polar crane wall, which is not accessible during plant operation.

Accordingly, TVA is requesting this proposed TS change under exigent circumstances, and requests that the NRC expedite the review of the requested change to support approval by January 28, 2018.

The inoperability of 2-TI-68-43C has been entered into the TVA Corrective Action Program (CAP). As part of the CAP, TVA will evaluate the cause of the failure to determine if there is any generic applicability for similar TVA TIs.

2.0 DETAILED DESCRIPTION

2.1 PROPOSED TECHNICAL SPECIFICATION CHANGE AND LICENSE CONDITION

The proposed change adds “(Refer to Note A on page 2 of 2)” to the Required Number of Functions for WBN Unit 2 TS Table 3.3.4-1, "Remote Shutdown System Instrumentation and Controls," item 4.a, “RCS Hot Leg Temperature Indication.” The new Note A on new page 2 of WBN Unit 2 TS Table 3.3.4-1 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.”

Due to pagination as a result of adding the new Note A, WBN Unit 2 TS Table 3.3.4-1 now contains two pages.

TVA also proposes the addition of the following new license condition 2.C(11) to the operating license of WBN Unit 2:

> “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.”

Attachment 1 to this enclosure provides the existing WBN Unit 2 TS pages marked-up to show the proposed changes. Attachment 2 to this enclosure provides the proposed WBN Unit 2 TS pages retyped to show the changes incorporated. Attachment 3 to this enclosure the WBN Unit 2 Operating License page marked-up to show the proposed changes. Attachment 4 to this enclosure provides the WBN Unit 2 Operating License page retyped to show the changes incorporated.

There are no TS Bases changes associated with this proposed change.

2.2 CONDITION INTENDED TO RESOLVE

The 30-day completion time for Condition A of TS 3.3.4 expires on January 29, 2018, at 0343 EST, which requires the plant to be in Mode 3 within 6 hours and Mode 4 in 12 hours in accordance with TS 3.3.4, Condition B. The inoperable device (2-TI-68-43C) is one of four instruments that provides indication in the ACR for the hot leg temperature for each RCS loop. Both the modifier circuit and the thermocouple are located inside the reactor building polar crane wall and are not accessible during plant operation.

2.3 JUSTIFICATION FOR THE CHANGE

On December 30, 2017, while performing 2-SI-0-4, TVA identified that 2-TI-68-43C was inoperable. After performing troubleshooting, TVA 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. The modifier circuit is a module that converts the millivolt direct current (mVDC) output from the RCS $T_{(hot)}$ thermocouple to a milliampere direct current (mADC) signal to an indicator and recorder located in the ACR. The mVDC signal input ranges from -0.675 to 17.418; the module conditions the signal output range from 4 to 20 mADC.

The inoperable RCS $T_{(hot)}$ indicator is only displayed in the ACR. The indicator is not part of the reactor protection system (RPS) and does not provide input to any safety-related shutdown system. The only component adversely affected by the inoperable RCS $T_{(hot)}$ indicator is the corresponding recorder.

TVA has evaluated the plant conditions needed to perform the necessary repairs. While the plant is operating, as discussed in more detail in Section 3.0 of this enclosure, the radiological conditions and environmental conditions inside this area would impose a significant challenge on plant staff attempting to repair the components. TVA has determined that the potential consequences to personnel safety and the radiological doses required to perform the repair outweigh the safety significance of operating with the Loop 3 hot leg temperature indication inoperable for the remainder of the operating cycle. In addition, the exigent LAR is being submitted as a deterministic LAR with risk insights using the WBN Probabilistic Risk Assessment (PRA). TVA concluded that the risk of continued plant operation with the Loop 3 hot leg temperature indication function inoperable is qualitatively assessed to be very low compared to the incremental risks associated with an unnecessary operational transient to initiate a plant shutdown.

As noted in Section 2.1 of this enclosure and contained in the proposed Note to TS Table 3.3.4-1, 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. 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. If the problem is with the thermocouple, the thermocouple will be repaired or replaced, if WBN Unit 2 enters Mode 5, for other reasons, 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.

Both the modifier circuit and the thermocouple associated with this hot leg temperature indication are located inside the reactor building polar crane wall. Therefore, the radiological environment is unacceptable for personnel entry with the unit at power. Accordingly, if the modifier circuit is the source of the loss of temperature indication, a unit shutdown to Mode 3 or 4 would be necessary to allow for replacement. If the thermocouple requires replacement, this maintenance will require a unit shutdown to Mode 5, because elevated RCS piping temperatures in Mode 3 or 4 would make such a replacement unsafe for personnel to perform without a Mode 5 entry. These repairs would occur prior to startup following a shutdown.

Additional information supporting this exigent LAR is provided in Section 3.0 of this Enclosure.

3.0 TECHNICAL EVALUATION

TVA could not have reasonably anticipated the failure of TI 2-TI-68-43C. There was no adverse maintenance history concerning this component. A timeline is provided below.

- In March 2014, 2-TI-68-43C was replaced as part of refurbishment activities associated with the WBN Unit 2 initial startup.
- Between November 2015 and November 2017, 2-TI-68-43C successfully completed its monthly channel checks in accordance with 2-SI-0-4.
- On April 8, 2015, April 4, 2016, and November 13, 2017, 2-TI-68-43C successfully completed its 18-month channel calibration in accordance with 2-SI-68-62, “18 Month Calibration of Remote Shutdown Monitor RCS Loop 3 Hot Leg Temperature Loop 2-LPT-68-43C.”
- On November 28, 2015, April 22, 2016, and December 3, 2017, 2-TI-68-43C also successfully completed its 18-month channel calibration in accordance with 2-SI-68-301, “Cross Calibration of RCS Temperature Sensors Using RTD Cross Calculation-DAQ.”
- On December 30, 2017, while performing 2-SI-0-4, 2-TI-68-43C in the ACR was observed to be offscale low.
- At 0343 on December 30, 2017, 2-TI-68-43C was declared inoperable and Condition A of TS 3.3.4 was entered with a 30-day completion time.
- After troubleshooting, TVA determined on January 4, 2018, that the cause of the failed TI was either the temperature modifier circuit or the associated thermocouple, which would necessitate a unit shutdown to either repair or replace the component.

The configuration of the affected instrumentation precludes repair at power because the affected equipment is located inside the reactor building polar crane wall, which is a high dose area during power operations.

Based on the information in Section 3.1 of this enclosure, a forced outage to repair or replace the temperature modifier circuit or the thermocouple associated with 2-TI-68-43C would result in an unnecessary transient to the unit.

The shutdown of the plant to implement the repairs is not necessary because the remaining RCS loop hot leg temperature indications available in the ACR are adequate to safely shutdown the unit should an emergency arise and maintain the unit in a safe shutdown condition.

WBN Unit 1 experienced a similar failure of the RCS Loop 4 hot leg instrument 1-TI-68-65C in 2015 (Reference 1). A failure analysis was not performed on the temperature modifier that was replaced. However, the WBN Unit 2 temperature modifier associated with 2-TI-68-43C is a different make and model than its corresponding Unit 1 temperature modifier.

3.1 SYSTEM DESCRIPTION

3.1.1 Remote Shutdown System

The remote shutdown system (RSS), 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 a safe shutdown condition from a location other than the main control room (MCR). The ACS is required in the event that the MCR must be evacuated due to some unspecified reason, as well as during a control building fire that causes loss of safe shutdown control from the MCR. The RSS is not required to function for mitigation of any design basis event, other than the fire or evacuation of the MCR or a design basis flood. Portions of the ACS that terminate in the ACR are used during the design basis flood. The ACS meets two separate failure criteria.

1. During normal operation, equipment and controls are provided to ensure that a random single failure in the ACS does not affect the corresponding MCR equipment and controls. During MCR evacuation, no single failure of ACS equipment must be assumed per the WBN design.

2. ACS equipment and controls are assumed to be damaged if the equipment is not fire protected in the zone of influence of a fire. No equipment failures other than those directly attributed to a fire must be considered.

The most limiting condition for the events during which the ACS is required is a fire. For a fire, procedures require that the reactor coolant pumps be tripped such that decay heat removal is via natural circulation. Section 7.4, "Safe Shutdown Systems," of NUREG-0800, "Standard Review Plan," establishes the review guidelines for the remote control stations and the equipment used to maintain safe shutdown. Consistent with these guidelines, TVA has developed a safe shutdown logic diagram for an Appendix R fire. This logic defines a sufficient set of equipment and indications to safely shutdown the reactor from the ACR. For each safety function, the equipment required to accomplish the safety function has been divided into groups of functionally related equipment necessary to accomplish the safety function. The RCS hot leg temperature indicators are required for assessment of decay heat removal. If Loop 3 temperature indication ($T_{(hot)}$) is removed, success for this function can still be achieved via the remaining available ACS $T_{(hot)}$ indicators.

Redundancy for decay heat removal exists in these paths to account for equipment in one of the redundant paths being damaged by any fire in a single area. For the case addressed by this TS change, the fire must exist in the control building, which is considered a single area, to cause an evacuation of the MCR. 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. Because a redundant path for decay heat removal is required to remain functional by the TS for the remainder of Cycle 2, the ACS can adequately perform its function to place and maintain the unit in a safe shutdown condition in a location other than the MCR. Therefore, the fire safe shutdown logic is met and adequate indication is present without Loop 3 $T_{(hot)}$ indication.

Design guidance for the ACS is provided in ANSI/ANS-58.6-1983, "Criteria for Remote Shutdown for Light Water Reactors." This guidance does not specifically state that RCS hot leg temperature indication is required for all four loops. Item 4(5) states that equipment, instrumentation and controls, which are required to monitor, achieve and maintain a hot shutdown condition (following power operation) shall be located in the Auxiliary Shutdown Station wherever practical. Item 4(5)(b) refers to decay heat removal as a minimum requirement for maintaining hot or cold shutdown and references the following to achieve the decay heat removal.

i. Monitor SG parameters for residual heat removal.

ii. Control auxiliary feedwater (AFW) flow and monitor AFW supply inventory.

iii. Control steam relieving system.

WBN uses the RCS hot leg temperature indication for compliance with Item 4(5)(b).

3.1.2. Repair Considerations and Mode Change Considerations

The problem has been isolated to either the temperature modifier circuit or the thermocouple, both of which are located inside the reactor building polar crane wall. While the plant is operating, the radiological and environmental conditions inside this area as discussed in Sections 3.1.3 and 3.1.4 would impose a significant challenge on plant staff attempting to repair the components.

The repairs to the temperature modifier would be performed in Mode 3 or Mode 4. Following repairs, the plant would be returned to normal power operation (Mode 1). Returning the plant to Mode 1 from Mode 3 or 4 with an inoperable RCS Loop 3 hot leg thermocouple is acceptable based on the technical information provided in Sections 3.1.5, 3.2, and 3.3 of this enclosure and the compensatory measures described in Section 3.4 of this enclosure.

If the thermocouple requires replacement, this maintenance would require a unit shutdown to Mode 5, because elevated RCS piping temperatures in Mode 3 or 4 would make such a replacement unsafe for personnel to perform without a Mode 5 entry. Transitioning the unit from Mode 3 or Mode 4 to Mode 5 to repair or replace the RCS Loop 3 hot leg thermocouple is not a desirable evolution and poses a significant operational transient to the unit as described below.

While WBN does not have a risk model for the transition from Mode 3 to Mode 5 and back to Mode 3, the precise maneuvering of the nuclear unit involves many operator evolutions and must be carefully performed. A plant mode change from Mode 3 at near 550°F and 2250 psig (the expected condition for repair of the temperature modifier) to Mode 5 at less than 200°F and less than 400 psig and subsequently back to Mode 3 is a significant plant maneuver. This evolution involves plant boration to cold shutdown conditions, a controlled cool down within RCS pressure and temperature limits using auxiliary feedwater and a transition to operation on residual heat removal in Mode 4. With the transition from Mode 4 to Mode 5, the cold overpressure mitigation system is engaged, emergency core cooling system (ECCS) injection capability is inhibited and the cool down is continued until the plant is less than 200°F.

After the unit has entered Mode 5, the replacement of the RCS thermocouple would occur, as required. The return of the plant to normal operating temperature and pressure would require the completion of numerous plant surveillances during plant heatup and subsequent mode changes. The approach to full temperature and pressure would be slowed to allow the pressurizer safety valves and power operated valves (PORVs) to become thermally stable to prevent leakage. The entire evolution to take the plant from Mode 3 to Mode 5 and back to Mode 3 at normal operating pressure and temperature would take approximately four to five days, not including the time required to repair the thermocouple.

3.1.3 Personnel Safety - Working Conditions

Based on operating experience and discussions with craft personnel, if TVA were to attempt to repair the components that are located inside the reactor building polar crane wall under current conditions, the time needed to complete the repairs would be approximately three hours. The environmental considerations include containment temperature, humidity, and required personnel protective equipment (PPE). Section 3.1.4 discusses the radiological effects associated with performing such a repair.

3.1.4 Expected Radiological Dose for Performing the Repair

Tables 1 and 2 provide the dose estimates for the repair effort at various power levels. Neutron dose contributes approximately 10% of the estimated total dose when at 100% reactor power.

Table 1 Expected Radiological Dose per Person for Performing the Repair					
Task	Reactor Power Level				
	100%	90%	75%	50%	25%
Inside Polar Crane Wall Entry Transit (Entry/Egress 5 min / 5 min)	165	132	88	66	33
At Job Location*					
Removal of Modifier (45 Min)	742	594	396	297	198
Installation of New Modifier (1 hour)	990	792	528	396	200
Calibration of Modifier (1.5 hour)	1485	1188	792	594	300
Total (mrem)	3382	2706	1804	1353	731

Note: the dose values are in millirem
*This takes into account two inches of shielding from steel walls of the pressurizer relief tank.

Table 2 Total Dose for Individuals to Complete the Repairs at Various Power Levels					
Individuals	Reactor Power Level				
	100%	90%	75%	50%	25%
Maintenance Technician #1	3382	2706	1804	1353	731
Maintenance Technician #2	3382	2706	1804	1353	731
RP Technician	3382	2706	1804	1353	731
RP Support Outside*	51	45	38	25	13
Locked High Radiation Area Door Watch*	51	45	38	25	13
Total (mrem)	10274	8208	5488	4109	2219

Note: the dose values are in millirem
*This takes into account five minutes for outside support to access the polar crane door and five minutes to secure the door.

3.1.5 Risk Considerations

When redundant and diverse indications are available to provide necessary information to plant operators, the WBN PRA model does not generally model the loss of a single indication. In addition, the WBN model does not currently credit shutdown from outside of the MCR. Therefore, from a quantitative perspective as measured by the WBN PRA model, unavailability of one RCS loop hot leg temperature indication in the auxiliary control room does not increase risk. Examining this issue qualitatively, the RCS loop hot leg temperature indication is used for assessment of decay heat removal via the associated SG. TI 2-TI-68-43C is one of several parameters used to assess decay heat removal via the SGs. The remaining indicators are sufficient that operators can ensure adequate decay heat removal. Therefore, the risk associated with this issue is negligible.

The WBN PRA model does not explicitly address risk associated with a downpower and return to full power. However, any significant plant maneuver increases the likelihood of complications, which could induce or require a plant trip. As a sensitivity calculation, the risk associated with a downpower was assumed to be equal to 10 percent (%) of the risk associated with a plant trip (%2 turbine trip initiating event

TTIE)). Increasing PRA initiator %2 TTIE from 0.241/yr to 0.2651 results in a delta-core damage frequency (CDF) of about 8E-9. For an assumed (bounding) 18-month cycle, the incremental conditional core damage probability (ICCDP) would be approximately 1.2E-8. This results in a delta-large early release frequency (LERF) of about 1.1E-10. For an assumed (bounding) 18-month cycle, the incremental conditional large early release probability (ICLERP) would be approximately 1.7E-10.

TVA has determined that the safety effect of continued plant operation without the Loop 3 $T_{(hot)}$ indication is qualitatively assessed to be very low compared to the incremental risks associated with an unnecessary operational transient to initiate a plant shutdown. Large power maneuvers increase the likelihood of a transient that could initiate or require a plant trip or shutdown. Plant trips and shutdowns have the potential to challenge important safety systems such as the RPS, AFW, and the RHR systems. Each of those systems has a small probability of failure. Therefore, performing a significant plant downpower or shutdown to effect repairs results in a very small safety impact, versus essentially no safety impact associated with continued operation with the Loop 3 $T_{(hot)}$ indication unavailable. Therefore, continuing to operate with the Loop 3 $T_{(hot)}$ indication unavailable until the upcoming refueling outage is not adverse to plant safety.

3.2 TECHNICAL SPECIFICATION CHANGE EVALUATION

The basis for continued operation with the RCS Loop 3 hot leg temperature indicator inoperable is acceptable because this parameter is only one of five parameters used to assess decay heat removal via the SGs. The other four parameters are SG pressure, SG level, AFW flow, and SG $T_{(sat)}$ indication. The other parameters will be available in the ACR during the remainder of Cycle 2. Relaxing the requirement for one loop of $T_{(hot)}$ indication while maintaining the requirements for the remaining three loops of $T_{(hot)}$ indication, AFW Controls, SG pressure indication and control, SG level indication, AFW flow indication and SG $T_{(sat)}$ indication, will not adversely affect the unit's ability to monitor decay heat. If the operable three loops are consistent relative to $T_{(hot)}$, SG $T_{(sat)}$ and SG level, and the other parameters for the inoperable loop are not contradictory to plant conditions indicated by the operable loops (i.e., SG level and SG $T_{(sat)}$ for Loop 3), then it is reasonable to consider that Loop 3 is performing its function to remove decay heat via its SG.

$T_{(hot)}$ is also used to set the reactor cooldown rate during safe shutdown from a location other than the MCR. The absence of one out of the four $T_{(hot)}$ indications does not adversely affect this function because the other three operable indications may be used.

Abnormal Operating Instruction (AOI) 27, "Main Control Room Inaccessibility," and AOI-30.2.C.69, "Fire Safe Shutdown Room Control Building," are the procedures used for MCR abandonment for non-Appendix R and Appendix R fire conditions, respectively. AOI-27 and AOI-30.2 both require the unit to be tripped before the MCR is abandoned. The indication for the RCS Loop 3 hot leg is used in these procedures to monitor the plant cooldown rate in the ACR. The probability of having to abandon the MCR is low and remains the same, whether the plant continues to operate or is shut down. Therefore, the change proposed in this LAR is considered to be risk neutral with regard to initiating events.

The inoperable RCS Loop 3 hot leg temperature indication is only displayed in the ACR. It is not part of the RPS and does not provide input to any safety related shutdown system. The only component adversely affected by the inoperable RCS Loop 3 hot leg temperature indicator is the corresponding recorder. 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 choose one of the remaining three loops (i.e., Loops 1, 2 or 4) to assess decay heat removal Therefore, the out of service temperature indicator has no effect on the safe operation and shutdown of the reactor.

3.3 ADDITIONAL CONSIDERATIONS

If the temperature indicator for another RCS hot leg loop fails while the Loop 3 indicator is inoperable, TVA would evaluate the impact of the inoperable components in accordance with the TVA CAP. The evaluation would provide site management with the necessary information to decide if the unit must be shutdown to implement the needed repairs or whether adequate remote shutdown information is available to the operating staff for safe operation of the unit. TVA would conform to the applicable required actions of TS 3.3.4.

TVA conducts weekly walkdowns of safety-related areas within the control building to preclude introduction of new transient combustibles. The Fire Operations staff reviews the transient combustibles log to confirm that if new transient combustibles have been introduced into safety-related areas within the control building, they have been appropriately evaluated.

As noted in Section 3.2, in the event that any other ACR indication becomes unavailable, in addition to the RCS Loop 3 hot leg temperature indication ($T_{(hot)}$), control room operators could rely on the remaining Loop 1, 2 or 4 $T_{(hot)}$ indications to confirm natural circulation flow as well as cool down rates. If one of the other parameters becomes unavailable, plant operators could continue to monitor RCS cooldown rate by confirming the indicated values through channel check verifications.

3.4 ADDITIONAL COMPENSATORY MEASURES

To ensure operating personnel are fully cognizant of the out-of-service instrument, WBN will take the following actions during the time the subject instrument is out of service.

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

The following will be implemented in addition to existing fire protection and operational program requirements.

1. Plant operations personnel will perform shiftly walkdowns of the control building to ensure new transient combustibles have been evaluated.
2. 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.
3. The power supplies for the other RCS hot leg temperature indicators are being protected to preclude loss of additional indication.

As noted in Section 2.1 of this enclosure, TVA has proposed a new license condition regarding implementation of the above compensatory measures.

4.0 REGULATORY EVALUATION

4.1 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

The Bases for TS 3.3.4 states that the operability of the remote shutdown control and instrumentation functions ensures that there is sufficient information available on selected unit parameters to place and maintain the unit in Mode 3 should the MCR become inaccessible. Should it be necessary to go to Mode 4 or Mode 5, decay heat removal via the RHR system is available to support the transition.

4.1.1 General Design Criteria

WBN was designed to meet the intent of the “Proposed General Design Criteria for Nuclear Power Plant Construction Permits” published in July 1967. The WBN construction permit was issued in January 1973. The WBN dual-unit updated final safety analysis report (UFSAR) address the NRC General Design Criteria (GDC) published as Appendix A to 10 CFR 50 in July 1971. Conformance with the GDC is described in Section 3.1.2 of the WBN dual-unit UFSAR.

The relevant GDC are described below

Criterion 19 - Control Room

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 conditions including loss of coolant accidents (LOCAs). Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of five rem whole body, or its equivalent to any part of the body, for the duration of the accident.

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.

The ACS is required to provide equipment at appropriate locations outside the MCR with the capability to promptly shut down and maintain the unit in a safe condition in Mode 3. The criteria governing the design and specific system requirements of the ACS are located in GDC 19. WBN's compliance with GDC 19 is discussed in the dual-unit UFSAR Section 3.1.2.2, "Protection By Multiple Fission Product Barriers." The instrumentation functions required for the ACR are discussed in Section 7.4, "Systems Required for Safe Shutdown," of the UFSAR.

4.2 PRECEDENT

This exigent LAR is similar to the other exigent LARs approved by the NRC for WBN Unit 1 and the Catawba Nuclear Station as described further below.

- Watts Bar Unit 1 - Issuance of Exigent Amendment Regarding Application to Allow Temperature Indication for Reactor Coolant System Loop 3 to be Inoperable for the Remainder of Operating Cycle 13 (TAC No. MF6286), dated June 12, 2015 (Reference 1). This license amendment provided a one-time change to Function 4.a, “Reactor Coolant System (RCS) Hot Leg Temperature Indication,” of TS Table 3.3.4-1 to allow a WBN Unit 1 temperature indicator in the ACR for RCS Loop 4 to remain inoperable for the remainder of Operating Cycle 13 (approximately a three-month duration). The issues associated with the 2015 failure (failing low scale) were isolated to the modifier circuit that is a different make and model than the WBN Unit 2 modifier circuit.
- Watts Bar Unit 1 - Issuance of Exigent Technical Specification Amendment Concerning Inoperable Reactor Coolant System Temperature Indicator (TAC No. MC4979), dated November 19, 2004 (Reference 2). This license amendment provided a one-time change to Function 4.a of TS Table 3.3.4-1 to allow a WBN Unit 1 temperature indicator in the ACR for RCS Loop 4 to remain inoperable for the remainder of Operating Cycle 6 (approximately a four-month duration). The issues in the 2004 failure resulted in a full scale reading.
- Catawba Nuclear Station, Units 1 and 2 - Issuance of Amendments Regarding Exigent License Amendment Request to Revise Technical Specification 3.3.4, Remote Shutdown System (TAC Nos. MF3473 and MF3474), dated February 27, 2014 (Reference 3). This license amendment provided a one-time change to Function 3.b, “Decay Heat Removal via Steam Generators (SGs) - Reactor Coolant System (RCS) Cold Leg Temperature - Loop A and B,” of TS Table 3.3.4-1 to allow a Unit 2 resistance temperature detector (RTD) for RCS Loop B to remain inoperable for the remainder of Operating Cycle 20 (approximately a 13-month duration).

4.3 SIGNIFICANT HAZARDS CONSIDERATION

Tennessee Valley Authority (TVA) proposes to revise the Watts Bar Nuclear Plant (WBN) Technical Specifications (TS) 3.3.4, Table 3.3.4-1, Function 4a, "RCS Hot Leg Temperature Indication," as follows:

The proposed change adds “(Refer to Note A on page 2 of 2)” to the Required Number of Functions for WBN Unit 2 TS Table 3.3.4-1, "Remote Shutdown System Instrumentation and Controls," item 4.a, “RCS Hot Leg Temperature Indication.” The new Note A on new page 2 of WBN Unit 2 TS Table 3.3.4-1 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.”

TVA also proposes the addition of a new license condition 2.C(11) to the operating license of WBN Unit 2 to implement the compensatory measures described in Section 3.4, “Additional Compensatory Measures,” of the proposed amendment.

TVA has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed 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 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, TVA concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

4.4 CONCLUSIONS

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) 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.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. NRC Letter to TVA, "Watts Bar Unit 1 - Issuance of Exigent Amendment Regarding Application to Allow Temperature Indication for Reactor Coolant System Loop 3 to be Inoperable for the Remainder of Operating Cycle 13 (TAC No. MF6286)," dated June 12, 2015 (ML15160A407)
2. NRC Letter to TVA, "Watts Bar Unit 1 - Issuance of Exigent Technical Specification Amendment Concerning Inoperable Reactor Coolant System Temperature Indicator (TAC No. MC4979)," dated November 19, 2004 (ML043140476)
3. NRC letter to Duke Energy Carolinas, LLC, "Catawba Nuclear Station, Units 1 and 2 - Issuance of Amendments Regarding Exigent License Amendment Request to Revise Technical Specification 3.3.4, Remote Shutdown System (TAC Nos. MF3473 and MF3474)," dated February 27, 2014 (ML14056A217)

Enclosure 2

ATTACHMENT 1

Proposed TS Changes (Mark-Ups) for WBN Unit 2

Table 3.3.4-1 (page 1 of ~~12~~)
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.

Enclosure 2

ATTACHMENT 2

Proposed TS Changes (Final Typed) for WBN Unit 2

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.

Enclosure 2

ATTACHMENT 3

Proposed License Condition (Mark-Ups) for WBN Unit 2

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

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

Enclosure 2

ATTACHMENT 4

Proposed License Condition (Final Typed) for WBN Unit 2

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.

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FOR THE NUCLEAR REGULATORY COMMISSION

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