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

December 10, 2019

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

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT NOS. 131 AND 34 REGARDING CORRECTION TO UNBALANCED VOLTAGE RELAY INSTRUMENTATION VALUES (EPID L-2019-LLA-0228)

Dear Mr. Barstow:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 131 to Facility Operating License No. NPF-90 and Amendment No. 34 to Facility Operating License No. NPF-96 for the Watts Bar Nuclear Plant (WBN), Units 1 and 2, respectively. These amendments are in response to your application dated October 23, 2019.

The amendments revise the WBN Technical Specification Table 3.3.5-1, "LOP DG Start Instrumentation," Function 5, "6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage)," to correct the values for the allowable value (AV) for the unbalanced voltage relay (UVR) low trip voltage, the AV for the UVR high trip time delay, and the trip setpoint for the UVR high trip time delay.

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

Sincerely,

Kimberly J. Green, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-390 and 50-391

Enclosures:
1. Amendment No. 131 to NPF-90
2. Amendment No. 34 to NPF-96
3. Safety Evaluation

cc: Listserv

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

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 131
License No. NPF-90

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Tennessee Valley Authority (TVA, the licensee) dated October 23, 2019, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A as revised through Amendment No. 131 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 by December 25, 2019.

FOR THE NUCLEAR REGULATORY COMMISSION

Undine Shoop, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating License
and Technical Specifications

Date of Issuance: December 10, 2019

ATTACHMENT TO AMENDMENT NO. 131

WATTS BAR NUCLEAR PLANT, UNIT 1

FACILITY OPERATING LICENSE NO. NPF-90

DOCKET NO. 50-390

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

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove Pages	Insert Pages
3.3-51a	3.3-51a

(4) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required, any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis, instrument calibration, or other activity associated with radioactive apparatus or components; and

(5) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

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

(1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3459 megawatts thermal.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 131 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Safety Parameter Display System (SPDS) (Section 18.2 of SER Supplements 5 and 15)

Prior to startup following the first refueling outage, TVA shall accomplish the necessary activities, provide acceptable responses, and implement all proposed corrective actions related to having the Watts Bar Unit 1 SPDS operational.

(4) Vehicle Bomb Control Program (Section 13.6.9 of SSER 20)

During the period of the exemption granted in paragraph 2.D.(3) of this license, in implementing the power ascension phase of the approved initial test program, TVA shall not exceed 50% power until the requirements of 10 CFR 73.55(c)(7) and (8) are fully implemented. TVA shall submit a letter under oath or affirmation when the requirements of 73.55(c)(7) and (8) have been fully implemented.

Table 3.3.5-1 (page 2 of 2)
LOP DG Start Instrumentation

	FUNCTION	REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	TRIP SETPOINT	ALLOWABLE VALUE
5.	6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage)	3	SR 3.3.5.1 SR 3.3.5.2 SR 3.3.5.3	1.30 V at 2.95 sec (Permissive Alarm) 2.96 V at 9.95 sec (Lo) 18.13 V at 3.45 sec (High)	≤ 1.5 V at 3 sec (Permissive Alarm) ≤ 3.3 V at 10 sec (Lo) ≤ 20.0 V at 3.50 sec (High)

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. 34
License No. NPF-96

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Tennessee Valley Authority (TVA, the licensee) dated October 23, 2019, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A as revised through Amendment No. 34 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 by December 25, 2019.

FOR THE NUCLEAR REGULATORY COMMISSION

Undine Shoop, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating License
and Technical Specifications

Date of Issuance: December 10, 2019

ATTACHMENT TO AMENDMENT NO. 34

WATTS BAR NUCLEAR PLANT, UNIT 2

FACILITY OPERATING LICENSE NO. NPF-96

DOCKET NO. 50-391

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

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove Pages	Insert Pages
3.3-53	3.3-53

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. 34 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 until the WBN Unit 2 steam generators are replaced with steam generators equivalent to the existing steam generators at WBN Unit 1.

(5) By December 31, 2019, 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:

Table 3.3.5-1 (page 1 of 1)
LOP DG Start Instrumentation

	FUNCTION	REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	TRIP SETPOINT	ALLOWABLE VALUE
1.	6.9 kV Emergency Bus Undervoltage (Loss of Voltage)				
a.	Bus Undervoltage	3	SR 3.3.5.1 SR 3.3.5.2	≥ 5994 V and ≤ 6006 V	≥ 5967.6 V
b.	Time Delay	2	SR 3.3.5.3	≥ 0.73 sec and ≤ 0.77 sec	≥ 0.58 sec and ≤ 0.94 sec
2.	6.9 kV Emergency Bus Undervoltage (Degraded Voltage)				
a.	Bus Undervoltage	3	SR 3.3.5.1 SR 3.3.5.2	≥ 6593.4 V and ≤ 6606.6 V	≥ 6570 V
b.	Time Delay	2	SR 3.3.5.3	≥ 9.73 sec and ≤ 10.27 sec	≥ 9.42 sec and ≤ 10.49 sec
3.	Diesel Generator Start	2	SR 3.3.5.1 SR 3.3.5.2	≥ 4733.4 V and ≤ 4926.6 V with an internal time delay of ≥ 0.46 sec and ≤ 0.54 sec	≥ 2295.6 V with an internal time delay of 0.56 sec at zero volts
4.	Load Shed	4	SR 3.3.5.1 SR 3.3.5.2	≥ 4733.4 V and ≤ 4926.6 V with an internal time delay of ≥ 2.79 sec and ≤ 3.21 sec	≥ 2295.6 V with an internal time delay of ≤ 3.3 sec at zero volts.
5.	6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage)	3	SR 3.3.5.1 SR 3.3.5.2 SR 3.3.5.3	1.30 V at 2.95 sec (Permissive Alarm) 2.96 V at 9.95 sec (Lo) 18.13 V at 3.45 sec (High)	≤ 1.5 V at 3 sec (Permissive Alarm) ≤ 3.3 V at 10 sec (Lo) ≤ 20.0 V at 3.50 sec (High)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 131 AND 34

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

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-390 AND 50-391

1.0 INTRODUCTION

By letter dated August 27, 2019, the U.S. Nuclear Regulatory Commission (NRC, the Commission) issued Amendment Nos. 128 and 31 to Facility Operating License Nos. NPF-90 and NPF-96 for the Watts Bar Nuclear Plant (WBN), Units 1 and 2, respectively (Reference 1). These amendments added a new level of protection, "unbalanced voltage," for loss of power (LOP) instrumentation to the WBN Technical Specifications (TSs), including revisions to TS Table 3.3.5-1, "LOP DG [diesel generator] Start Instrumentation," Function 5, "6.9 kV [kilovolt] Emergency Bus Undervoltage (Unbalanced Voltage)."

By letter dated October 23, 2019, the Tennessee Valley Authority (TVA, the licensee) submitted a license amendment request (LAR) to the NRC to revise WBN TS Table 3.3.5-1, "LOP DG Start Instrumentation," Function 5, "6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage)," for the Allowable Value (AV) for the unbalanced voltage relay (UVR) low trip voltage, the AV for the UVR high trip time delay, and the Trip Setpoint for the UVR high trip time delay (Reference 2). This amendment request corrects transcription errors that TVA submitted in its November 17, 2017, amendment request, as supplemented by letter dated November 19, 2018 (References 3 and 4, respectively) that were ultimately issued as part of Amendment Nos. 128 and 31.

2.0 REGULATORY EVALUATION

2.1 System Description

As described in the WBN Updated Final Safety Analysis Report (UFSAR), Section 8.2, "Offsite (Preferred) Power System" (Reference 5):

> Preferred offsite power is supplied from TVA's 161 kV transmission grid at Watts Bar Hydro Plant (WBH) switchyard over two separate transmission lines, each connecting to two 161-6.9-kV common station service transformers (CSSTs) at

> Watts Bar Nuclear Plant (WBN). The Class 1E power system is normally supplied from offsite power through CSSTs C and D.
>
> ....
>
> Common station service transformers C and D both have two 6.9kV secondary windings with automatic high-speed load-tap changer units. Each secondary of the transformer is the normal power supply for one 6.9kV shutdown board in each unit. Each secondary is also the alternate power supply for the opposite train, opposite unit 6.9kV shutdown board in each unit.

Each 6.9 kV shutdown board is equipped with LOP relays consisting of loss of voltage relays and degraded voltage relays (DVRs). The standby onsite power at WBN Units 1 and 2 is supplied by four DGs. The LOP relays monitor the voltage on the engineered safety feature buses (shutdown boards). In the event of loss of voltage or degraded voltage conditions on the shutdown boards, the LOP relays actuate to isolate the degraded power source and start the DGs and supply power to the safety-related loads.

In its letter dated November 19, 2018, Section 3.2, "TVA Design Description," the licensee described the new Class 1E UVRs (negative sequence overvoltage relays) to be installed on the medium voltage 6.9 kV shutdown boards at WBN units to protect the functionality of the Class 1E equipment from unbalanced voltages. The licensee stated that ABB Type 60Q phase unbalance relays were used because these relays were already qualified for Class 1E use and were similar to existing DVRs. In addition, the licensee stated:

> The [unbalanced voltage protection] logic scheme is set up in a permissive 1-out-of-2 logic to ensure reliability and security. For the logic scheme, the alarm relay is used to supervise either the low trip or high trip relays to initiate the existing logic to transfer from the degraded offsite power source to the DGs prior to individual safety related motors tripping. This provides both redundancy as well as reliability (prevent nuisance tripping). For a given unbalanced voltage, if the alarm relay and either the low trip relay or high trip relay times out, the resulting trip signal is sent to the existing logic that trips the incoming offsite power circuit breakers on the medium voltage SDBD [shutdown board]. This disconnects the onsite Class 1E distribution system from the voltage unbalance. Existing under-voltage protective relays would then transfer the affected Class 1E board to the onsite power supply (DG), in the same manner as a loss-of-offsite power.
>
> ...[T]he unbalanced voltage protective relay scheme monitors the Class 1E bus voltage on the medium voltage safety bus via the [existing] Class 1E bus PTs [potential transformers] measuring the three-phase voltage, to verify the bus voltage is balanced enough for the running and starting of Class 1E motors to operate. Upon responding to an unbalanced voltage condition, the protective relay scheme would actuate after a time delay to pick-up the auxiliary relay, which would disconnect the preferred power supply. The unbalanced voltage protection scheme is commensurate with the degraded voltage sensing system....

2.2 Description of Proposed Changes

In the LAR, the licensee proposed revising three instrument values for Function 5 in TS Table 3.3.5-1, as follows:

1. Revise the Function 5 AV associated with the UVR low trip voltage from "≤ 3.35 V [volt] at 10 sec [seconds] (Lo)" to "≤ 3.3 V at 10 sec (Lo)."

2. Revise the Function 5 Trip Setpoint associated with the UVR high trip time delay from "18.13 V at 3.95 sec (High)" to "18.13 V at 3.45 sec (High)."

3. Revise the Function 5 AV associated with the UVR high trip time delay from "≤ 20.0 V at 4 sec (High)" to "≤ 20.0 V at 3.50 sec (High)."

The licensee stated that the above proposed changes were required due to transcription errors from the UVR setpoint calculation in its amendment request dated November 17, 2017, as supplemented on November 19, 2018, that resulted in the issuance of Amendments Nos. 128 and 31 for WBN Units 1 and 2, respectively.

2.3 Applicable Regulatory Requirements and Guidance

2.3.1 Regulatory Requirements

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36, "Technical specifications," establishes the regulatory requirements related to the content of TSs. Paragraph 50.36(a)(1) requires an application for an operating license to include proposed TSs. A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the TSs.

Pursuant to 10 CFR 50.36, TSs for operating reactors are required to include items in the following five specific categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation (LCOs); (3) surveillance requirement (SRs); (4) design features; and (5) administrative controls. In accordance with 10 CFR 50.36(c)(2), LCOs are the lowest functional capability or performance level of equipment required for safe operation of the facility. When LCOs are not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the LCO can be met. In accordance with 10 CFR 50.36(c)(3), SRs are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met.

Pursuant to 10 CFR 50.36(c)(1)(ii)(A), "Limiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting [LSSS] is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. If, during operation, it is determined that the automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor."

Appendix A to 10 CFR Part 50, General Design Criterion (GDC) 13, "Instrumentation and control," states, in part, that "Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and

for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges."

Appendix A to 10 CFR Part 50, GDC 17, "Electric power systems," states, in part, that an onsite electrical power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components (SSCs) important to safety. The safety function for each system shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. GDC 17 ensures that the electric power system provides: (1) capacity and capability to permit functioning of SSCs important to safety; (2) independence, redundancy, and availability; and (3) provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the LOP generated by the nuclear power unit, the LOP from the transmission network, or the LOP from the onsite electric power supplies.

Pursuant to 10 CFR 50.57(a)(3), "Issuance of operating license," the Commission may issue an operating license upon finding, in part: There is reasonable assurance (i) that the activities authorized by the operating license can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the regulations in this chapter...."

2.3.2 Regulatory Guidance and Industry Standards

At the time of licensing the WBN plants, the regulations promulgated in 10 CFR Part 50 and NRC regulatory guides did not consider the consequences of unbalanced voltage conditions on safety-related equipment. The NRC staff used publicly available industry standards to support the evaluation of the proposed setpoint changes. The documents may not be part of the licensing basis of WBN, but provide technical information related to unbalanced voltages and the impact on safety-related motors.

Regulatory Guide (RG) 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," dated December 1999 (Reference 6), describes a method acceptable to the NRC staff for complying with the NRC's regulations for ensuring that setpoints for safety-related instrumentation are initially within and remain within the TS limits. RG 1.105 endorses Part 1 of Instrument Society of America (ISA) Standard S67.04-01-1994, "Setpoints for Nuclear Safety-Related Instrumentation" (Reference 7). The staff used the principles of this guide to establish the adequacy of the licensee's setpoint calculation methodologies and the related plant surveillance procedures.

ISA-S67.04-01-1994, Section 4.3, "Setpoints for Nuclear Safety-Related Instrumentation (LSSS)," states, in part, that, "The LSSS is derived from the analytical limit in a manner determined by the setpoint calculation methodology. Depending on the methodology, the LSSS may be the allowable value, the trip setpoints, or both."

National Electrical Manufacturers Association (NEMA) MG-1-2009, "Motors and Generators" (Reference 8), is a guidance document for evaluating the allowable unbalanced voltages in power systems. This guidance document is generally invoked for purchase of rotating

equipment such as motors and generators by all industries. The standard recommends motors to produce rated output for 1 percent of voltage unbalance. NEMA MG-1-2009 states, in part, that, "[a] small percentage voltage unbalance will result in a much larger percentage current unbalance."

Institute of Electrical and Electronics Engineers (IEEE) Standard 308-1974, "Standard Criteria for Class IE Power Systems for Nuclear Power Generating Stations" (Reference 9), has been adopted by WBN and provides guidance for the design of Class 1E power systems. The purpose of this standard is to provide:

1. The principal design criteria and the design features of the Class 1E electric systems that enable the systems to meet their functional requirement under the conditions produced by the design-basis events.

2. The minimum operational conditions of the Class 1E electric systems under which the station will be permitted to operate.

3. The surveillance requirements of the Class 1E electric systems.

The previous amendment request supplemental letter, dated November 19, 2018 (Reference 4), referenced NEMA MG-1-1987, "Motors and Generators" (Reference 10), as a guidance document for evaluating the allowable unbalanced voltages in power systems. This guidance document is generally invoked for purchase of rotating equipment such as motors and generators by all industries. The commercial nuclear industry has also adopted NEMA MG-1 for procurement of motors in safety-related applications. The standard provides limits on percentage of voltage unbalance for motors.

IEEE Standard 3004.8-2016, "Recommended Practice for Motor Protection in Industrial and Commercial Power Systems" (Reference 11), provides an approximate relationship between voltage unbalance and negative sequence current magnitude that can degrade motor insulation. This standard also provides information on protective relays that can be used to protect motors from abnormal power supply conditions including detection of unbalanced voltages, negative sequence voltages, and negative sequence currents.

3.0 TECHNICAL EVALUATION

The NRC staff used the information provided by the licensee in its November 17, 2017, amendment request, as supplemented by letter dated November 19, 2018, to review the proposed (correct) instrument values for TS Table 3.3.5-1, Function 5, in the LAR.

Section 3.0, "Technical Evaluation," of the LAR provides the methodology used by the licensee to calculate the trip setpoint and the AVs for the UVR based on Analytical Limits (ALs) and uncertainties. In Section 3.1, "Vulnerability Studies Summary," of its November 19, 2018, letter, the licensee stated that the ALs calculations determined the acceptable limit of unbalanced voltage levels to maintain protection of the equipment, and the UVR setpoints (i.e., Trip Setpoint and AV) provide protection for any scenario that could cause unbalanced voltages to exceed the setpoints.

The LAR would revise the AV for the UVR low trip voltage function from ≤ 3.35 V to ≤ 3.3 V. The associated low trip time delay AV of 10 seconds (Lo) would be unchanged. The NRC staff notes that the AV of ≤ 3.3 V for the UVR low trip voltage was approved in its safety evaluation

(SE) dated August 27, 2019, but an incorrect AV of ≤ 3.35 V was provided in the changes shown for the associated TS page.

The LAR would also revise the Trip Setpoint and AV for the UVR high trip time delay function from 3.95 seconds to 3.45 seconds and from 4 seconds to 3.50 seconds, respectively. The associated Trip Setpoint of 18.13 V and AV of ≤ 20.0 V for the UVR high trip voltage function would remain unchanged. The NRC staff notes that the proposed revised Trip Setpoint (3.45 seconds) and AV (3.50 seconds) for the UVR high trip time delay function in the LAR are lower than the previously approved time delays' Trip Setpoint (3.95 seconds) and AV (4 seconds). A lower time delay in actuating a protective relay means that the duration of unbalanced voltage conditions on the plant shutdown busses will be less and, thus, the heating effects on the connected safety-related equipment during high voltage unbalance will be reduced. The staff also notes that the proposed change is relatively small and will not result in spurious actuation of the UVRs during minor transients in the electrical system.

The LAR provided the upper ALs for the UVR low trip voltage function and the UVR high trip time delay function. The lower ALs were not provided. The NRC staff evaluated the upper ALs for the UVR voltage and time delays in Section 3.1 of this SE. The staff also evaluated the TS Table 3.3.5-1 Trip Setpoint and AVs in Section 3.2 of this SE.

3.1 Evaluation of Analytical Limits

UVR Low Trip Voltage Upper AL

The licensee used an upper AL of 3.329 V to calculate the UVR low trip voltage AV (3.3 V).

In Section 3.4, "Analytical Limits and UVR Nominal Setpoints Methodology," of its November 19, 2018, letter, the licensee stated:

> The Low Trip Relay protects against loss of safety function for the connected Class 1E loads during a voltage unbalance. The analytical limit protects the point where the required safety loads perform their safety function during a voltage unbalance, operational occurrences, and design basis events.
>
> ....
>
> The upper analytical limit of the setting is less than the recommended maximum limit of voltage unbalance for motors to tolerate from industry standards. To avoid nuisance tripping (unnecessary loss of offsite power), the relay nominal setting should be as close as possible to this upper limit, accounting for associated errors and tolerances.

The licensee used the industry standard NEMA MG-1 guidance of maximum 5 percent voltage unbalance for motor operation. The NEMA MG-1 guidance indicates that a small percentage of voltage unbalance creates large percentage of current unbalance (approximately 6 to 10 times the voltage unbalance at normal operating speed) in the motors' windings which in turn causes a high temperature rise of the motor. In addition, IEEE Standard 3004.8-2016 states that a 5 percent voltage unbalance produces a stator negative sequence current equal to 30 percent of full load current that can lead to a 40 to 50 percent increase in temperature rise. This increase in temperature is damaging to the motors' windings.

Because the upper AL of 3.329 V for the UVR low trip voltage is below the maximum 5 percent voltage unbalance recommended in the NEMA MG-1 guidance and IEEE Standard 3004.8-2016, the NRC staff finds that the 3.329 V AL provides an acceptable limit of unbalanced voltage levels to maintain protection of the affected safety-related motors from overheating damage caused by unbalanced currents.

UVR High Trip Time Delay Upper AL

The licensee used an upper AL of 4 seconds to calculate the UVR high trip time delay Trip Setpoint (3.45 seconds) and AV (3.50 seconds).

In Section 3.2 of its November 19, 2018, letter, the licensee described the following effects of high unbalance voltages on the distribution system connected to the degraded power source:

> If the voltage unbalance is high enough, the resulting current unbalance can cause protective devices (overcurrent relays, circuit breakers, thermal overload relays) to trip prematurely, leading to an unanalyzed loss of safety loads. For some very large unbalanced voltage conditions, the connected loads lose rotational torque which causes them to quickly transition to locked-rotor current conditions and ultimately trip their protective devices, also leading to an unanalyzed loss of safety loads.

The licensee provided the UVR with "high trip" settings to protect the functionality of connected safety-related loads from high unbalanced voltages. In Section 3.4 of its November 19, 2018, letter, the licensee stated:

> The High Trip Relay protects against loss of safety function for the connected Class 1E loads during a voltage unbalance. This relay provides a faster tripping time for high-level unbalances, where catastrophic load failure may occur within a few seconds.
>
> ....
>
> The upper analytical limit of the time delay is less than the minimum design time allowed for motor starting, adjusting for additional current created by unbalanced voltages, and less than the tripping time of overcurrent protective devices during unbalance voltage conditions.

Section 8.2 of the WBN UFSAR (Reference 5) states that overcurrent protective relays are provided for each shutdown board to lockout all supply breakers if the loss of voltage is caused by overload or an electrical fault. In addition, as described in the WBN UFSAR, Section 8.3, "Onsite (Standby) Power System," overcurrent protective devices with time settings are provided to protect the motors in the distribution system against motor overloads, locked-rotor currents, and electrical circuit faults. The time settings for these above-mentioned overcurrent relays allow for normal motor starts, which draw high inrush starting currents.

The NRC staff notes that since the upper AL of 4 seconds for the UVR high trip time delay function is less than the motor start time and the tripping time of the overcurrent protective devices, the UVR will quickly disconnect the shutdown board from the unbalanced voltage power source to keep the overcurrent protective devices from prematurely tripping and the connected starting and running motors from locking due to very large unbalanced currents. In

addition, as stated in the November 19, 2018, letter, the existing undervoltage protective relays will transfer the disconnected shutdown board to the DG, in the same manner as a loss of offsite power. Furthermore, the proposed revised Trip Setpoint (3.45 seconds) and AV (3.50 seconds) for the UVR high trip time delay function are less than the 4-second upper AL and, as such, the heating effects on the connected safety-related equipment during high voltage unbalance will be reduced.

Based on the above discussion, the NRC staff finds that the proposed 4-second upper AL for the UVR high trip time delay provides an acceptable time limit to maintain protection of the safety-related equipment during high-level unbalance voltages since the connected equipment will be isolated from the degraded power source and remain available to perform their safety functions once the power for the equipment is transferred to the DG. This will maintain conformance with the GDC 17 requirement for assuring that required onsite electrical power is available to permit functioning of safety-related equipment.

3.2 Evaluation of Allowable Values

3.2.1 Evaluation of Allowable Value of UVR Low Trip Voltage Function

TVA proposed to make a correction to the AV associated with the UVR low trip voltage of the 6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage), Function 5, in WBN TS Table 3.3.5-1, as shown in Section 2.2 of this SE.

The existing AV:	"≤ **3.35 V** at 10 sec (Lo)"
The proposed AV:	"≤ **3.3 V** at 10 sec (Lo)"

The NRC staff verified that, in the NRC letter to TVA, the NRC staff approved as the AV for the UVR low trip voltage **"≤ 3.3 V at 10 sec (Lo)"** in Section 3.3.3 of the NRC staff's SE (Reference 1) for the previous amendment request (References 3 and 4). The **"≤ 3.35 V at 10 sec (Lo)"** for the AV of the UVR low trip voltage was an administrative error in the Attachment 4.4, "Proposed TS Changes (Clean) for WBN, Units 1 and 2," of the previous license amendment request and the supplement (References 3 and 4). Therefore, the proposed change will rectify an administrative error to provide correct values for degraded channel performance.

In addition, based on Section 3.3.3 of the NRC staff's SE, the proposed AV setting **"≤ 3.3 V at 10 sec (Lo)"** for the 6.9 kV unbalanced voltage setpoints and their associated time delays for the WBN UVR had been chosen so that automatic protective action will take place to prevent the abnormal situation before a safety limit is exceeded (Reference 1). The maximum AV setting, 3.3 V at 10 seconds, was consistent with RG 1.105 and NEMA MG-1, and satisfied the requirements of 10 CFR 50.36(c)(1)(ii)(A), 10 CFR 50.57(a)(3), and GDC 13.

On this basis, the NRC staff determines that the proposed TS change will correct an administrative error and provide reasonable assurance of adequate protection of public health and safety. Therefore, the proposed change is acceptable.

3.2.2 Evaluation of Trip Setpoint and Allowable Value Associated UVR High Trip Time Delay Function

TVA proposed to change the Trip Setpoint and AV associated with the UVR high trip time delay of the 6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage), Function 5, as shown in Section 2.2 of this SE.

The existing Trip Setpoint:	"18.13 V at **3.95** sec (High)"
The existing AV:	"≤ 20.0 V at **4** sec (High)"
The proposed Trip Setpoint:	"18.13 V at **3.45** sec (High)"
The proposed AV:	"≤ 20.0 V at **3.50** sec (High)"

In the LAR, the licensee stated:

> The UVR high trip time delay AV, as also approved by the NRC in Reference 3 [Note: this is Reference 1 in this SE], exceeds the designated AV in the TVA setpoint calculation. Thus, it will also provide an incorrect indicator of degraded channel performance. The UVR high trip relay time delay Trip Setpoint, as also approved by the NRC, has inadequate margin to the analytical limit, and also exceeds the AV established by the TVA UVR setpoint calculation.

The staff notes that in the previous license amendment request and supplement (References 3 and 4) TVA did not provide the AL and the TVA UVR setpoint calculations. Therefore, in the NRC staff's SE (Reference 1), the NRC staff did not evaluate or approve the AL and the TVA's Trip Setpoint and AV calculations of the UVR high trip time delays of the Function 5 in TS Table 3.3.5-1. The NRC staff approved the AV and the Trip Setpoint (High) time delays based on the applicable NRC regulatory requirements in Section 2.3 of the NRC staff's SE (Reference 1).

The NRC staff evaluated the proposed AV and Trip Setpoint in the current LAR. The review methodology, however, is similar to the previous methodology.

Sections 3.1 and 3.2 of the LAR include the summary of the TVA Trip Setpoint and AV calculations for the UVR high trip setpoint voltage time delays:

AL	= 4.0 sec
Proposed TS Setpoint	= 3.45 sec
Proposed TS AV	= 3.50 sec

The NRC staff evaluated these setpoint values but did not evaluate the TVA's calculations for the UVR high voltage time delay settings because these calculations did not include the details for the setpoint calculation (e.g., the as-left and the as-found values used for calibration, the assumptions, and the basis for the assumption of the total loop uncertainty).

Based on guidance in ISA-S67.04-1994, the NRC staff reviewed the margin between the AL and the AVs (existing and proposed values) associated with the WBN UVR high trip time delays that are showed below:

	AL (Time Delay) (sec)	AV (Time Delay) (sec)	Margin between AL and AV (sec)
Existing Value	4*	4	0
Proposed Value	4	3.50	0.5

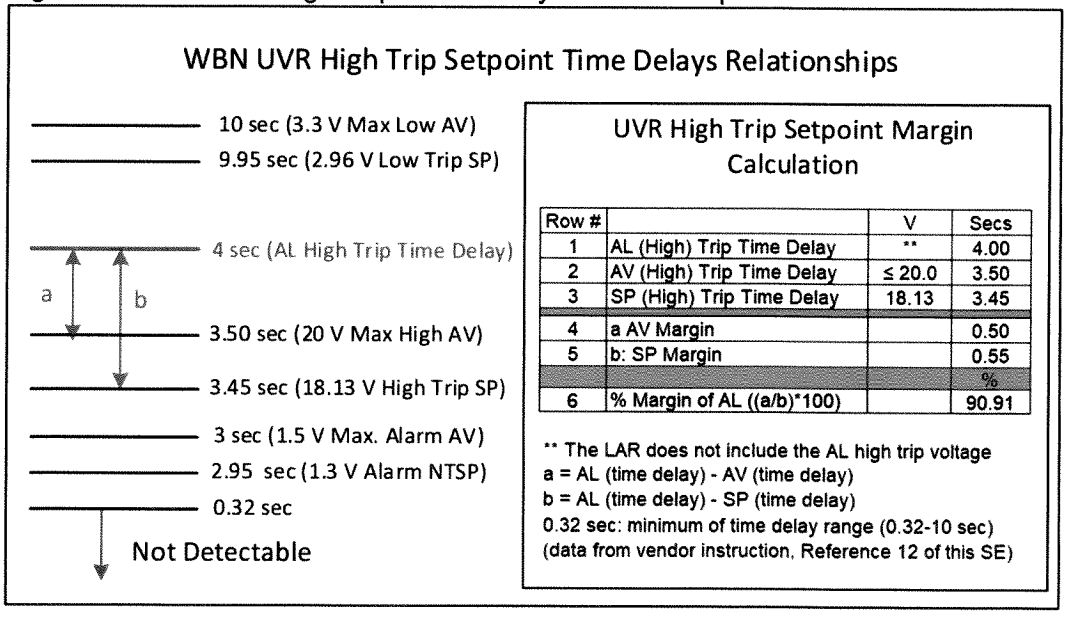
*The previous license amendment request and supplement did not provide AL time delay.

For a setpoint determination, an allowance is added to the instrument channel uncertainty and the margin moves the setpoint father away from the analytical limit. The margin between the newly provided AL time delay and the previously approved value of AV is "0", which would not ensure that a trip or safety actuation will occur within the allowable time to protect safety-related equipment. Therefore, the existing AV in the TS would not provide an automatic protective action to correct the abnormal voltage condition. The proposed corrected AV of 3.50 seconds provides for a margin of 0.5 seconds that is intended to ensure that the safety function will take place prior to exceeding the AL time delay of 4 seconds.

The NRC staff followed the guidance in RG 1.105, Revision 3, to confirm whether there are adequate margins for instrument channel performance uncertainty between the AL to the proposed setpoint and the proposed associated AV of the WBN UVR high trip time delays to satisfy the requirements of 10 CFR 50.36(c)(1)(ii)(A), 10 CFR 50.57(a)(3), and GDC 13.

The NRC staff independently evaluated the relationship between the AL, the proposed AV, and proposed Trip Setpoint settings for the UVR (no scale) high trip time delays for the WBN Units 1 and 2, as shown in Figure 1 below:

Figure 1: WBN UVR High Trip Time Delays Relationship



Based on its independent evaluation, the NRC staff determined the following for the UVR high trip time delays:

- The setpoints lie within the guidance of NEMA MG-1. When the proposed UVR is at the high setting level, the time delay settings are within a few seconds (≤ 4 seconds and ≥ 3 seconds) which would not create significant heat and possibly damage motors.

- The low delay time setting minimizes the heating effects that can degrade motor insulation. The time delays associated with the AVs are longer than the time delays of the Trip Setpoint (of all high, low, or alarm levels) as shown in Figure 1 above and are consistent with the analyses of Section A.4 and the guidance of Relay Timing Period in the Figure A.1 of IEEE Standard 741-1997 (Reference 13).

- The licensee proposed UVR settings (i.e., AV and the Trip Setpoint time delays) in the LAR are considered as the LSSS of the proposed UVR and consistent with the intent of the RG 1.105.

- The margins (as indicated Rows 4, 5, and 6 in Figure 1 above) are adequate at a value greater than 90 percent to ensure that a trip or safety actuation will occur significantly before the measured process reaches the AL level.

- The proposed time delay settings are also consistent with the guidance of IEEE Standard 3004.8-2016's recommendations pertaining to the relationship between voltage unbalance and negative sequence current magnitude that can degrade motor insulation.

- The proposed AV time delay (3.50 sec) is less than the existing AV time delay (4 sec). The proposed Trip Setpoint time delay (3.45 sec) is less than the existing Trip Setpoint time delay (3.95 sec). Therefore, the proposed time delay settings will be more conservative than the existing time delay settings to the WBN's protection of safety-related equipment from effects of unbalanced voltage conditions originating in the offsite or onsite power systems.

Based on the above discussion, the NRC staff finds that the proposed time delay settings for the UVRs provide reasonable assurance that a trip or safety actuation will occur within the allowable time to protect safety-related equipment. Consequently, an automatic protective action will correct the abnormal situation before a safety limit is exceeded. Therefore, these proposed time delay settings, which are based on the unbalanced voltage value, satisfy the requirements of 10 CFR 50.36(c)(1)(ii)(A) and are acceptable.

3.3 Technical Conclusion

The NRC staff evaluated the licensee's proposed changes to the WBN TS Table 3.3.5-1, 6.9 kV Emergency Bus Undervoltage (Unbalanced Voltage), Function 5, as described in Section 3 of this SE, against the applicable regulatory requirements and guidance in Section 2.3 of this SE. The NRC staff finds that the proposed changes provide reasonable assurance that the safety-related equipment connected to the 6.9 kV buses will be protected from the effects of unbalanced currents resulting from unbalanced voltage conditions and will have adequate onsite power to perform its intended safety functions. The NRC staff concludes that the

implementation of the proposed TS changes provides reasonable assurance that the GDC 17 required onsite electric power system will be available to permit functioning of SSCs important to safety following a detectable degradation related to unbalanced voltages in the offsite power system.

The NRC staff independently confirmed that the proposed changes to the WBN TS Table 3.3.5-1, Function 5, voltage setpoints and their associated time delay settings are acceptable. The proposed settings have been chosen so that automatic protective action will correct abnormal voltage conditions before a safety limit is exceeded and maintain these variables and systems within prescribed operating ranges. Therefore, the NRC staff finds that the proposed settings satisfy the requirements of 10 CFR 50.36(c)(1)(ii)(A) and GDC 13 will continue to be met. The NRC staff concludes that the proposed TS changes do not impact the licensee's continued compliance with 10 CFR 50.36(c)(2) because the LCO 3.3.5 and associated TS Table 3.3.5-1 will include the setpoints and associated time delays for the UVR required for safe operation of the facility.

4.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION

The NRC made a proposed determination that the license amendment request involves no significant hazards consideration in the *Federal Register* on November 6, 2019 (84 FR 59846). The NRC's regulation in 10 CFR 50.92(c) states that the NRC may make a final determination, under the procedures in 10 CFR 50.91, that a proposed license amendment 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.

An evaluation of the issue of no significant hazards consideration is presented below:

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

   Response: No.

   The proposed changes correct the TS to reflect the UVR setpoint calculation. The Trip Setpoint and Allowable Value changes restore the UVR instrumentation function to its analyzed design, and so the probability of an accident previously evaluated is not affected. The changes to the Trip Setpoint will ensure that there is acceptable margin to the associated analytical limit, and the Allowable Values will provide proper indicators of degraded channel performance. Thus, the consequences of an accident with the incorporation of these changes will not be increased.

   Based on the above, it is concluded that the proposed changes [do not] involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed changes correct the TS to reflect the UVR setpoint calculation. The proposed changes ensure the affected UVR channels are in conformance with the existing plant design, and will operate as credited in and as constrained by existing accident analyses.

Based on the above, it is concluded that the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No.

The proposed changes correct the TS to reflect the UVR setpoint calculation. The changes result in ensuring the Trip Setpoint has acceptable margin to the associated analytical limits, and that the Allowable Values will provide proper indicators of degraded channel performance. The safety analysis acceptance criteria are not affected by this change. The proposed changes will not result in plant operation in a configuration outside of the design basis.

Based on the above, it is concluded that the proposed changes do 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 final determination that no significant hazards consideration is involved for the proposed amendments and that the amendments should be issued as allowed by the criteria contained in 10 CFR 50.91.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendments on November 8, 2019. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on November 6, 2019 (84 FR 59846). The Commission has made a final determination that no significant hazards consideration is involved for the proposed amendments as discussed in Section 4.0 of this SE. Accordingly, the amendments meet the

eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

7.0 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.

8.0 REFERENCES

1. Miller, G. Edward, U.S. Nuclear Regulatory Commission, letter to Joseph Shea, Tennessee Valley Authority, August 27, 2019, ADAMS Accession No. ML18277A110.

2. Policikoski, James T., Tennessee Valley Authority, letter to U.S. Nuclear Regulatory Commission, October 23, 2019, ADAMS Accession No. ML19296C538.

3. Shea, J.W., Tennessee Valley Authority, letter to U.S. Nuclear Regulatory Commission, November 17, 2017, ADAMS Accession No. ML17324A349.

4. Henderson, E.K., Tennessee Valley Authority, letter to U.S. Nuclear Regulatory Commission, November 19, 2018, ADAMS Accession No. ML18324A609.

5. Tennessee Valley Authority, Watts Bar Nuclear Plant, Dual-Unit Updated Final Safety Analysis Report, Amendment 1, Chapter 8, "Electric Power," November 2017, ADAMS Accession No. ML17334A173.

6. U.S. Nuclear Regulatory Commission, "Setpoints for Safety-Related Instrumentation," Regulatory Guide 1.105, Revision 3, ADAMS Accession No. ML993560062.

7. American National Standards Institute/Instrument Society of America, "Setpoints for Nuclear Safety-Related Instrumentation," ANSI/ISA S67.04, 1994, Research Triangle Park, NC.

8. National Electrical Manufacturers Association, "Motor and Generators," NEMA MG-1-2009, Rosslyn, VA.

9. Institute of Electrical and Electronics Engineers, "Standard Criteria for Class IE Power Systems for Nuclear Power Generating Stations," IEEE Standard 308-1974, New York, NY.

10. National Electrical Manufacturers Association, "Motors and Generators," NEMA MG-1-1987, Rosslyn, VA.

11. Institute of Electrical and Electronics Engineers, "Recommended Practice for Motor Protection in Industrial and Commercial Power Systems," IEEE Standard 3004.8-2016, New York, NY.

12. ASEA Brown Boveri, "ABB Instructions for Phase Unbalance Relay," IB 7.4.1.7-3, Issue C, Zurich, Switzerland.

13. Institute of Electrical and Electronics Engineers, "Standard Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations," IEEE Standard 741-1997, New York, NY.

Principal Contributors: A. Foli, NRR
G. Matharu, NRR
H. Vu, NRR
G. Singh, NRR

Date: December 10, 2019

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT NOS. 131 AND 34 REGARDING CORRECTION TO UNBALANCED VOLTAGE RELAY INSTRUMENTATION VALUES (EPID L-2019-LLA-0228) DATED DECEMBER 10, 2019

DISTRIBUTION:
PUBLIC
PM File Copy
RidsACRS_MailCTR Resource
RidsNrrDorlLpl2-2 Resource
RidsNrrPMWattsBar Resource
RidsNrrDssStsb Resouce
RidsNrrDexEicb Resource
RidsNrrLABAbeywickrama Resource
RidsRgn2MailCenter Resource
HVu, NRR
GSingh, NRR
AFoli, NRR
GMatharu, NRR

ADAMS Accession No.: ML19336C519 ***by e-mail**

OFFICE	NRR/DORL/LPL2-2/PM	NRR/DORL/LPL2-2/LA	NRR/DEX/EEOB/BC*	NRR/DEX/EICB/BC*
NAME	KGreen	BAbeywickrama	BTitus (KNguyen for)	MWaters
DATE	12/4/19	12/4/19	11/27/19	11/27/19
OFFICE	NRR/DSS/STSB/BC*	OGC – NLO (w/edits)*	NRR/DORL/LPL2-2/BC*	NRR/DORL/LPL2-2/PM
NAME	VCusumano	JWachutka	UShoop	KGreen
DATE	12/3/19	12/9/19	12/9/19	12/10/19

OFFICIAL RECORD COPY