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

January 13, 2017

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3R-C
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 – ISSUANCE OF AMENDMENTS REGARDING EXTENSION OF COMPLETION TIME FOR INOPERABLE DIESEL GENERATOR (CAC NOS. MF7147 AND MF7148)

Dear Mr. Shea:

The U.S. Nuclear Regulatory Commission (NRC or the Commission) has issued the enclosed Amendment Nos. 110 and 5 to Facility Operating License Nos. NPF-90 and NPF-96 for the Watts Bar Nuclear Plant, Units 1 and 2, respectively. These amendments consist of changes to the Facility Operating Licenses in response to your application dated December 8, 2015, and superseded by letter dated March 11, 2016, and supplemented by letters dated October 13, November 1, and December 8, 2016.

The amendments revise the Watts Bar Nuclear Plant, Units 1 and 2, Technical Specification (TS) 3.8.1, "AC Sources – Operating," to extend the Completion Time for one inoperable diesel generator (DG) from 72 hours to 10 days based on the availability of a supplemental alternating current power source (specifically, the FLEX DG added as part of the mitigating strategies for beyond-design-basis events in response to NRC Order EA-12-049). The amendments would also make clarifying changes to certain TS 3.8.1 Conditions, Required Actions, and Surveillance Requirements.

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,

Robert G. Schaaf, 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. 110 to NPF-90
2. Amendment No. 5 to NPF-96
3. Safety Evaluation

cc w/enclosures: Distribution via 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. 110
License No. NPF-90

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

   A. The application for amendment by the Tennessee Valley Authority (the licensee) dated December 8, 2015, as superseded by letter dated March 11, 2016, as supplemented by letters dated October 13, November 1, and December 8, 2016, complies with the standards and requirements of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 Facility Operating License No. NPF-90 and Technical Specifications as indicated in the attachment to this license amendment.

3. This license amendment is effective as of the date of its issuance, and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Benjamin G. Beasley, 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: January 13, 2017

ATTACHMENT TO LICENSE AMENDMENT NO. 110

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 page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

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

REMOVE	INSERT
3.8-2	3.8-2
3.8-2a	3.8-2a
--	3.8-2b
3.8-3	3.8-3
3.8-4	3.8-4
3.8-5	3.8-5
3.8-15	3.8-15

(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. 110 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.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.3	Restore required offsite circuit to OPERABLE status.	72 hours AND 13 days from discovery of failure to meet LCO
B. One DG inoperable.	B.1	Perform SR 3.8.1.1 for the required offsite circuits.	1 hour AND Once per 8 hours thereafter
	AND		
	B.2	Evaluate availability of 6.9 kV FLEX DG.	2 hours AND Once per 12 hours thereafter
	AND		
	B.3	Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	AND		

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.4.1 Determine OPERABLE DGs are not inoperable due to common cause failure. OR B.4.2 Perform SR 3.8.1.2 for OPERABLE DGs. AND B.5 Restore DG to OPERABLE status.	24 hours 24 hours 72 hours from discovery of unavailability of 6.9 kV FLEX DG AND 24 hours from discovery of Condition B entry ≥ 48 hours concurrent with unavailability of 6.9 kV FLEX DG AND 10 days AND 13 days from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION		REQUIRED ACTION		COMPLETION TIME
C.	Two DGs in Train A inoperable. OR Two DGs in Train B inoperable.	C.1	Perform SR 3.8.1.1 for the required offsite circuits. AND	1 hour AND Once per 8 hours thereafter
		C.2	Declare required feature(s) supported by the inoperable DGs inoperable when its required redundant feature(s) is inoperable. AND	4 hours from discovery of Condition C concurrent with inoperability of redundant required feature(s)
		C.3.1	Determine OPERABLE DGs are not inoperable due to common cause failure. OR	24 hours
		C.3.2	Perform SR 3.8.1.2 for OPERABLE DGs. AND	24 hours

(continued)

ACTIONS

CONDITION		REQUIRED ACTION		COMPLETION TIME
C.	(continued)	C.4	Restore DGs to OPERABLE status.	72 hours AND 6 days from discovery of failure to meet LCO
D.	Two required offsite circuits inoperable.	D.1	Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition D concurrent with inoperability of redundant required features.
		AND		
		D.2	Restore one required offsite circuit to OPERABLE status.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One required offsite circuit inoperable. AND One or more DG(s) in Train A inoperable. OR One or more DG(s) in Train B inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating," when Condition E is entered with no AC power source to any train. ---------- E.1 Restore required offsite circuit to OPERABLE status. OR E.2 Restore DG(s) to OPERABLE status.	 12 hours 12 hours
F. One or more DG(s) in Train A inoperable. AND One or more DG(s) in Train B inoperable.	F.1 Restore DG(s) in Train A to OPERABLE status. OR F.2 Restore DG(s) in Train B to OPERABLE status.	2 hours 2 hours
G. Required Action and Associated Completion Time of Condition A, B, C, D, E, or F not met.	G.1 Be in MODE 3. AND G.2 Be in MODE 5.	6 hours 36 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. Two required offsite circuits inoperable. AND One or more DG(s) in Train A inoperable. OR One or more DG(s) in Train B inoperable.	H.1 Enter LCO 3.0.3.	Immediately
I. One required offsite circuit inoperable. AND One or more DG(s) in Train A inoperable. AND One or more DG(s) in Train B inoperable.	I.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.19	----------NOTE---------- For DGs 1A-A and 1B-B, this Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through load sequencer, 3. achieves steady state voltage: ≥ 6800 V and ≤ 7260 V, 4. achieves steady state frequency ≥ 59.8 Hz and ≤ 60.1 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	18 months
SR 3.8.1.20	Verify during idle operation that any automatic or emergency start signal disables the idle start circuitry and commands the engine to full speed.	18 months

(continued)

UNITED STATES
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TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-391

WATTS BAR NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 5
License No. NPF-96

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

   A. The application for amendment by the Tennessee Valley Authority (the licensee) dated December 8, 2015, as superseded by letter dated March 11, 2016, as supplemented by letters dated October 13, November 1, and December 8, 2016, 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 Facility Operating License No. NPF-96 and Technical Specifications as indicated in the attachment to this license amendment.

3. This license amendment is effective as of the date of its issuance, and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Benjamin G. Beasley, 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: January 13, 2017

ATTACHMENT TO LICENSE AMENDMENT NO. 5

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 page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

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

REMOVE	INSERT
3.8-2	3.8-2
3.8-2a	3.8-2a
--	3.8-2b
3.8-3	3.8-3
3.8-4	3.8-4

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. 5 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

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

(5) By December 31, 2017, the licensee shall report to the NRC that the actions to resolve the issues identified in Bulletin 2012-01, "Design Vulnerability in Electrical Power System," have been implemented.

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

(7) TVA shall fully implement and maintain in effect all provisions of the Commission approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The TVA approved CSP was discussed in NUREG-0847, Supplement 28.

(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:

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.3	Restore required offsite circuit to OPERABLE status.	72 hours AND 13 days from discovery of failure to meet LCO
B. One DG inoperable.	B.1	Perform SR 3.8.1.1 for the required offsite circuits.	1 hour AND Once per 8 hours thereafter
	AND		
	B.2	Evaluate availability of 6.9 kV FLEX DG.	2 hours AND Once per 12 hours thereafter
	AND		
	B.3	Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required features(s)
	AND		

(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.4.1	Determine OPERABLE DGs are not inoperable due to common cause failure.	24 hours
	OR		
	B.4.2	Perform SR 3.8.1.2 for OPERABLE DGs.	24 hours
	AND		
	B.5	Restore DG to OPERABLE status.	72 hours from discovery of unavailability of the 6.9 kV FLEX DG AND 24 hours from discovery of Condition B entry ≥ 48 hours concurrent with unavailability of the 6.9 kV FLEX DG. AND 10 days AND 13 days from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Two DGs in Train A inoperable. OR Two DGs in Train B inoperable.	C.1	Perform SR 3.8.1.1 for the required offsite circuits.	1 hour AND Once per 8 hours thereafter
	AND		
	C.2	Declare required feature(s) supported by the inoperable DGs inoperable when its required redundant feature(s) is inoperable	4 hours from discovery of Condition C concurrent with inoperability of redundant required feature(s)
	AND		
	C.3.1	Determine OPERABLE DGs are not inoperable due to common cause failure.	24 hours
	OR		
	C.3.2	Perform SR 3.8.1.2 for OPERABLE DGs.	24 hours
	AND		

(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. (continued)	C.4	Restore DGs to OPERABLE status.	72 hours AND 6 days from discovery of failure to meet LCO
D. Two required offsite circuits inoperable.	D.1	Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition D concurrent with inoperability of redundant required features
	AND		
	D.2	Restore one required offsite circuit to OPERABLE status.	24 hours
E. One required offsite circuit inoperable. AND One or more DG(s) in Train A inoperable. OR One or more DG(s) in Train B inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating," when Condition E is entered with no AC power source to any train. ----------		
	E.1	Restore required offsite circuit to OPERABLE status.	12 hours
	OR		
	E.2	Restore DG(s) to OPERABLE status.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. One or more DG(s) in Train A inoperable. AND One or more DG(s) in Train B inoperable.	F.1	Restore DG(s) in Train A to OPERABLE status. OR	2 hours
	F.2	Restore DG(s) in Train B to OPERABLE status.	2 hours
G. Required Action and Associated Completion Time of Condition A. B, C, D, E, or F not met.	G.1	Be in MODE 3.	6 hours
	AND		
	G.2	Be in MODE 5.	36 hours
H. Two required offsite circuits inoperable. AND One or more DG(s) in Train A inoperable. OR One or more DG(s) in Train B inoperable.	H.1	Enter LCO 3.0.3.	Immediately
I. One required offsite circuit inoperable. AND One or more DG(s) in Train A inoperable. AND One or more DG(s) in Train B inoperable.	I.1	Enter LCO 3.0.3.	Immediately

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 110 TO FACILITY OPERATING LICENSE NO. NPF-90

AND AMENDMENT NO. 5 TO FACILITY OPERATING LICENSE NO. 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 December 8, 2015, and superseded by letter dated March 11, 2016, as supplemented by letters dated October 13, November 1, and December 8, 2016 (Agencywide Documents and Access Management System (ADAMS) Accession Nos. ML15342A477, ML16071A456, ML16287A656, ML16307A054, and ML16343A940, respectively), Tennessee Valley Authority (TVA or the licensee), requested changes to the Technical Specifications (TSs) for the Watts Bar Nuclear Plant (WBN), Units 1 and 2.

The amendments revise the WBN, Units 1 and 2, TS 3.8.1, "AC [alternating current] Sources – Operating," to extend the Completion Time (CT) for one inoperable diesel generator (DG) from 72 hours to 10 days based on the availability of a supplemental AC power source (specifically, the FLEX DG added as part of the mitigating strategies for beyond-design-basis events in response to Nuclear Regulatory Commission (NRC) Order EA-12-049). The amendments would also make clarifying changes to certain TS 3.8.1 Conditions, Required Actions, and Surveillance Requirements. The changes would provide operational and maintenance flexibility for the DG, most notably, the proposed CT will allow sufficient time to perform planned maintenance activities that cannot be performed within a 72-hour CT.

The original December 8, 2015, submittal proposed a risk-informed licensing change; however, following discussions with NRC staff, TVA determined that a deterministic-based request was more appropriate. Therefore, in its letter dated March 11, 2016, TVA revised its original request with a deterministic engineering justification that superseded the December 8, 2015, request in its entirety.

The supplements dated October 13, November 1, and December 8, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on May 24, 2016 (81 FR 32810).

2.0 REGULATORY EVALUATION

System Description

The offsite sources are two independent 161 kiloVolt (kV) transmission lines terminating at the 161 kV switchyard, providing power to the plant, on demand, via the common station service transformers to the onsite Class 1E distribution system.

The onsite Class 1E AC Distribution System supplies electrical power to four power trains, shared between the two units, with each train powered by an independent Class 1E 6.9 kV shutdown board. Power trains 1A and 2A comprise load group A, and power trains 1B and 2B compose load group B. Two DGs associated with one load group can provide all safety-related functions to mitigate a loss-of-coolant accident (LOCA) in one unit and safely shut down the opposite unit. Each 6.9 kV shutdown board has two separate and independent offsite sources of power as well as a dedicated onsite DG source. Each A and B train engineered safety feature system provides for the minimum safety functions necessary to shut down the plant and maintain it in a safe shutdown condition. Each DG consists of two 16-cylinder engines directly connected to a 6.9 kV generator. The continuous rating of each DG is 4400 kilowatt (kW) at 0.8 power factor, 6.9 kV, 3-phase, and 60 hertz. Each DG also has an additional rating of 4840 kW for 2 hours out of 24 hours.

Applicable Regulatory Requirements

The staff applied the below listed regulatory requirements in its review of this application. First, under 10 CFR 50.90, whenever a holder of a license wishes to amend the license, including technical specifications in the license, an application for amendment must be filed, fully describing the changes desired. Under 10 CFR 50.92(a), determinations on whether to grant an applied-for license amendment are to be guided by the considerations that govern the issuance of initial licenses or construction permits to the extent applicable and appropriate. Both the common standards for licenses and construction permits in 10 CFR 50.40(a), and those specifically for issuance of operating licenses in 10 CFR 50.57(a)(3), provide that there must be reasonable assurance that the activities at issue will not endanger the health and safety of the public.

The WBN units were designed to meet the intent of the "Proposed General Design Criteria for Nuclear Power Plant Construction Permits" published in July 1967. The Watts Bar construction permit was issued in January 1973. However, in its Updated Final Safety Analysis Report (UFSAR), the licensee addresses the NRC General Design Criteria (GDC) published as Appendix A to 10 CFR 50 in July, 1971, including Criterion 4 as amended October 27, 1987.

In UFSAR Section 3.1.2.2, "Protection By Multiple Fission Product Barriers," the licensee describes how the plants meet Criterion 17, "Electric power systems." Criterion 17 states in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components that are important to safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a single failure. The offsite power system is required to be supplied by two physically independent circuits that are designed and located to minimize, to the extent

practical, the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions.

In UFSAR Section 3.1.2.2, the licensee describes how the plants meet Criterion 18, "Inspection and Testing of Electric Power Systems," which requires, in part, that electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components.

In UFSAR Section 3.1.2.1, "Overall Requirements," the licensee describes how the plants meet Criterion 5, "Sharing of structures, systems, and components," which states that structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

In UFSAR Section 3.1.2.4, "Fluid Systems," the licensee describes how the plants meet Criterion 44 "Cooling water" which, as related to ultimate heat sink, states, in part, that the system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions. Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure.

The regulation at 10 CFR 50.36(c)(2)(i) "Limiting conditions for operation" states, in part, that limiting conditions for operation (LCOs) are the lowest functional capability performance levels of equipment required for safe operation of the facility. When a limiting condition for operation is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met. To issue or amend a license with a particular remedial action, the Commssion must be able to find, among other things, that there is reasonable assurance that the activities authorized by the operating license (e.g., continued operation for a set amount of time when an LCO is not met) can be conducted without endangering the health and safety of the public.

The regulation at 10 CFR 50.36(c)(3) "Surveillance requirements" states that surveillance requirements (SRs) are requirements relating to test, calibration or inspection to assure that the necessary quality of systems and components is maintained, that the facility operation will be within safety limits and the LCOs will be met.

The regulation at 10 CFR 50.63 "Loss of all alternating current power" requires, in part, that each light-water-cooled nuclear power plant licensed to operate under this part, must be able to withstand for a specified duration and recover from a station blackout (SBO) as defined in Section 50.2.

The regulation at 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," requires that preventive maintenance activities must not reduce the

overall availability of the systems, structures and components. It also requires that before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities.

The following guidance documents were also considered during this review:

Japan Lessons-Learned Directorate (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ADAMS Accession No. ML12229A174). Order EA-12-049, requires that operating power reactor licensees and construction permit holders use a three-phase approach for mitigating Beyond-Design-Basis External Events (BDBEEs). The initial phase requires the use of installed equipment and resources to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities. The transition phase requires providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely. The NRC staff's approval of TVA's mitigation strategy to satisfy NRC Order EA-12-049 is documented in its safety evaluation dated March 27, 2015 (ADAMS Accession No. ML15078A193).

NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Unit 2," Supplement 27 (ADAMS Accession Number ML15033A041).

Regulatory Guide (RG) 1.9 Revision 3, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants." This RG provides guidance acceptable to the NRC staff for complying with the Commission's requirements that DG units intended for use as onsite emergency power sources in nuclear power plants be selected with sufficient capacity, be qualified, and have the necessary reliability and availability for SBO and design basis accidents.

RG 1.155, "Station Blackout," describes a method acceptable to the NRC staff for complying with the Commission regulation that requires nuclear power plants to be capable of coping with an SBO event for a specified duration.

NUREG-1431, Revision 4, "Standard Technical Specifications Westinghouse Plants." This NUREG contains the improved Standard Technical Specifications (STSs) for Westinghouse plants. The changes reflected in Revision 4 result from the experience gained from plant operation using the improved STSs and extensive public technical meetings and discussions among the NRC staff and various nuclear power plant licensees and the Nuclear Steam Supply System Owners Groups. The improved STSs were developed based on the criteria in the Final Commission Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, dated July 22, 1993, which was subsequently codified by changes to 10 CFR 50.36 (60 FR 36953).

Branch Technical Position (BTP) 8-8, "Onsite (Emergency Diesel Generators) and Offsite Power Sources Allowed Outage Time Extensions," was developed by NRC staff to provide guidance for reviewing license amendment requests for Allowed Outage Time (AOT) or CT extensions for the onsite and offsite power sources to perform online maintenance of the power sources. The

BTP provides guidelines from a deterministic perspective for reviewing such amendment requests. The BTP was developed based on a typical single unit nuclear power plant designed with redundant (each 100-percent capacity) onsite power sources with each source capable of supporting plant shutdown following a single failure. However, the main concept of BTP 8-8 for a single unit plant has been applied to the WBN with two units in which the DGs are shared. A supplemental power source, if needed, should be able to bring both units to cold shutdown if there is a loss of offsite power (LOOP), and there is a worst case single failure of one train. In the case of WBN, the worst case single failure is a loss of one train (two DGs of the same train). The BTP follows the defense-in-depth concepts and recommends a minimum duration for the CT and provides guidelines for compensatory actions that should be implemented for reducing plant risk.

3.0 TECHNICAL EVALUATION

3.1 Proposed TS Changes

The proposed amendments revise WBN Units 1 and 2 TS 3.8.1, "AC Sources – Operating," to extend the CT for one inoperable DG from 72 hours to 10 days based upon implementation of compensatory measures, including the availability of a supplemental AC power source (i.e., one 6.9 kV FLEX DG) installed for compliance with BDBEE. In addition, the licensee proposed some additional minor changes. The changes are applicable to both WBN Units 1 and 2, unless indicated otherwise. The details of the TS changes are discussed as follows:

3.1.1 Changes to Condition A

The maximum CT for Required Action A.3 is proposed to be extended from 6 days to 13 days. The maximum CT limits the total time that LCO 3.8.1 is not met while concurrently or simultaneously in Condition A and the new Condition B. Currently, this CT is the sum of the CTs for existing Required Actions A.3 (i.e., 72 hours) and B.4 (i.e., 72 hours). The licensee has proposed a new Condition B for one inoperable DG. The new Required Action B.5 will allow one DG to be inoperable for up to 10 days, if one 6.9 kV FLEX DG is available. Therefore, the maximum CT for Required Action A.3, which is the sum of the CTs for existing Required Action A.3 and new Required Action B.5, is increased from 6 days to 13 days.

3.1.2 Changes to Condition B

The existing Condition B, which applies to one or more DGs inoperable in a single load group, is split into two separate conditions: (1) New Condition B for one DG inoperable, and (2) Re-designated Condition C for two DGs in a single load group inoperable. Condition C retains the Required Actions and associated CTs from the current Condition B.

3.1.2.1 Proposed Condition B – One DG Inoperable

Proposed Condition B is new and applies to one inoperable DG. The associated Required Actions and Completion Times for the new Condition B are as follows:

REQUIRED ACTION		COMPLETION TIME
B.1	Perform SR 3.8.1.1 for the required offsite circuits.	1 hour AND Once per 8 hours thereafter
AND		
B.2	Evaluate availability of 6.9 kV FLEX DG.	2 hours AND Once per 12 hours thereafter
AND		
B.3	Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
AND		
B.4.1	Determine OPERABLE DGs are not inoperable due to common cause failure.	24 hours
OR		
B.4.2	Perform SR 3.8.1.2 for OPERABLE DGs.	24 hours
AND		(continued)

REQUIRED ACTION		COMPLETION TIME
B.5	Restore DG to OPERABLE status.	72 hours from discovery of unavailability of 6.9 kV FLEX DG AND 24 hours from discovery of Condition B entry ≥ 48 hours concurrent with unavailability of 6.9 kV FLEX DG AND 10 days AND 13 days from discovery of failure to meet LCO

Condition B serves the same purpose as Condition B of the ACTIONS table of LCO 3.8.1 of NUREG-1431, Rev. 4 guidance in that it prescribes Required Actions with associated CTs for a single inoperable DG.

Required Action B.1 is the same as the existing Required Action B.1.

Proposed Required Action B.2 is a new action. The proposed action requires evaluation of the availability of the 6.9 kV FLEX DG. The availability of the 6.9 kV FLEX DG supports the extended CT included in proposed Required Action B.5 discussed below. Unavailability of the 6.9 kV FLEX DG does not, by itself, result in the LCO not being met.

Required Action B.3 is the same as existing Required Action B.2.

Required Actions B.4.1 and B.4.2 are the same as the existing Required Actions B.3.1 and B.3.2.

Proposed Required Action B.5 contains CT elements from both the existing CTs and new CTs. Required Action B.5 itself is stated as it is in the existing Required Action B.4. The first CT of 72 hours is as stated in the existing TS. The addition of the words "from discovery of unavailability of 6.9 kV FLEX DG" distinguish it from the following CTs, which apply when the FLEX DG is available. The purpose of the second new proposed CT is to limit a continued stay in the CT to 24 hours if the 6.9 kV FLEX DG is discovered to be unavailable at greater than or equal to 48 hours into Condition B. The second CT is connected with an 'AND' conjunction meaning both CTs are applicable simultaneously. The third new proposed CT adds a CT of 10 days with an 'AND' meaning it applies

simultaneously to the first two CTs. The effect is to limit the overall CT in Condition B to 10 days when the 6.9 kV FLEX DG is available. The fourth CT is the second CT in the existing Required Action B.4 and, similar to Required Action A.3, is proposed to be extended from 6 to 13 days with an 'AND' meaning it applies simultaneously to the first three CTs. The effect is to limit the total time that LCO 3.8.1 may not be met while concurrently or simultaneously in conditions A and B.

3.1.2.2 Proposed Condition C – Two DGs in Train A OR Train B Inoperable

Existing Condition B is modified to apply only to two (in lieu of one or more) DGs in a single load group inoperable and is renumbered as new Condition C. The Required Actions and CTs of proposed Condition C are identical to the current Condition B requirements.

3.1.3 Changes to Conditions D, E, F, G and H

Due to the addition of new Condition B and renumbering of existing Condition B as new Condition C, existing Conditions D, E, F, G, and H are renumbered to E, F, G, H, and I, respectively.

3.1.4 Changes to Selected TS 3.8.1 Required Actions and Conditions

The current wording of the following WBN Unit 1 TS 3.8.1, Conditions, and Required Actions use the word "required" when referring to the DGs.

- Required Action B.4
- Condition D
- Required Action D.2
- Condition E
- Required Actions E.1 and E.2
- Condition G
- Condition H

Changes are proposed to delete the word "required" when immediately preceding "DGs" or "DG(s)." This proposed change was incorporated in the WBN Unit 2 TSs approved October 22, 2015 (ML15251A587), except for renumbered Required Action E.2. The proposed change to WBN Unit 2 TS 3.8.1, renumbered Required Action E.2 includes this deletion of the word "required.'

3.1.5 Changes to SR 3.8.1.19

The current wording of WBN Unit 1, SR 3.8.1.19.c is proposed to be changed from "DGs of the same power train auto-start from standby condition" to "DG auto-starts from standby condition." Because the Note modifying SR 3.8.1.19 precludes performance of the SR for DGs 1A-A and 1B-B in Modes 1, 2, 3, and 4, this proposed change clarifies that the DGs in the same power train can be tested individually. A similar change was incorporated in the WBN Unit 2 TS, approved October 22, 2015.

3.2 Staff Evaluation of CT Change for One Inoperable DG from 72 Hours to 10 Days

At WBN, the safe shutdown loads are divided into load group A and load group B for dual-unit operation. There are electric motors powered by the onsite distribution system of one unit that drive safety-related components (such as essential raw cooling water (ERCW) pumps, component cooling system (CCS) pumps) required for safe shutdown of the other unit. The ERCW system is arranged in two headers (trains) each serving certain components in each unit. For the diesel generators, support systems include ERCW and the CCS. The minimum combined safety requirements for an accident on one unit and safe shutdown of the non-accident unit, or safe shutdown of two non-accident units, are met by two DGs on the same plant train. The electrical AC and DC systems have common buses, and safety-related loads that are fed from Train 'A' or Train 'B' power supplies. In view of the shared systems for dual-unit operation, when the WBN units are in Modes 1, 2, 3, and 4, TS LCO 3.8.1 requires four operable DGs. With one or more DGs in a train inoperable, TS 3.8.1 Condition B currently requires the inoperable DG(s) to be restored to operable status within 72 hours to avoid entering TS 3.8.1 Condition F, which requires a plant shutdown. If both units are at power and the inoperable DG is not restored within the 72-hour CT, a dual-unit shutdown would be required. The amendment request states that the main purpose of the proposed extension of the CT is to support 6-, 12-, and/or 18-year planned periodic maintenance, which can take more than the current TS-allowed CT of 72 hours.

The NRC Order EA-12-049, related to mitigation of BDBEEs directed licensees to develop, implement, and maintain new guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities. As part of the strategy to satisfy the requirements of Order EA-12-049, TVA installed two (one for each unit) 225 kiloVolt-Ampere, 480 Volt (V) AC FLEX DGs to power the 125 V direct current DC vital battery chargers and energize critical loads such as required motor-operated valves, DC components, and desired AC instrumentation. In addition TVA permanently installed two (one for each Unit) 6.9 kV, 3.25 Megawatt electric (MWe) FLEX DGs to provide power to the existing electrical distribution system in each unit.

To facilitate and conduct the review in a consistent manner, the staff evaluated and considered the past precedent of similar NRC-approved license amendment requests. The NRC staff considered a previous license amendment request approved for the TVA-owned Sequoyah Nuclear Plant (SQN), Units 1 and 2. On December 16, 1998, the NRC staff approved a change in the allowed CT for the DGs from 72 hours to 7 days for the SQN Units (ADAMS Accession No. ML013320442). Based on the similarity of plant design, and DG type and model numbers, the staff requested information on the duration of tasks performed at WBN Units 1 and 2. Specifically, in its requests for additional information (RAIs) dated August 3, 2016 (ADAMS Accession No ML16217A090), the staff requested information (NRC Request 1) about the actual time taken for all 6-, 12-, and/or 18-year maintenance activities at WBN, Units 1 and 2, for each of the four DGs. In its letter dated October 13, 2016 (ADAMS Accession No. ML16287A656), the licensee provided a tabulated summary (Table 1) of time taken to perform major extended maintenance activities for the four WBN DGs. The staff noted that unavailability time associated with 6-year and 12-year DG maintenance activities conducted since commercial operation is less than 147 hours, or approximately 6 days, indicating that the 6-, 12-, or 18-year maintenance activities on the DG can be completed in less than 7 days.

The staff also noted that Very Low Frequency (VLF) cable testing has consistently taken longer than direct maintenance activities associated with the DGs. In order to establish the minimum time necessary for a safety related DG to be unavailable, the staff requested a listing of cables and associated equipment that render the respective DG to be inoperable and the corresponding estimated time for each cable testing. In Table 1 of the letter dated October 13, 2016, the licensee provided a summary of time taken to perform testing on cables that require the DG to be tagged out. The response indicates that the longest planned maintenance activity for the DGs was 179 hours (approximately 7.5 days) when VLF cable testing was included in the DG maintenance activities. The licensee also stated that the main supply cables from the DG to the respective shutdown board (SDB) are tested during DG maintenance outages. The cable testing was last performed in 2014 and subsequently a design change was implemented to allow for new cable runs and quick disconnects. The licensee anticipates that future VLF testing should take approximately 24 hours.

In its letter dated October 13, 2016, based on historical trends coupled with the shorter anticipated duration for cable testing, and allowing 50 percent margin for unforeseen issues, the licensee proposed an extension of the DG CT for one inoperable DG from 72 hours to 10 days (revised from its original request of 14 days). The staff finds that the licensee has provided sufficient justification to support the proposed extension of the DG CT to 10 days.

In view of the shared electrical systems and reduction in defense-in-depth for dual units when one train of electrical or mechanical systems is unavailable to support safe shutdown of dual units, in its RAIs dated August 3, 2016, the NRC staff requested (NRC Request 2):

a) Whether the extended CT will only be used for preplanned periodic maintenance activities.

b) Whether the planned maintenance will be performed with the associated Unit in Mode 5 or Mode 6.

In its letter dated October 13, 2016, the licensee stated:

> Although TVA does not plan to limit the CT extension to planned maintenance activities, outages, or only once per cycle, in order for TVA to extend the CT for one inoperable DG from 72 hours to 10 days the availability of the FLEX DGs must be confirmed as required by proposed Condition B CTs. Condition B, "One Inoperable DG," includes five required actions:
>
> 1) Perform surveillance requirement (SR) 3.8.1.1, verifying the availability of the required offsite circuit(s)
> 2) Evaluate the availability of the 6.9 kV FLEX DG
> 3) Declare required supported features inoperable as necessary
> 4) Determine redundant DGs are operable by evaluation or testing
> 5) Restore the DG to operable status

Condition B, Required Action 5, restore the DG to operable status, has four CTs. The first two CTs limit the DG inoperability time to 72 hours with an unavailable 6.9 kV FLEX DG. The third CT limits the DG inoperability time to 10 days, and the fourth to 13 days. Only when the FLEX DG is determined to be available is the 72-hour CT not applicable allowing the 10-day CT to be limiting.

In its letter dated October 13, 2016, the licensee also provided the following Regulatory Commitments (which superseded the commitments made in its amendment request, dated March 11, 2016):

- One 6.9 kV FLEX Diesel Generator will be protected, as defense-in-depth, during the extended diesel generator Completion Time.

- One 6.9 kV FLEX Diesel Generator will be routinely monitored during Operator Rounds, with monitoring criteria identified in the Operator Rounds. One 6.9 kV FLEX Diesel Generator will be monitored for fire hazards during Operator Rounds.

- Component testing or maintenance of safety systems and important non-safety equipment in the offsite power systems which can increase the likelihood of a plant transient or loss-of-offsite-power, will be avoided during the extended diesel generator Completion Time.

- No elective switchyard maintenance will be allowed during the extended diesel generator Completion Time.

- Licensed Operators and Auxiliary Operators, for the operating crews on-shift when the extended diesel generator Completion Time is in use, will be briefed on the DG work plan, the revised Technical Specification 3.8.1, and procedural actions regarding loss-of-offsite-power and 6.9 kV FLEX Diesel Generator alignment and use prior to entering the extended diesel generator Completion Time.

- The steam-driven Auxiliary Feedwater Pump will be controlled as "protected equipment," during the extended diesel generator Completion Time.

- The availability of one 6.9 kV FLEX Diesel Generator will be verified within the last 30 days before entering the extended diesel generator Completion Time by operating the 6.9 kV FLEX Diesel Generator at its rated voltage and frequency for 5 minutes and ensuring the skid-mounted auxiliary support systems are available.

The staff determined that these commitments are consistent with the staff's position in BTP 8-8, which identified commitments expected to ensure maintenance of defense-in-depth during an extended CT. These commitments also ensure that plant risk during the extended completion time will be assessed and managed in accordance with the requirements of 10 CFR 50.65(a)(4).

The licensee also stated that the preplanned 6-, 12-, and/or 18-year maintenance activities on the DGs may be performed with one or both units in Modes 1, 2, 3, or 4. Maintenance on one DG may also be performed when one unit is in Modes 5 or 6.

By letter dated August 31, 1992 (ADAMS Accession No. ML073230184), TVA provided its response to the requirements of 10 CFR 50.63, the SBO rule. Enclosure 2 of this letter (ADAMS Accession No. ML073620394) provided the details on the SBO coping strategy for WBN, Units 1 and 2. The Enclosure has the following excerpts:

- Section 1.4.1 states, "This enclosure addresses the SBO scenario as if both Units 1 and 2 were operating [WBN, Unit 2, was in deferred construction status at the time of TVA's response to the SBO rule]. By assuming that both WBN Units 1 and 2 are in operation, the analysis applies to an SBO on either unit; one unit is in an SBO condition, and the other unit has lost one of two EDGs [emergency DGs], and is in a non-blackout (NBO) condition. For the purposes of the analysis, one SBO unit is analyzed without any dependence on the ac-power potentially available (for common systems/areas) from the NBO unit."

- Section 2.2.2 states, "An SBO is then postulated for WBN as follows: A total LOOP is postulated concurrently on both units; one unit (the SBO unit) also suffers a total loss of the ac emergency power system (i.e., a loss of two EDGs), and the other unit (NBO unit) must be able to achieve a SBO safe shutdown assuming a single failure (non-DBA [design-basis accident]). The single failure assumed on the NBO unit is a loss of one of the two remaining EDGs normally available. This SBO condition is postulated to last for the duration determined on a plant-specific basis ..."

- Section 3.5.2 discusses the number of necessary EDGs for SBO and states: "The SBO event requires that the SBO unit and the NBO unit must achieve the SBO safe shutdown/hot standby functions described in Subsection 1.3. The WBN design of shared fluid systems is such that, with three EDGs available (for example 1A, 2A, and 2B), shutdown of Unit 1 and/or Unit 2 would require the use of EDG 1A and 2A. Normal shutdown on Unit 1 or Unit 2 could not be obtained using EDG 1A alone, nor could it be obtained using EDGs 1A and 2B. The EDGs normally available are four EDGs. The number of necessary EDGs for SBO is three, since a random selection of any three EDGs ensures that at least the "A-A" or the "B-B" EDGs are in that random selection. A random selection of two EDGs would not ensure the specific EDGs required. Therefore, to obtain two specific EDGs, any three EDGs are necessary for SBO."

Section 3.5, "Station Blackout Capability," of Enclosure 1 of the amendment request dated March 11, 2016 provides an overview of the SBO assessment for dual unit operation and the impact of the proposed DG CT extension. Section 3.5.1 states:

> The existing shared design of the WBN fluid systems, in particular the ERCW system and the CCS, requires certain components to be energized from the common or Unit 2 power sources to achieve and maintain hot standby on Unit 1. Similarly, certain components need to be energized from Unit 1 sources for

> Unit 2. Furthermore, to achieve hot standby, both Train A DGs or both Train B DGs must be operable. For example, hot standby on Unit 1, with only DG 1A-A available, requires that DG 2A-A (not DG 1B-B or 2B-B) also be available. The converse is true for DG 1B-B. Thus, hot standby for Unit 1 (or Unit 2) requires power from both DG 1A-A and 2A-A, or from both DG 1B-B and 2B-B, and cannot be achieved from DG 1A-A or 1B-B alone. For SBO coping duration analyses, the determination of how many DGs are necessary must account for the *need of two specific DGs* [emphasis added]. The 6.9 kV FLEX DG is a defense-in-depth measure for SBO and is not credited in the SBO analysis.

This clarification is similar to the shared system considerations discussed in the August 31, 1992, SBO Enclosure 2 discussed above.

The March 11, 2016, amendment application requested extension of the CT for maintenance on any one DG with both WBN units operating in Mode 1. Based on the information provided in the amendment request Enclosure 1, Section 3.5, related to coping with SBO, in its RAIs dated August 3, 2016 (NRC Request 3), the staff requested clarification on the sequence of events for the following scenarios:

(a) LOOP (both Units) when Unit 1 DG 1A-A (or 1B-B) is under maintenance, the redundant DG 1B-B (or 1A-A) fails to start (SBO Unit 1) and a Unit 2 DG has a single failure; and similarly,

(b) SBO in Unit 2 and a single failure of a DG in Unit 1.

In its letter dated October 13, 2016, the licensee provided the following summary of the sequence of anticipated events and the planned actions that would be taken to cope with an SBO in one WBN unit and controlled shutdown of the other unit during DG maintenance and single failure of an additional DG.

As an example for Unit 1, the licensee assumed DG 1A-A out-of-service for maintenance, all other DGs operable and in a standby condition, and both WBN units initially at 100 percent power. A LOOP coupled with failure of DG 1B-B to start and a single failure of DG 2-A-A on Unit 2 leaves DG 2B-B as the only DG in operation. These failures result in WBN Unit 1 being in an SBO condition with no offsite or onsite power available to the Unit 1 6.9 kV SDBs 1A-A and 1B-B. WBN Unit 2 DG 2B-B is available to power 6.9 kV SDB 2B-B while the 2A-A 6.9 kV SDB is de-energized.

For both Units, the LOOP event results in trip of reactor coolant pumps, reactor trip, turbine trip, and start of the turbine-driven auxiliary feedwater (TDAFW) pumps. The steam generators would be used for heat removal from the reactor coolant system and the steam released through the atmospheric dump valves. Makeup to the steam generators is via the auxiliary feedwater system. The Unit 1 operators would initially use emergency operating instructions to restore power to a Unit 1 SDB and start essential pumps needed to bring the plant to cold shutdown.

If power to an SDB cannot be restored within 30 minutes, an extended loss of AC power is declared and guidance is provided to use three FLEX support instructions (FSIs) that were developed in response to NRC Order EA-12-049. The FSIs provide guidance to place a 480 V FLEX DG in operation or to extend DC battery lifetime to 8 hours. The high-level actions of the FSIs include 6.9 kV FLEX DG startup and alignment to provide power to 6.9 kV & 480 V SDBs. The licensee has stated that within 4 hours, a source of power would be available (offsite or onsite) to power a 6.9 kV SDB. Once a source of power is established to a 6.9 kV SDB, a recovery plan would be implemented to energize the safe shutdown loads and place the Residual Heat Removal System in service and continue cooling down to less than 200 °F (Mode 5). For this scenario, at Unit 2, a 6.9 kV SDB would be supplied from a DG (either 2A-A or 2B-B) and the corresponding train of emergency core cooling system (ECCS) equipment can be used to cool down the plant.

For the scenario of an SBO at Unit 2 and a single failure of a WBN unit 1 DG, the licensee stated there is a difference in the consequences of SBO in Unit 2 when compared to Unit 1. In its letter dated October 13, 2016, the licensee provided the following details:

> In the event of a complete LOOP, both units would trip due to the load rejection. The loss of voltage to the 6.9 kV SDBs would initiate a TDAFW pump start on both units. If the 6.9 kV SDB 1A-A is supplied from the remaining standby DG, the A train ECCS equipment would be available. If the 6.9 kV SDB 1B-B is supplied by the remaining standby DG, the Unit 1 ECCS would be initially unavailable because no CCS pump is connected to the B header. The centrifugal charging pump (CCP) 1B would have to be shut down due to a lack of cooling water for the bearings. The MDAFW [motor-driven auxiliary feedwater] and ERCW pumps would remain available because the bearings are not cooled by CCS.
>
> Because power to the auxiliary air compressors is supplied from the Unit 2 SDBs, neither train of the ACAS [auxiliary control air system] compressor would be powered. None of the atmospheric PORVs [power-operated relief valves] would have control air, so the steam generator pressure would initially be controlled by the atmospheric relief valves. To commence the unit cooldown, the PORVs could be controlled using nitrogen or by the hand wheel until control air is restored. The AFW level control valves would continue to have air from the plant nitrogen system. The vital DC System would be available for 4 hours with no load shedding required. After 30 minutes, the 480V FLEX DGs would be started and aligned to supply the vital battery chargers. Each of these DGs has sufficient capacity to supply one train of battery chargers. If there is no 480V FLEX DG available, a load shed is performed that increases the battery life to 8 hours.
>
> Prior to 4 hours, one or more 6.9 KV FLEX diesel(s) would be aligned to the Unit 2 6.9 kV SDB of the same train as the remaining Unit 2 DG. The one ACAS compressor could then be started to control the atmospheric PORVs and AFW level control valves or they could be continued to be controlled from the manifold stations and plant nitrogen."

Based on the responses to NRC Request 3, the staff finds that there is reasonable assurance that an SBO event at WBN, Unit 1 or Unit 2, coupled with a single failure at the non-SBO unit, will not preclude dual unit safe shutdown when FLEX strategies are implemented to cope with loss of power for an extended duration, and a 6.9 kV FLEX DG will be connected to an SDB in a timely manner to restore shutdown cooling.

The staff also noted that for the WBN SBO, safe shutdown is considered as placing both units in a hot standby condition (TS Mode 3) and maintaining such a condition. However, in view of proposed extended maintenance on one standby DG, BTP 8-8 recommends that the supplemental AC source used to support an extended CT has the capacity and capability to bring the unit to cold shutdown. At WBN, both units may have to be brought to cold shutdown in view of the DG configurations (two DGs in one train) required to support dual unit operation. The amendment request proposes only one FLEX DG to be available during DG maintenance.

By letter dated October 13, 2016, in response to the staff's August 3, 2016, RAIs (NRC Request 5), the licensee provided details of how one FLEX DG will perform its intended function of serving as the supplemental power source for an inoperable DG while satisfying the guidelines of BTP 8-8 and Criterion 5 in the following scenarios and for all the unit Mode combinations (1-4) allowed by the proposed TS changes:

a) The FLEX DG is substituting for a Train 'A' DG and a dual unit LOOP and dual unit cooldown with loss of emergency power Train 'B', such that both units are relying on Train A power.

b) The FLEX DG is substituting for a Train B DG and a dual unit LOOP and dual unit cooldown with loss of emergency power Train 'A', such that both units are relying on Train 'B' power.

In response to NRC Request 5a above, the licensee stated:

> The unit with a standby DG available would have ECCS capability for the A train. A single ERCW pump would provide adequate cooling for the remaining DG and ECCS pump cooling. The unit without a standby DG would maintain the unit using the TDAFW. Prior to 4 hours, the FLEX DG would be aligned to the unpowered A train SDB. Once powered, the required ECCS equipment could be restarted. Two ERCW pumps would be available on one train and cold shutdown of both units can commence.

In response to NRC Request 5b above, the licensee stated:

> The following two scenarios address the NRC question:
>
> <u>6.9 kV SDB 1B-B Powered:</u>
>
> In this case, there would be no CCS pump available on the B train. Initially the 1B centrifugal charging pump would start; however, it eventually would be secured due to the lack of CCS flow for bearing cooling. The Unit 1 TDAFW and MDAFW pumps would remain available. Unit 2 would continue using the TDAFW

pump. Prior to 4 hours, the FLEX DG would be aligned to the unpowered 2B-B train SDB. Once powered, the desired required ECCS equipment would be restarted. Two ERCW pumps would be available on one train and cold shutdown of both units could commence.

6.9 kV SDB 2B-B Powered

Standby DG 2B-B would have ECCS capability for the Unit 2 B train. The CCS pump CS and the B train CCS train would be available for B train cooling. To ensure adequate long term cooling to the 2B-B DG, flow would be restricted to CCS heat exchanger C. Unit 1 would continue using the TDAFW. Prior to 4 hours, the 6.9 kV FLEX DG would be aligned to the unpowered 1B train SDB. Once powered, the desired Unit 1 ECCS equipment would be restarted. Two ERCW pumps would be available on one train and cold shutdown of both units could commence.

The licensee's response to NRC Request 3 also satisfactorily addresses NRC Request 5. As stated in the NRC's evaluation above of the licensee's response to NRC Request 3, the staff determined that there is reasonable assurance that an SBO event at WBN, Unit 1 or Unit 2, coupled with a single failure at the non-SBO Unit, will not preclude dual-unit safe shutdown when FLEX strategies are implemented to cope with loss of power for an extended duration. The FLEX DG would be aligned to the unpowered A or B train SDB, as applicable, within 4 hours. Once powered, the required equipment could be restarted. Two ERCW pumps would be available on one train and cold shutdown of both units could commence, meeting the intent of the guidelines of BTP 8-8 and continue to meet the plants' design with respect to Criterion 5.

WBN has two FLEX DGs that can be connected to any 6.9 kV SDB. The amendment request proposes the use of one 3.25 MWe FLEX DG for supporting plant shutdown in the event of a LOOP during DG maintenance. The FLEX DGs were installed for supporting a BDBEE. The transient and steady state loading and power requirements for coping with a LOOP may be different from the loading requirements assumed for a BDBEE. In its RAIs dated August 3, 2016, and follow-up RAIs dated November 30, 2016 (ADAMS Accession No. ML17006A094), the NRC staff requested information on the capability of the FLEX DGs to start and run loads required for controlled shutdown of dual units. In its letter dated October 13, 2016 (in response to NRC Requests 6 and 7), and its letter dated December 8, 2016 (ADAMS Accession No. ML16343A940) (in response to NRC Follow-Up Request 4), the licensee stated that the FLEX DGs, required to place both WBN units in cold shutdown and maintain cold shutdown conditions, have adequate capacity to start and carry a load equivalent to the loads of the scenarios listed in the above NRC requests. Specifically, the FLEX DGs have been load tested to a resistive load bank rated at 3.25 MWe. Based on the licensee responses, the staff finds the FLEX DGs have adequate capacity to carry the required loads.

The staff finds that based on the above response, the licensee has confirmed that one standby DG and one 6.9 kV FLEX DG are sufficient to place both units in cold shutdown and maintain cold shutdown conditions.

In its amendment request, the licensee stated that existing procedures developed for BDBEE will be used to connect the FLEX DGs to the safety buses. Specifically, Section 3.7.2 "FLEX

DG Implementation" of Enclosure 1 of the amendment request provides steps associated with 6.9 kV FLEX DG alignment and states, "These actions would be the same actions the operators would take if the FLEX DG were needed to operate when a DG is inoperable for maintenance during the DG extended CT." Action 2 states, "Align and place 480 V FLEX DGs in service." According to the Watts Bar response to NRC Order EA-12-049, during the first phase of an extended loss of AC power event, WBN will be relying on the Class 1E station batteries to cope until additional power supplies (i.e., FLEX DGs) can be aligned and connected to the Watts Bar electrical distribution system (Phase 2). Transitioning to Phase 2 includes aligning and placing into service the pre-staged 480 V FLEX DGs and the 6.9 kV FLEX DGs.

In view of the difference between the proposal in the amendment request for use of a single 6.9 kV FLEX DG and the procedural steps also requiring connection of the 480 V FLEX DG, in its follow-up RAIs dated November 30, 2016, the staff requested clarification on whether the 480 V FLEX DGs are part of the proposed extension request for the DG CTs and will have the same requirements for testing and availability checks as the 6.9 kV FLEX DGs. In its letter dated December 8, 2016, the licensee clarified (in response to NRC Follow-Up Request 3) that though the 480 V FLEX DG would be available during the period of the proposed extension, these DGs are not credited as part of the proposed DG CT extension request. The FLEX procedures provide direction to load shed the batteries to increase their life to 8 hours, and if the 480 V FLEX DG is not available, the vital battery chargers can be supplied by the 6.9 kV FLEX DG via the plant distribution system to recharge the batteries. The existing plant licensing basis for SBO is a 4-hour coping duration without offsite or onsite AC power.

For the WBN units, the licensee has evaluated a 4-hour SBO coping capability without alternate AC sources. In view of the proposed additional actions required to establish the availability and connect the FLEX DGs, in its RAIs dated August 3, 2016, and follow-up RAIs dated November 30, 2016, the NRC staff requested an approximate timeline, using current plant procedures, for connecting the proposed 6.9 kV FLEX DG and the 480 V FLEX DG (if required) to each of the associated safety buses if an unplanned DG maintenance was being conducted and a LOOP event is experienced. In its letter dated October 13, 2016 (in response to NRC Request 8b), and its letter dated December 8, 2016 (in response to NRC Follow-Up Request 1), the licensee stated that, based on steps provided in FLEX procedures, the estimated time for energizing the 6.9 kV SDB(s) with a 6.9 kV FLEX DG is 2 hours. Since 2 hours is within the limit of the 4-hour SBO coping duration, the staff finds this estimated time to power an appropriate shutdown bus as acceptable.

The operator manual actions or human-system interfaces previously approved for compliance with NRC Order EA-12-049 (ADAMS Accession No. ML15078A193) are not changed as a result of these amendments. The NRC previously conducted an audit at WBN including a walk down of the necessary equipment and a review of the associated procedures to demonstrate the feasibility of these actions as described in its safety evaluation regarding implementation of mitigating strategies to EA-12- 049. The staff concluded in its Safety Evaluation related to Order EA-12-049 that TVA had developed guidance to maintain or restore reactor core cooling, containment, and SFP cooling that should adequately address the requirements of the Order.

In response to the staff's August 3, 2016, RAI request (NRC Request 12) for a succinct summary of work control and precautions that will be taken to reduce plant risk during the extended outage of one safety related DG, the licensee provided a summary of all precautions

and compensatory actions delineated in WBN Technical Instruction TI-12.16, "Diesel Generator Outage T/S or SR Contingency Actions." The list includes contingency actions that are taken for a planned or unplanned DG outage and performance of the DG 24-hour load runs, as listed below:

- determine the stability state of the offsite power system in the vicinity of WBN is within the single contingency limit
- obtain the expected weather condition forecast for the expected duration of the DG outage period and determine if severe thunderstorms or heavy snowfall is forecast
- ensure the SDB room heating, ventilation, and air conditioning (HVAC) system, 480 V shutdown transformer room ventilation system, 480 V auxiliary board and battery room HVAC system supply to the Unit 2 480 V SDB room are in service or placement of a suitable portable fan as a compensatory measure
- notify the unit senior reactor operator (SRO) and the work control center (WCC) SRO and the work week manager not to remove the following from service: a) TDAFW pump; b) AFW level control valves to the steam generators; and c) opposite train residual heat removal (RHR) pump
- notify the unit SRO and the WCC SRO and work week manager not to remove reactor trip breakers A and B for any DG outage
- contact the WBN PSO (Power System Operations) group and verify the hydro transmission switchyard is locked down or have TVA operations walkdown and approve risk management actions (RMAs) such as placards and stanchions or flagging barriers are in place to protect the 161 kV off-site breakers and relays
- place placards on operable DG mode selector switches
- limit access to the Watts Bar Hydro switchyard
- place placards and approved barriers at the inside entrance to the operable DG rooms
- place placard and approved barrier at the entrance to the 480 V diesel auxiliary board rooms
- place approved portable sign stand, placards and stanchions or flagging barriers to protect the 6.9 kV SDBs
- place placard on the entrance to the terry turbine room
- limit access to the WBN 161 kV switchyard

The above list is in addition to the revised regulatory commitments contained in Enclosure 6 of the licensee's letter dated October 13, 2016, and discussed above in this safety evaluation.

The staff has determined that the licensee has provided adequate justification for the proposed CT duration of 10 days. There is reasonable assurance that an SBO event at either WBN unit, coupled with a single failure on the non-SBO unit, will not preclude safe shutdown of both units. The staff has also determined that the combination of one Class 1E standby DG and one 6.9 kV FLEX DG is sufficient to place both units in cold shutdown and maintain the units in that condition. Furthermore, no changes are necessary to operator manual actions previously approved for connection of the 6.9 kV FLEX DGs to the plant SDBs to facilitate maintaining or restoring core cooling, containment, and SFP cooling. The staff also finds that the licensee has established acceptable precautionary measures for reducing risk and maintaining overall defense-in-depth to assure safe shutdown of both WBN units. The licensee has described compensatory measures and Regulatory

Commitments that will ensure that plant risk during the extended CT will be managed in accordance with the requirements of 10 CFR 50.65. Based on the above evaluation, the staff has determined that the change in the CT for TS 3.8.1, Condition B, for one inoperable DG from 72 hours to 10 days to be acceptable.

3.3 Staff Evaluation of CT Change for Required Actions A.3 and B.5 from 6 Days to 13 Days

The second CT for Required Action A.3 and fourth CT for Required Action B.5 establish limits on the maximum time allowed for any combination of required ac power sources to be inoperable during any single continuous occurrence of failure to meet the LCO. The maximum CT limits the total time that LCO 3.8.1 may not be met while concurrently or simultaneously in Conditions A and B. The maximum CT is the sum of the CTs for an inoperable offsite power source and an inoperable onsite power source. Currently, this maximum CT is the sum of the CT for existing Required Actions A.3 (72 hours for an inoperable offsite power source) and B.4 (72 hours for an inoperable onsite power source).

In the newly proposed Condition B, Required Action B.5 takes the place of existing Required Action B.4. The CT for an inoperable onsite power source in proposed Required Action B.5 is extended by 7 days to a total of 10 days (provided a FLEX DG is available). Therefore, the proposed new maximum CT for Required Action A.3 and proposed Required Action B.5 is equal to the sum of the CT for existing Required Action A.3 (72 hours for an inoperable offsite power source) and proposed Required Action B.5 (10 days for an inoperable onsite power source), and is equal to 13 days. This change retains the existing relationship between the CTs for inoperable offsite and onsite power sources. This is an editorial change, and is considered to be acceptable to the staff.

3.4 Staff Evaluation of Deletion of "Required" When Referring to DGs

In its request, the licensee stated that "With the removal of the allowance to substitute the C-S DG for any of the required DGs, the remaining DGs are all required to be operable by LCO 3.8.1. Therefore, it is no longer necessary to refer to the DGs as "required DGs" in the TS 3.8.1 Conditions and Required Actions."

The staff considers the above change to be editorial, and therefore acceptable.

3.5 Staff Evaluation of Deletion of Phrase "of the same train" from SR 3.8.1.19

In the amendment request, the licensee proposed new wording for SR 3.8.1.19 for Unit 1. The existing wording indicates that all DGs of the same power train must auto-start from a standby condition, permanently energize connected loads in less than or equal to 10 seconds, energize auto-connected loads through a load sequencer, achieve steady state voltage and frequency within acceptable ranges, and supply connected loads and auto-connected loads for greater than or equal to 5 minutes. The proposed wording removed the plural form of DG and the words "of the same power train." While the proposed SR more closely matches that in NUREG-1431, Rev. 4, the wording in the NUREG is based on typical plant design where a single DG has the capacity and capability to supply all necessary accident and safe shutdown loads for the specific Unit. At Watts Bar, both DGs of the same load group are necessary to supply all necessary accident and safe shutdown loads. The staff asked for clarification on how

the proposed wording results in an SR that is equivalent in purpose to the existing SR. In response to NRC Request 10a, in its letter dated October 13, 2016, the licensee stated that the change to SR 3.8.1.19 is consistent with the design basis for WBN during two-unit operation. Specifically, the licensee has stated:

> As each DG in a power train auto-starts on an undervoltage condition on its respective 6.9 kV SDB and a Unit 1 engineered safety feature (ESF) signal auto-starts DGs 1A-A and 1B-B, but not DGs 2A-A and 2B-B, there is no safety-related signal that auto-starts both DGs in the same power train. Therefore, the SR is more appropriately stated on an individual DG basis. This change will allow the auto-start of DGs 2A-A and 2B-B with Unit 1 in Mode 1, 2, 3, or 4. The performance of SR 3.8.1.19, for DGs 1A-A and 1B-B, will be performed when Unit 1 is in Mode 5, Mode 6, or is defueled.

In its RAIs dated August 3, 2016, the staff requested (NRC Request 10b) whether both DGs of the same load group will be simultaneously started and loaded during surveillance testing at WB for SR 3.8.1.19. In its RAIs dated August 3, 2016, the staff also requested (NRC Request 10c) clarification on how both DGs of the same load group start if there is an accident and a LOOP event in one unit only. In its letter dated October 13, 2016, the licensee stated that simultaneous DG start is not required. The response to NRC Request 10c states:

> Each DG receives a start signal on undervoltage or degraded voltage from its respective 6.9 kV SDB. If a LOOP were to occur on one unit, both unit's 6.9 kV SDBs would sense the loss of voltage condition generating a start signal to both 6.9 kV SDBs' respective DG. Both units DGs receive a start signal from the units safety injection signal should a LOCA occur. Although not safety-related, all DGs receive a start signal for the common start circuit if one DG starts.

Previously, when WBN, Unit 1, was the only operational unit, the requirement to start both diesels of the same power train was necessary to ensure the opposite unit DG would be adequately tested per SR 3.8.1.19, since all four DGs were required to be operable per LCO 3.8.1. Now, both units at the WBN site are operating, and each unit has an SR 3.8.1.19 that will be separately performed on each of the four DGs identified in LCO 3.8.1 during its unit's outage. Each of the four DGs autostarts on a degraded or undervoltage signal from its respective bus and the use of common station service transformers for supplying power to the SDBs of the same train for dual units provides reasonable assurance that a grid-related LOOP event will start DGs in the same train. Therefore, amended SR 3.8.1.19 assures the necessary quality of the DG system is maintained and that the LCO will be met.

3.6 Technical Conclusion

The staff finds the proposed changes to revise TS 3.8.1, "AC Sources – Operating," to extend the CT for one inoperable DG from 72 hours to 10 days based on the availability of a supplemental AC power source to be acceptable. The licensee has addressed the need to minimize risk for operability of equipment required to support controlled safe shutdown of both units during maintenance of one DG. In the event of loss of all the offsite power sources or loss of the normal preferred power source, the Class 1E AC buses will be powered from the available safety related DGs. The staff finds that the proposed use of one 6.9 kV FLEX DG

during maintenance of one safety related DG, is an acceptable compensatory method to support dual unit shutdown in the event of a LOOP. The licensee has stated that the adequacy and availability of the FLEX DG(s) will be assured prior to entering extended maintenance activities for the safety related DGs.

The staff concludes that the FLEX DGs and permanently installed equipment provide reasonable assurance of the capability to safely shutdown the operating unit(s) and mitigate the effects of a LOOP event in one unit and SBO in the other unit. The use of the 6.9kV FLEX DGs as supplemental power sources meets the staff's position in BTP 8-8, which is that the availability of an additional power source is a condition for approval of the extended DG allowed outage time. The two WBN units would continue to meet the design criteria as described in the UFSAR. The staff finds reasonable assurance that each unit will continue to be able to withstand for a specified duration, and recover from, a station blackout. The staff finds reasonable assurance that the amended remedial actions to be taken when LCO 3.8.1 is not met provide reasonable assurance that the activities as authorized (e.g. the longer completion times) will not endanger the health and safety of the public. Lastly, the revised Unit 1 SR 3.8.1.19 will continue to provide the appropriate test requirements to ensure that the necessary quality of AC systems is maintained.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and, for Unit 1 only, changes surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (81 FR 32810; May 24, 2016). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

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

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Date: January 13, 2017

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,

/RA/

Robert G. Schaaf, 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. 110 to NPF-90
2. Amendment No. 5 to NPF-96
3. Safety Evaluation

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