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

CNL-14-217

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

Watts Bar Nuclear Plant, Unit 2
Facility Construction Permit No. CPPR-92
NRC Docket No. 50-391

Subject: **Watts Bar Nuclear Plant Unit 2, Responses to Requests for Additional Information - Developmental Revision I Technical Specification Sections 3.8 and 5.7**

References:
1. TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 – Submittal of Developmental Revision I of the Unit 2 Technical Specification & Technical Specification Bases and Developmental Revision D of the Unit 2 Technical Requirements Manual and Technical Requirements Manual Bases," dated June 16, 2014 [ML14169A525]

2. Email from M. Miernicki (NRC) to G. Arent (TVA), "TS Review Clarification RAIs 10 07 2014," dated October 8, 2014

By letter dated June 16, 2014, Tennessee Valley Authority (TVA) submitted the Watts Bar Nuclear Plant (WBN) Unit 2 Developmental Revision I of the Unit 2 Technical Specifications (TS), TS Bases, Developmental Revision D of the Unit 2 Technical Requirements Manual, and Technical Requirements Manual Bases to the Nuclear Regulatory Commission (NRC) (Reference 1). By electronic mail (email) dated October 8, 2014, the NRC provided a set of requests for additional information (RAIs) regarding Developmental Revision I of TS Sections 3.8 and 5.7 (Reference 2).

The enclosure provides the TVA responses to the NRC RAIs regarding Developmental Revision I of Technical Specification Sections 3.8 and 5.7.

There are no new regulatory commitments associated with this letter. Please direct any questions concerning this matter to Gordon Arent at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 27th day of February 2015.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosure:

Responses to NRC Requests For Additional Information – Developmental Revision I Technical Specification Sections 3.8 and 5.7

Enclosure

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Enclosure

Responses to NRC Requests For Additional Information – Developmental Revision I Technical Specification Sections 3.8 and 5.7

Background

In June 1982, the Nuclear Regulatory Commission (NRC) staff issued a safety evaluation report (SER), NUREG-0847, "Safety Evaluation Report related to the operation of Watts Bar Nuclear Plant Units 1 and 2," regarding the Tennessee Valley Authority (TVA) application for licenses to operate Watts Bar Nuclear Plant (WBN) Units 1 and 2 (Reference 1). In Supplements 1 through 20 to the SER, the NRC staff concluded that WBN Unit 1 met all applicable regulations and regulatory guidance and on February 7, 1996, the NRC issued an Operating License to WBN Unit 1 (Reference 2).

On August 3, 2007, TVA informed the NRC of its plan to complete construction activities at WBN Unit 2 under the existing Construction Permit (Reference 3). In Staff Requirements Memorandum (SRM)-SECY-07-0096, "Staff Requirements - Possible Reactivation of Construction and Licensing Activities for the Watts Bar Nuclear Plant, Unit 2," dated July 25, 2007 (Reference 4), the Commission directed the NRC staff to employ the current licensing basis for WBN Unit 1 as the reference basis for the licensing review of WBN Unit 2. The SRM also states, ". . .TVA and the NRC staff should review any exemptions, reliefs, and other actions which were specifically granted for Unit 1 to determine whether the same allowance is appropriate for Unit 2. Significant changes to that licensing approach would be allowed where the existing backfit rule would be met or as necessary to support dual unit operation. The staff should encourage the licensee to adopt updated standards for Unit 2 where it would not significantly detract from design and operational consistency between Units 1 and 2."

In 2008, the NRC staff developed a licensing process, documented in Office Instruction LIC-110, "Watts Bar Unit 2 License Application Review," that describes the NRC staff's approach to perform the OL review for WBN Unit 2. This licensing review process implements the direction given to the NRC staff by the Commission documented in SRM-SECY-07-0096. Following implementation of this licensing review process, the NRC staff continued its review of the WBN Unit 2 OL review with Supplemental Safety Evaluation Report (SSER) 21.

In SSER 21 (Reference 5), the NRC staff provided information regarding the status of the WBN Unit 2 items that remain to be resolved, that were outstanding at the time that TVA deferred construction of Unit 2, and that were not evaluated and resolved as part of the licensing of WBN Unit 1. In SSER 22 (Reference 6), the NRC stated that it was documenting its evaluation of open items in support of TVA's application for a license to operate WBN Unit 2. The NRC further stated that it would continue to evaluate and close open items in future Safety Evaluation Report Supplements.

In SSER 22, the NRC staff provided a status of the action items (open items, confirmatory issues, and proposed license conditions) that must be resolved prior to completion of an NRC finding of reasonable assurance on the Operating License application for WBN Unit 2.

By letter dated June 16, 2014, the TVA submitted the WBN Unit 2 Developmental Revision I of the Unit 2 Technical Specifications (TS), TS Bases, Developmental Revision D of the Unit 2 Technical Requirements Manual, and Technical Requirements Manual Bases to the NRC (Reference 7). By electronic mail (email) dated October 8, 2014, the NRC provided a set of requests for additional information (RAIs) regarding Developmental Revision I of TS Sections 3.8 and 5.7 (Reference 8).

Enclosure

Responses to NRC Requests For Additional Information – Developmental Revision I
Technical Specification Sections 3.8 and 5.7

It is TVA's understanding that the NRC RAIs are related to aspects of dual unit operation. It is TVA's position that these RAIs address issues that have been the subject of NRC review and approval for WBN Unit 2.

The WBN Unit 1 and WBN Unit 2 electrical TSs are identical with the exception of 1) unit-specific identification of components (i.e., WBN Unit 1 Amendment 89 (see responses to RAIs 3 and 6)), 2) unit-specific license amendments that require conforming changes to the opposite unit's TSs (for example, diesel generator (DG) frequency and new qualified offsite power circuits), and 3) an outstanding change to WBN Unit 1 TS regarding reference to the fifth DG.

The WBN design includes a number of mechanical systems that are shared between the units for both normal operation and for the mitigation of postulated accidents (e.g., Essential Raw Cooling Water System and Component Cooling Water System). Sharing of the electrical system between the units is also required to support the shared mechanical systems. In order to facilitate the sharing of the electrical system between the units, the WBN electrical system design is based on dual unit operation. This dual unit electrical system design was reviewed and documented by the NRC in support of the WBN Unit 1 operating license in NUREG-0847, as well as several of the supplemental safety evaluation reports. The acceptability of the electrical system dual unit design aspects were further addressed for WBN Unit 2 in SSERs 22 and 24.

The following responses to the NRC RAIs demonstrate that there are no new dual unit operation considerations that have not been addressed in WBN SSERs.

NRC RAI 1

TS Section 5.7.2.21 "Battery Monitoring and Maintenance Program," has been deleted. Please confirm WBN Unit 2 batteries will be monitored and maintained consistent with the current WBN Unit 1 TS including SRs and implementing SIs.

TVA Response

By letter dated August 28, 2013 (Reference 9), TVA submitted a license amendment request (LAR) to modify WBN Unit 1 TS 3.8.4, "DC Sources - Operating," TS 3.8.5, "DC Sources - Shutdown," TS 3.8.6, "Battery Cell Parameters," and add Specification 5.7.2.21, "Battery Monitoring and Maintenance Program," with the adoption of Technical Specification Task Force (TSTF) change travelers TSTF-360, Revision 1, "DC Electrical Rewrite," and TSTF-500, Revision 2, "DC Electrical Rewrite - Update to TSTF-360." By letter dated June 20, 2014 (Reference 10), TVA withdrew the August 28, 2013 LAR submittal. Therefore, the current WBN Unit 1 TSs do not include Specification 5.7.2.21, "Battery Monitoring and Maintenance Program."

By letter dated December 12, 2013 (Reference 11), TVA submitted WBN Unit 2 TSs and TS Bases, Developmental Revision H. This revision of the TSs included Specification 5.7.2.21, "Battery Monitoring and Maintenance Program," based on the proposed changes to WBN Unit 1 TS LAR submitted on August 28, 2013. Upon withdrawal of the WBN Unit 1 LAR, Specification 5.7.2.21 was removed from the WBN Unit 2 TS in Developmental Revision I, as submitted in letter dated June 16, 2014 (Reference 12).

As a result of the changes described above, the WBN Unit 2 TSs reflect the same requirements for monitoring and maintaining the batteries that are reflected in the current WBN Unit 1 TSs. Therefore, dual-unit operation will not impact battery monitoring and maintenance.

NRC RAI 2

Surveillance testing for batteries and DGs [diesel generators] as required by Technical Specifications (TS) is proposed using different revisions industry (IEEE) Standards and Regulatory Guides compared to Licensing basis in the FSAR [Final Safety Analysis Report]. As an example, the battery design is in conformance with IEEE Standard 450-1980 but a modified performance test based on section 5.4 of IEEE 450-1995 is proposed for TS. Similarly, FSAR Section 3.8.16 states compliance with Regulatory Guide (RG) 1.9, Rev. 2, but selective TS required testing is proposed in compliance with a later revision of the RG 1.9.

Please compare and contrast the differences in the standards and RGs proposed between the two licensing documents and provide justification for the differences in compliance requirements.

TVA Response

The WBN Unit 2 FSAR, Section 8.1.5.3, "Compliance to Regulatory Guides and IEEE Standards," lists IEEE 450-1980, annotated by footnote (12). Footnote (12) provides the following information, in part, to clarify the extent of WBN conformance to IEEE 450-1980:

> (12) Full compliance with IEEE Std. 450-1980 with the following exceptions:
>
> (1) A modified performance test based on section 5.4 of IEEE 450-1995 may be performed in lieu of the performance or service test in accordance with the Technical Specification.

The WBN Unit 2 FSAR, Section 8.3.2.1.1, "Vital 125V dc Control Power System," subsection heading "Tests and Inspections" states, in part,

> A battery service test, conducted in accordance with the procedures of Section 6.6 of IEEE Standard 450-1980 or modified performance test based on Section 5.4 of IEEE Std. 450-1995, is also used to test the batteries under conditions as close to design as practical.

Supplemental SER 22, Section 8.3.2.3, "Availability of the Battery Supplies to Vital Instrument Buses," states,

> In its December 6, 2010, letter, TVA provided detailed information on the discharge rates for both the service discharge test and the modified performance discharge test. The NRC staff finds that TVA has demonstrated that the modified performance discharge test bounds the service discharge test profile. Based on this information, the NRC staff concludes that the modified performance discharge test is acceptable for use at WBN Unit 2.

The TS Surveillance Requirement (SR) 3.8.4.13 requires the performance of a battery service test at a frequency of 18 months. The SR 3.8.4.13 is modified by two notes. Note 1 specifies that the modified performance discharge test of SR 3.8.4.14 may be performed in lieu of the service test in SR 3.8.4.13 once per 60 months. The TS Bases for SR 3.8.4.14 states the acceptance criteria for the Surveillance are consistent with IEEE-450-1980/1995.

With regard to Regulatory Guide (RG) 1.9, WBN Unit 2 FSAR Section 8.1.5.3 lists RG 1.9, Revision 3, annotated by Footnote (7). Footnote (7) provides further information to clarify the extent of WBN conformance to RG 1.9, Revision 3. For example, Footnote (7) specifies that for RG 1.9, Revision 3, Regulatory Position C1.3, the WBN DG load assignment was based on the RG 1.9, Revision 2 limit, whereby the DG predicted loads do not exceed the short time rating. The Bases for TS 3.8.1 Surveillance Requirements states the SRs for demonstrating the operability of the DGs are in accordance with the recommendations of RG 1.9, Revision 3.

Therefore, the FSAR statements regarding conformance to RG 1.9, Revision 3, and IEEE 450-1980/1995, are modified by statements that clarify the extent of conformance, and the proposed Technical Specification Surveillance testing for batteries and DGs is consistent with the licensing basis described in the FSAR.

NRC RAI 3

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

a. *Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and*
b. *Four diesel generators (DGs) capable of supplying the onsite Class 1E AC Electrical power Distribution System.*

The staff notes that:

1. *All four DGs are required to be operable with unit 2 in Modes 1, 2, 3, or 4.*
2. *Several DG surveillances in TS Section 3.8.1 are precluded by a note stating "For DGs 2A-A and 2B-B Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR."*
3. *DG testing may be performed during unit 2 refueling outages.*
4. *WBN FSAR states "Power trains 1A and 2A comprise load group A, and power trains 1B and 2B comprise 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 shutdown the opposite unit." TS 3.8.1 (B) also requires Train A and Train B DGs to be operable.*

In a typical two unit design with four DGs, the emergency core cooling systems can be split into four unique trains (two for each unit) that are independent of each other. Thus any component in one train can be independently tested without impacting or being influenced by the corresponding component in the redundant or other unit's components.

At WBN, the load group A and load group B philosophy does not appear to provide independence between redundant and/or corresponding components. As an example, there are electric motors powered by the onsite distribution system of one unit that drive safety-related

motors (i.e., 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. Unit 2 FSAR Section 9.2.1.3, states that the minimum combined safety requirements for one accident unit and one non-accident unit or two non-accident units are met by two pumps on the ***same plant train.*** *The electrical ac and dc systems have common busses and non safety loads fed from Train 'A' or Train 'B' power supplies*

With one unit in shutdown mode and the other unit in mode 1, some or all the 'common' loads may be operating potentially impacting the testing of shutdown units components. Based on the above observations, clarify how all four DGs will be tested to satisfy the SRs for each operating Unit. Provide details on the adequacy of surveillances that require DG to be loaded with a complete set of ECCS loads.

TVA Response

By letter dated August 10, 2011 (Reference 13), TVA submitted a license amendment request (LAR) seeking to amend the WBN Unit 1 TS to permit performance of the WBN Unit 2 integrated safeguards test without requiring WBN Unit 1 to be shut down. Specifically, the LAR proposed to modify SR Notes associated with SR 3.8.1.8, SR 3.8.1.9, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.13, SR 3.8.1.16, SR 3.8.1.18, and SR 3.8.1.19 to allow performance of the Surveillances on Unit 2 6.9 kV shutdown boards and associated DGs while Unit 1 is operating in MODES 1, 2, 3, or 4.

In the NRC's Safety Evaluation related to WBN Unit 1 License Amendment 89, dated November 22, 2011 (Reference 14), Section 3.2, "Need for Proposed Change," the NRC stated, "The proposed changes will allow performance of the preoperational integrated safeguards test of WBN Unit 2 with WBN Unit 1 in MODE 1, 2, 3, or 4. If the NRC grants an Operating License to WBN Unit 2, the proposed changes to the WBN Unit 1 TSs will allow periodic performance of the Surveillances on WBN Unit 2 in MODE 5 or 6 with WBN Unit 1 in MODE 1, 2, 3, or 4."

As discussed in SRM-SECY-07-0096 (Reference 4), the Commission supports a licensing review approach that employs the current licensing basis for WBN Unit 1 as the reference basis for the review and licensing of WBN Unit 2. Therefore, the proposed adoption of the WBN Unit 1 TS 3.8.1 SR Notes, as amended by WBN Unit 1 License Amendment 89, represents conforming changes to the WBN Unit 2 TS 3.8.1 SR Notes.

With respect to the adequacy of the surveillances that require a DG to be loaded with a complete set of ECCS loads, WBN Unit 1 TS SR 3.8.1.14 requires verification that each DG operating at a power factor between 0.8 and 0.9 operates for at least 24 hours, with at least 2 hours loaded between 4620 kW and 4840 kW and between 3465 kVAR and 3630 kVAR, and for the remaining hours of the test loaded between 3960 kW and 4400 kW and between 2970 kVAR and 3300 kVAR. The WBN Unit 2 TS SR 3.8.1.14 is identical to the WBN Unit 1 SR 3.8.1.14.

NRC RAI 4

SR 3.8.1.13 is related to verification of each DG's automatic trips that are bypassed on automatic or emergency start signal with the exception of:

a. *Engine overspeed; and*
b. *Generator differential current*

Clarify if the procedure used for this surveillance will uniquely verify the functionality of the bypass contacts and the functionality of the trip contacts that are:

a) *Available during testing and emergency modes*
b) *Bypassed during emergency mode*

TVA Response

WBN Unit 1 TS Bases for SR 3.8.1.13, states,

> This Surveillance demonstrates that DG noncritical protective functions (e.g., high jacket water temperature) are bypassed on an automatic or emergency start signal and that critical protective functions (engine overspeed and generator differential current) remain functional to affect a DG trip to avert substantial damage to the DG unit or to the safety related equipment powered by the DG. It is not necessary to actually trip the DG using critical protective functions in order to satisfy this SR. The noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The WBN Unit 2 TS SR 3.8.1.13 Bases statement contains the same information as the WBN Unit 1 statement above.

In addition, WBN procedures periodically verify the capability of the DG trip relays and associated instrumentation to actuate a DG trip.

NRC RAI 5

SR 3.8.1.14 has a requirement to test the DG at postulated accident profile and states: Verify each DG operating at a power factor ≥ 0.8 and ≤ 0.9 operates for ≥ 24 hours:

a. *For ≥ 2 hours loaded ≥ 4620 kW and ≤ 4840 kW and ≥ 3465 kVAR and ≤ 3630 kVAR; and*
b. *For the remaining hours of the test loaded ≥ 3960 kW and ≤ 4400 kW and ≥ 2970 kVAR and ≤ 3300 kVAR.*

The FSAR section 8.1.5.3 indicates the postulated accident loading is equal to or greater than the nominal DG rating. Confirm that the DG testing requirements will envelope the postulated accident loads.

TVA Response

The WBN Unit 1 UFSAR, Section 8.1.5.3, "Compliance to Regulatory Guides and IEEE Standards," lists RG 1.9, Revision 3, annotated by Footnote (5). Footnote (5) provides the following information, in part, to clarify the extent of WBN conformance to RG 1.9, Revision 3:

> (5) Since Regulatory Guide 1.9 has been revised, the following information defines the degree of conformance with Regulatory Guide 1.9 R3 for the design bases listed in Section 8.1.4.
>
> Position C1.3 Does not comply - Revision 2 of RG 1.9 Position C2 required the predicted loads not to exceed the short time rating. This position has required the predicted loads not to exceed the continuous rating. WBN diesel generators load assignment was based on the RG 1.9 R2 limit.

WBN Unit 1 UFSAR Section 8.3.1.1, "Description," subsection, "Diesel Generator Capacity," states, in part,

> In compliance with Regulatory Guide 1.9, Rev. 2, the table below compares worst case loading of the diesel generators with their continuous rating and their 2-hour rating. Worst case loading occurs for a simultaneous loss of offsite power and a loss-of-coolant accident on the unit the diesel is associated with. Adequate margin exists between worst case loading and diesel capacity. {emphasis added} To satisfy the continuous rating, it may be necessary for operator action to remove certain loads not required for accident mitigation within 2 hours of starting a diesel. Also refer to Section 8.1.5.3.

	Diesel Generator			
	1A-A	1B-B	2A-A	2B-B
Worst Case Loading (kW)*	4400	4400	4400	4400
Short Time (2-hr) rating (kW)	4840	4840	4840	4840
Continuous rating (kW)	4400	4400	4400	4400

> * The worst case loading is less than or equal to the diesel generator rating. {emphasis added}

The WBN Unit 2 FSAR Section 8.1.5.3 and Section 8.3.1.1 statements contain the same information as the WBN Unit 1 statements above. In addition, the WBN Unit 2 TS SR 3.4.1.14 is identical to the WBN Unit 1 TS SR 3.4.1.14.

NRC RAI 6

SR 3.8.1.8 has a note that states that for the 2A-A and 2B-B Shutdown Boards, this Surveillance shall not be performed in MODE 1 or 2. The surveillance requires verification of automatic and manual transfer of each 6.9 kV shutdown board power supply from the normal offsite circuit to each alternate offsite circuit. Similar to RAI #3,

1. *Clarify when this surveillance will be performed on each of the four shutdown boards that are required when Unit 2 is in Mode 1 or 2.*
2. *Clarify if 'each' includes shutdown boards 1A-A, 1B-B, 2A-A and 2B-B and how the applicable note for surveillances in Mode 1 or 2 will impact each of the shutdown boards.*

TVA Response

By letter dated August 10, 2011 (Reference 13), TVA submitted a license amendment request (LAR) seeking to amend the WBN Unit 1 TS to permit performance of the WBN Unit 2 integrated safeguards test without requiring WBN Unit 1 to be shut down. Specifically, the LAR proposed to modify SR Notes associated with SR 3.8.1.8, SR 3.8.1.9, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.13, SR 3.8.1.16, SR 3.8.1.18, and SR 3.8.1.19 to allow performance of the Surveillances on Unit 2 6.9 kV shutdown boards and associated DGs while Unit 1 is operating in MODES 1, 2, 3, or 4.

In the NRC's Safety Evaluation related to WBN Unit 1 License Amendment 89, dated November 22, 2011 (Reference 14), Section 3.2, "Need for Proposed Change," the NRC stated, "The proposed changes will allow performance of the preoperational integrated safeguards test of WBN Unit 2 with WBN Unit 1 in MODE 1, 2, 3, or 4. If the NRC grants an Operating License to WBN Unit 2, the proposed changes to the WBN Unit 1 TSs will allow periodic performance of the Surveillances on WBN Unit 2 in MODE 5 or 6 with WBN Unit 1 in MODE 1, 2, 3, or 4."

As discussed in SRM-SECY-07-0096 (Reference 4), the Commission supports a licensing review approach that employs the current licensing basis for WBN Unit 1 as the reference basis for the review and licensing of WBN Unit 2. Therefore, the proposed adoption of the WBN Unit 1 TS 3.8.1 SR Notes, as amended by WBN Unit 1 License Amendment 89, represents conforming changes to the WBN Unit 2 TS 3.8.1 SR Notes.

NRC RAI 7

SR 3.8.3.4 requires verification that each DG air start receiver pressure is ≥ 190 psig. The licensing basis of the plant is that each set of accumulators is sized for a compressed air storage capacity sufficient to start the diesel generator unit five times without recharging.

1. *Confirm that each accumulator at 190 psig has adequate capacity to provide five DG starts. Please provide references to any testing that was done to validate this requirement.*
2. *The station blackout (SBO) rule assumes recovery from blackout conditions either from onsite DGs or offsite power. Confirm that there is adequate starting air available for DG starting requirements after 4 hours, assuming an initial pressure of 190 psig, several start failures at the onset of a LOOP event resulting in SBO conditions.*

TVA Response

WBN Unit 1 UFSAR Section 9.5.6.2, "System Description," states, in part,

> Each diesel engine has two pairs of air starting motor units (hence, there are four pairs per diesel generator unit). A minimum of two pairs of air start motors are needed to start the diesel generator unit. A set of two skid-mounted air accumulators is provided for each diesel engine; four accumulators per diesel generator unit.
>
> The accumulators are designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII. Each set of accumulators is sized for a compressed air storage capacity sufficient to start the diesel generator unit five times without recharging. {emphasis added}

WBN Unit 1 TS SR 3.8.3.4 Bases states, in part,

> This Surveillance ensures that, without the aid of the refill compressor, sufficient air start capacity (≥ 190 psig, value does not account for instrument error, Ref. 7) for each DG is available. The system design requirements provide for a minimum of five engine start cycles without recharging. A start cycle is defined by the DG vendor, but usually is measured in terms of time (seconds of cranking) or engine cranking speed. The pressure specified in this SR is intended to reflect the lowest value at which the five starts can be accomplished.

The WBN Unit 2 FSAR Section 9.5.6.2 and TS SR 3.8.3.4 Bases statements contain the same information as the WBN Unit 1 statements above.

With regard to the adequacy of starting air to effect a DG start after the established coping time (four hours), SSER 22, Section 8.4.2.2, "Class 1E Battery Capacity," states,

> In its current review in support of the WBN Unit 2 application, the NRC staff requested that TVA provide information on the adequacy of the battery capacity to support loads required for decay heat removal for the specified SBO duration and EDG field flashing for recovering onsite power sources. In its letter dated July 31, 2010, TVA stated the following:
>
> . . .
>
> (3) 125 VDC Emergency Diesel Generator (EDG) Power System:
>
> As stated in Unit 2 FSAR 8.3.1.1, the EDG batteries are designed to support an SBO event for four (4) hours. The batteries are required to provide power and indication to allow starting of the EDG to recover from the event. The coping duration can be achieved with the battery and all loads connected, provided that a maximum of three (3) start sequences are attempted. The batteries will have sufficient capacity remaining to "flash the generator field" with the third and final start occurring at the end of the coping period. The battery capacity analysis demonstrates the capacity to

> provide the remaining loads for up to four (4) hours. The evaluation includes allowances for aging, design margin and temperature derating.
>
> Based on the above responses to the NRC staff questions, TVA maintains that the 125-V dc vital power system battery, 250-V dc battery system, and 125-V dc EDG power system have sufficient capacity with load shedding to cope with and recover from an SBO.

Therefore, although the DG starting air system design requirements provide for a minimum of five engine start cycles without recharging, the capability of each DG battery to "flash the generator field" is only ensured by limiting DG start attempts to three, with the third and final start occurring at the end of the coping period. Therefore, since only three manual DG start attempts are made, there will be sufficient starting air to effect the last DG start attempt at the end of the blackout event.

The above assumed limitation on manual DG start attempts is implemented in TVA procedure AOI-40, "Station Blackout," Appendix C, "Energizing Shutdown Boards from Onsite Emergency Power," by the following caution:

> If DG fails to start automatically upon a blackout (BO) signal, three manual starts may be attempted. One DG start will be attempted when the Loss of Offsite Power (LOOP) or BO occurs and the affected DG fails to start. Another start will be attempted when the first attempt fails. The final start attempt will be reserved for the end of the BO event.

Lastly, SSER 22, Section 8.4, "Station Blackout," subsection 8.4.8, "Summary and Conclusions," states,

> Based on the information provided by TVA regarding meeting the requirements of the SBO rule, the NRC staff concludes that TVA's completed and proposed actions, processes, and procedures to address an SBO event are acceptable, pending resolution before WBN Unit 2 startup of the open items noted above in Section 8 of this SSER.

The SSER 22, Section 8 open items (items 26 through 32) do not involve aspects of the SBO coping time.

NRC RAI 8

SR 3.8.4.5 and 3.8.4.6 require verification of no visible corrosion at terminals and connectors for the vital and DG batteries. The SR also provides limiting connection resistances for [e]ach battery connection. Confirm that the total battery resistance calculated with each connection at the maximum TS limited value will ensure adequate battery terminal voltage required for safety functions at the end of predicted life?

TVA Response

The requirements for SR 3.8.4.5 and SR 3.8.4.6 for the vital and DG batteries, respectively, are to verify no visual corrosion at terminals and connections. Alternatively, the resistance for

intercell connections, intertie connections, and interrack and terminal connections can be verified to be within the limits specified with the SRs.

The WBN procedures that implement these SRs require resistance measurements to be taken at each corroded connection or terminal.

The WBN Unit 2 batteries are shared with WBN Unit 1. The WBN Unit 2 TSs reflect the same requirements for monitoring and maintaining the batteries that are in the WBN Unit 1 TSs. With the advent of dual unit operation, there are no new requirements imposed on the batteries.

NRC RAI 9

TS 3.8.6.3 considers Battery Cell Parameters and average electrolyte temperatures for vital and DG batteries. Confirm that the temperature correction factors for temperatures provided in the TS were used for battery sizing criteria for DG batteries.

TVA Response

The WBN Unit 2 batteries are shared with WBN Unit 1. The WBN Unit 2 TSs reflect the same requirements for monitoring and maintaining the batteries that are in the WBN Unit 1 TSs. With the advent of dual unit operation, there are no new requirements imposed on the batteries.

NRC RAI 10

SR 3.8.4.13 requires verification of adequacy of battery capacity to supply, and maintain in OPERABLE status, the required emergency loads and any connected nonsafety loads for the design duty cycle when subjected to a battery service test. What is the battery service test and how long is it required to supply the loads. Clarify if the modified performance test includes accident and SBO profile or the most conservative loading.

TVA Response

Supplemental SER 22, Section 8.3.2.3, "Availability of the Battery Supplies to Vital Instrument Buses," states, in part,

> In its letter dated July 31, 2010, TVA stated that the service test duty cycle was determined in a WBN Unit 1/Unit 2 vital battery sizing calculation from a review of battery load duty cycles associated with battery I, II, III, IV, and V for the SBO, LOCA/LOOP, and Appendix R cases. The duty cycle chosen by TVA represents the worst-case duty cycle for an SBO event; in this case, the term "worst-case" means that the battery load case controls the battery size (more positive plates) and voltage (minimum voltage). TVA considered the LOCA/LOOP cases for first-minute loading only because the total duty cycle is much smaller than the SBO duty cycle. The Appendix R cases do not have an impact because the duty cycles are bounded by the SBO. Since the load study case results represent the worst-case loading for the first minute and complete duty cycle for SBO (i.e., 1-240 minutes), the NRC staff considers TVA's battery-load duty-cycle evaluation to be acceptable.
>
> . . .

> In its December 6, 2010, letter, TVA provided detailed information on the discharge rates for both the service discharge test and the modified performance discharge test. The NRC staff finds that TVA has demonstrated that the modified performance discharge test bounds the service discharge test profile. Based on this information, the NRC staff concludes that the modified performance discharge test is acceptable for use at WBN Unit 2. {emphasis added}

NRC RAI 11

(Licensing basis: Each vital (and DG battery?) has adequate storage capacity to carry the required load continuously for at least 4 hours in the event of a loss of all AC power (station blackout) without an accident or for 30 minutes with an accident considering a single failure. Load shedding of non-required loads will be performed to achieve the required coping duration for station blackout conditions.)

The TS basis states that the DG battery has sufficient capacity when fully charged to supply required loads for a minimum of 30 minutes following a loss of normal power. The station blackout rule assumes recovery from SBO using either the onsite DGs or the offsite power source. The DC systems should therefore be sized to support recovery from either source. Confirm that the DG battery system will be tested for a 4 hour SBO load profile.

TVA Response

Supplemental SER 22, Section 8.4, "Station Blackout," subsection 8.4.2.2, "Class 1E Battery Capacity," states, in part,

> The SEs dated March 18 and September 9, 1993 summarize the NRC staff's original findings and recommendations on Class 1E battery capacity for WBN Unit 2. The staff reviewed the battery capacity, including load shedding to conserve battery capacity, to ensure that the battery systems have the availability, adequacy, and capability to achieve and maintain a safe shutdown and recover from an SBO with a 4-hour coping duration. The staff findings, as documented in its SE dated March 18, 1993, were as follows:
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> . . .
>
> For EDG field flashing, WBN has separate 125 Vdc batteries from those discussed above. TVA proposes to attempt two EDG starts (field flashings) at the beginning of the SBO event (to identify that the event has occurred) and to reserve one start attempt (field flashing) for the end of the 4-hour period. TVA stated that the adequacy of these batteries have been analyzed using the IEEE Standard 485 methodology and that the results demonstrate sufficient battery voltage after the 4-hour event to flash the generator field.
>
> . . .
>
> In staff SEs dated March 18 and September 9, 1993, the staff found that there was reasonable assurance that the 125-V vital batteries, the 125-V EDG batteries, and the 250-V switchyard batteries will have sufficient capacity to cope with and recover from an SBO of 4 hours based on the information provided to the staff.

In its current review in support of the WBN Unit 2 application, the NRC staff requested that TVA provide information on the adequacy of the battery capacity to support loads required for decay heat removal for the specified SBO duration and EDG field flashing for recovering onsite power sources. In its letter dated July 31, 2010, TVA stated the following:

. . .

(3) 125 VDC Emergency Diesel Generator (EDG) Power System: As stated in Unit 2 FSAR 8.3.1.1, the EDG batteries are designed to support an SBO event for four (4) hours. The batteries are required to provide power and indication to allow starting of the EDG to recover from the event. The coping duration can be achieved with the battery and all loads connected, provided that a maximum of three (3) start sequences are attempted. The batteries will have sufficient capacity remaining to "flash the generator field" with the third and final start occurring at the end of the coping period. The battery capacity analysis demonstrates the capacity to provide the remaining loads for up to four (4) hours. The evaluation includes allowances for aging, design margin and temperature derating.

Based on the above responses to the NRC staff questions, TVA maintains that the 125-V dc vital power system battery, 250-V dc battery system, and 125-V dc EDG power system have sufficient capacity with load shedding to cope with and recover from an SBO.

The NRC staff asked TVA to clarify what analysis was used for the batteries in order to reach a conclusion that batteries have adequate capacity to achieve and maintain a safe shutdown and recover from an SBO for a 4-hour coping duration. In its response letter dated December 6, 2010, TVA stated that, as discussed in WBN Unit 2 FSAR Section 8.3.2.1.1, the capability of a 125 V dc battery system was verified by analysis for each battery using normal system alignment with loss of all ac power to both the units. This 125 V dc system analysis demonstrates that each vital battery has adequate capacity to supply the required loads to achieve and maintain a safe shutdown of both the units and to recover from the SBO event. Based on the response, the staff concludes that the batteries have adequate capacity to supply the necessary loads following an SBO.

NRC RAI 12

SR 3.8.4.14 requires verification that battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.

The test frequency 60 months

AND

12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating

AND

24 months when battery has reached 85% of the expected life with capacity 100% of manufacturer's rating

In general, the vital batteries and DG batteries have unique surveillance requirements. The DG battery systems do not appear to have corresponding surveillance requirement similar to SR 3.8.4.14 for battery degradation. Please confirm if TS amendments are proposed to have all the surveillances for the DG battery systems similar to vital batteries.

TVA Response

Technical Specification SR 3.8.4.14 is not unique to the vital batteries. Technical Specification SR 3.8.4.14 applies to the vital batteries and the DG batteries. Therefore, no amendments are required to provide an SR to verify the battery capacity of the DG batteries by means of a performance discharge test or a modified performance discharge test.

References

1. NUREG-0847, "Safety Evaluation Report related to the operation of Watts Bar Nuclear Plant Units 1 and 2," June 1982.

2. NRC Letter to TVA, "Issuance of Facility Operating License No. NPF-90, Watts Bar Nuclear Plant, Unit 1 (TAC No. M94025)," dated February 7, 1996.

3. TVA Letter to NRC, "Watts Bar Nuclear Plant (WBN) – Unit 2 – Reactivation of Construction Activities," dated August 3, 2007.

4. Staff Requirements Memorandum (SRM)-SECY-07-0096, "Staff Requirements - Possible Reactivation of Construction and Licensing Activities for the Watts Bar Nuclear Plant, Unit 2," dated July 25, 2007.

5. NUREG-0847, "Safety Evaluation Report related to the operation of Watts Bar Nuclear Plant Units 1 and 2, Supplement 21," published February 2009.

6. NUREG-0847, "Safety Evaluation Report related to the operation of Watts Bar Nuclear Plant Units 1 and 2, Supplement 22," published February 2011.

7. TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 – Submittal of Developmental Revision I of the Unit 2 Technical Specification & Technical Specification Bases and Developmental Revision D of the Unit 2 Technical Requirements Manual and Technical Requirements Manual Bases," dated June 16, 2014.

8. Email from M. Miernicki (NRC) to G. Arent (TVA), "TS Review Clarification RAIs 10 07 2014," dated October 8, 2014.

9. TVA Letter to NRC, "Application to Modify Watts Bar Nuclear Plant, Unit 1 Technical Specifications (TS) 3.8.4, 3.8.5, and 3.8.6 (WBN-TS-12-07)," dated August 28, 2013.

10. TVA Letter to NRC, "Withdrawal of Application to Modify Watts Bar Nuclear Plant, Unit 1 Technical Specifications (TS) 3.8.4, 3.8.5, and 3.8.6 (WBN-TS-12-07)," dated June 20, 2014.

11. TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 – Submittal of Developmental Revision H of the Unit 2 Technical Specification and Technical Specification Bases," dated December 12, 2013.

12. TVA Letter to NRC, "Watts Bar Nuclear Plant Unit 2 – Submittal of Developmental Revision I of the Unit 2 Technical Specification & Technical Specification Bases and Developmental Revision D of the Unit 2 Technical Requirements Manual and Technical Requirements Manual Bases," dated June 16, 2014.

13. TVA Letter to NRC, "Application to Modify Watts Bar Nuclear Plant, Unit 1, Technical Specifications in Support of Watts Bar Nuclear Plant, Unit 2, Testing and Operation (TS-WBN-11-02)," dated August 10, 2011.

14. NRC Letter to TVA, "Watts Bar Nuclear Plant, Unit 1– Issuance of Amendment Regarding Technical Specification 3.8.1, "AC [Alternating Current] Sources – Operating" Surveillance Requirements Notes (TAC No. ME6980)," dated November 22, 2011.