Watts Bar Nuclear Plant

Diesel Generator Completion Time Extension

August 4, 2016

Agenda

- **Opening Remarks**
- **TS Completion Time (CT) History**
- **System Overview**
- **Discussion of NRC Questions**
- **Closing Remarks**

Opening Remarks

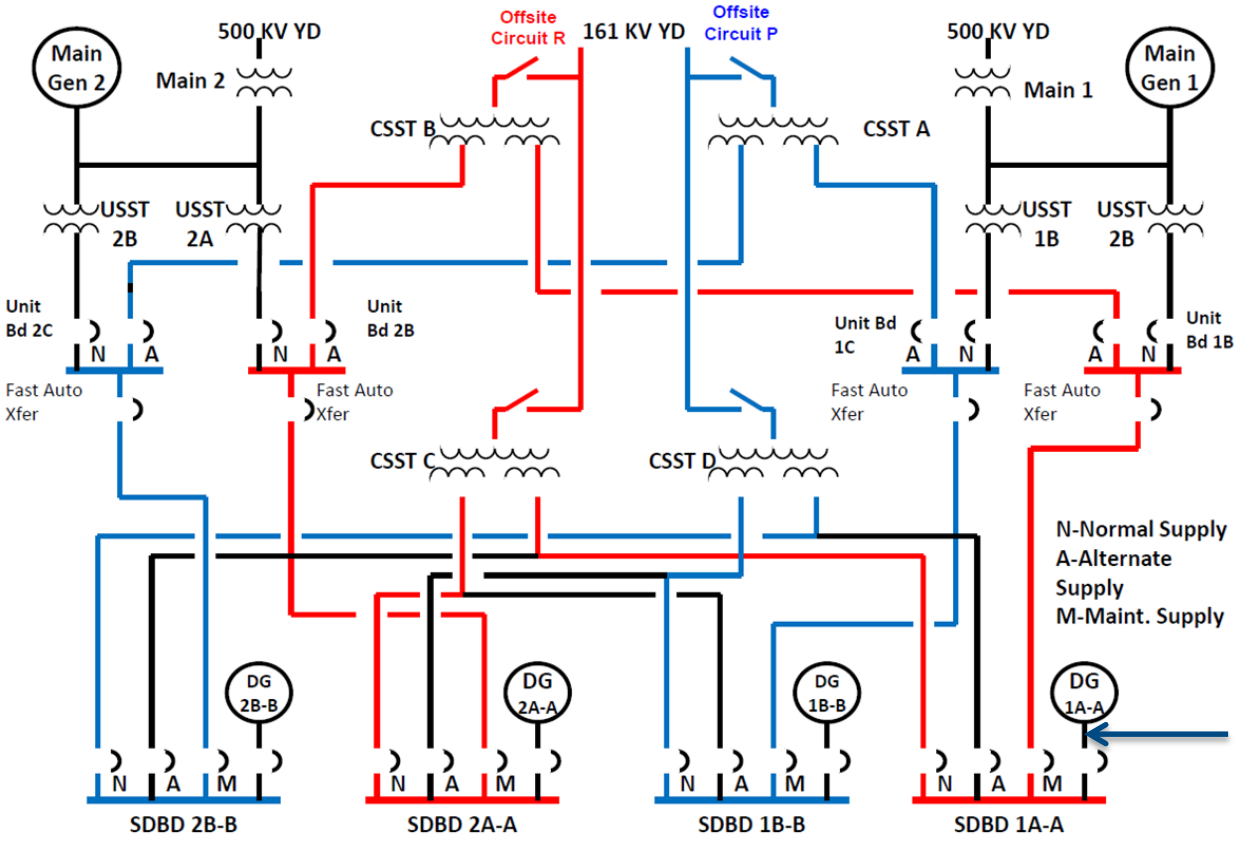
WBN Completion Time History

- **Original WBN Unit 1 Technical Specification**
  - 72 hour Completion Time for One Inoperable Diesel Generator (DG)
- **Amendment 30**
  - December 08 2000
  - One Time - 10 day completion time
- **Amendment 39**
  - July 7, 2002
  - 14 Day Completion Time
  - Risk-Informed Based on Unit 1 Operation Only
- **Amendment 84**
  - July 6, 2010
  - 72 Hour Completion Time
  - Implementation Delayed for Unit 1 until Prior to Unit 2 Entering MODE 4
- **WBN Unit 2 Operating License**
  - October 22, 2015
  - 72 Hour Completion Time
- **WBN Unit 2 Entered Mode 4**
  - March 17, 2016 Implemented WBN Unit 1 72 Hour CT
  - March 19, 2016 WBN U2 Entered Mode 4

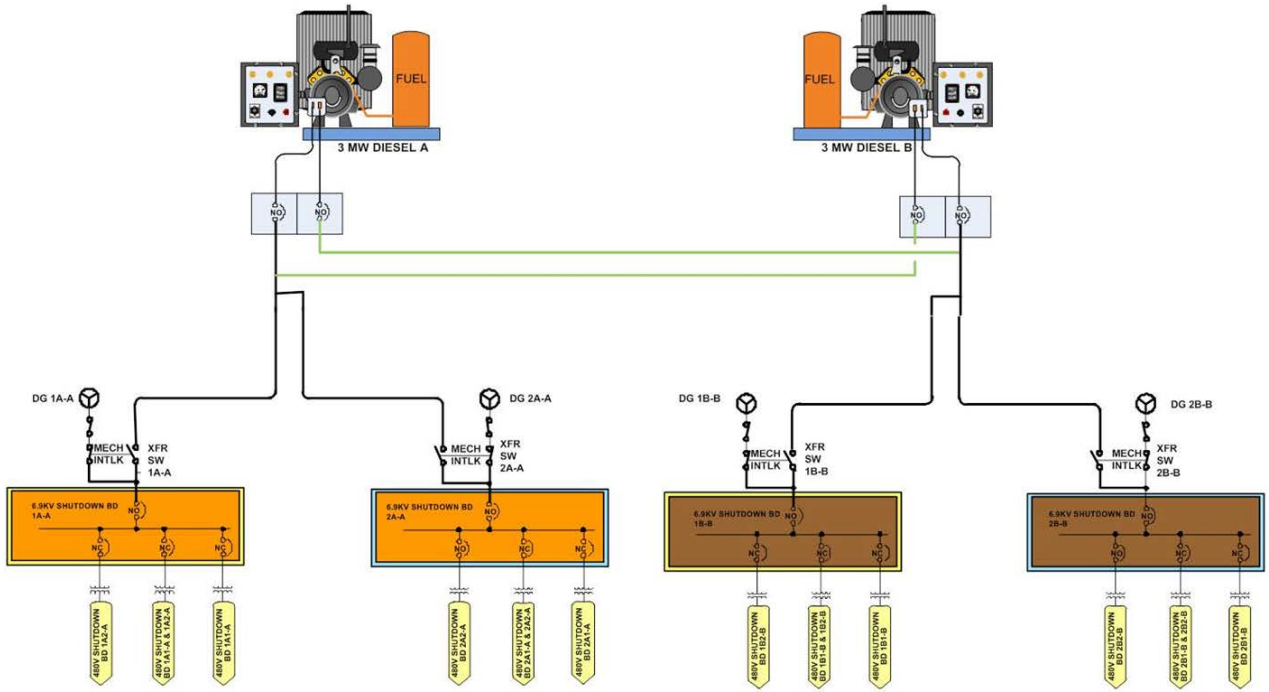
System Overview

- **Grid and Interconnections**
  - 500 kV (Power Distribution)
  - 161 kV (Preferred Power Source)
- **Plant Power System**
  - 500 kV Power Distribution
  - 161 kV Preferred Power Source
  - 6.9 kV Diesel Generators
- **Mitigating Strategies Power**
  - 6.9 kV FLEX Diesel Generators

Off Site Power Supplies



6.9 kV Flex Diesel Generators



Request for Additional Information (RAI) 1

Please provide the following information:

a) **The estimated and actual time taken for all 6-year, 12-year and/or 18*-year maintenance activities at WBN Unit 1 (and 2) for each of the four DGs, other than the values provided in Table 2 of the LAR.**

b) **Explain why WBN needs up to 14 days for 6-year, 12-year and 18* year maintenance related activities compared to 7 days at other plants with similar DGs.**

***As applicable if the 12-year overhaul frequency has been changed to 18 years**

TVA Response RAI 1

	1A-A DG	1B-B DG	2A-A DG	2B-B DG
4 year	68 (4/07)	59 (4/07)	160 (4/07)*	72 (4/07)
6 year	89 (4/09)	96 (5/09)	88 (4/09)	99 (5/09)
* Included as the emergent generator replacement (E1-11)				

- WBN Estimated 18 year Surveillance
  - Plan to Consolidate Work (VLF Testing, Tank Cleaning)

RAI 2

In view of the shared systems for dual unit operation, if 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(s) was not restored within the 72-hour CT, a dual-unit shutdown would be required.

Please clarify the following:

a) **The LAR states that the completion time (CT) extension will "allow sufficient time to perform planned (emphasis added) maintenance activities that cannot be performed within a 72-hour CT." Please confirm that the proposed CT extension time will be used for preplanned 6-year, 12-year/18-year maintenance activities ONLY; and for routine testing and maintenance activities, the extended CT will not be invoked.**

b) **The LAR also states that "TVA anticipates (emphasis added) that the above planned maintenance activities will be performed with one or both units in Mode 4 or above." From a defense-in-depth perspective, clarify if the preplanned 6-year and 12/18-year maintenance activities on the DGs, one at a time, will be performed with the associated Unit in Mode 5 or Mode 6.**

TVA Response

a) **TVA is evaluating limiting the proposed completion time to the pre-planned 6-yr and 18-yr maintenance and will provide our position in the formal response to this RAI**

b) **TVA does plan to perform this maintenance with both Units in Modes 1 - 4.**

RAI 3

Based on the information provided in Enclosure 2 of letter dated August 31, 1992 and the LAR Section 3.5 related to coping with Station Black Out:

Please clarify the following:

a) **Please explain the sequence of events of 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.**

b) **Please explain if the response is also applicable for SBO in Unit 2 and single failure of a DG in Unit 1.**

c) **According to the Watts Bar licensing basis, safe shutdown is considered as placing both units in a hot standby (Technical Specification MODE 3) condition 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 extended CT, have the capacity and capability to bring the Unit to cold shutdown. Please confirm that one 6.9 kV FLEX DG coupled with one standby DG is adequate to place both units in cold shutdown and maintain cold shutdown conditions.**

TVA Response

a) **TVA will provide the logic and sequence of events of a Loss of Offsite Power on both Units with a DG out of service for maintenance and a failure of the redundant DG to start.**

b) **The response is applicable to Unit 2 and will be provided in our response.**

c) **TVA will confirm that one 6.9 kV FLEX DG coupled with one standby DG is adequate to place both units in cold shutdown and maintain cold shutdown conditions.**

RAI 4

Section 4.3 of Enclosure 1 of the LAR provides an assessment of DG completion time extension and has the following statements "Each of the four DGs can supply one of the four separate Class 1E 6.9 kV shutdown boards. Each DG is started automatically on a LOOP or LOCA. The DG arrangement provides adequate capacity to supply the ESF and protection systems for the DBA, assuming the failure of a single active component in the system. Because the standby power systems can accommodate a single failure, extending the CT for an out-of-service DG has no impact on the system design basis. Safety analyses acceptance criteria as provided in the UFSAR are not impacted by the changes."

With the proposed 6.9 kV FLEX DG as a replacement for a DG under maintenance, please explain if the conclusion is applicable for all postulated events (coupled with single failure) that are considered in the licensing basis.

TVA Response

TVA is evaluating the RAI however, it appears that the "out of service" DG coupled with an additional single failure (redundant DG) would result in a SBO on the affected Unit. The Watts Bar design basis is LOOP/LOCA and therefore the single failure would not be considered with the redundant DG out of service.

RAI 5

Considering a single failure of ‘A’ train power after a dual unit LOOP, the ‘B’ train power must be able to bring both units to cold shutdown to comply with BTP 8-8 and General Design Criteria (GDC)-5. Likewise, considering a single failure of ‘B’ train power after a dual unit LOOP, the ‘A’ train power must be able to bring both units to cold shutdown to comply with BTP 8-8 and GDC-5.

Based on analysis, demonstrate that the 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 the requirements of GDC-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’ EDG 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. Please explain if the response is also applicable for SBO in Unit 2 and single failure of a DG in Unit 1.**

b) **The FLEX DG is substituting for a Train B EDG 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.**

c) **In the above scenarios, identify which loads on the shutdown switchboard powered by the FLEX DG would not receive power because the FLEX DG cannot supply the same power capacity as the DG and explain why that would be satisfactory in each of the above scenarios.**

d) **In the above scenarios, discuss which ERCW pumps and CCS pumps are running and what heat exchange function each CCS heat exchanger is performing.**

TVA Response

TVA understands the question and will provide a response

RAI 6

Please provide details of DG loadings for the scenarios considered in question 5 above. In view of the differences in DG loadings, please indicate which case is the limiting case. Also, provide a time-line based on plant procedures, for connecting the proposed 6.9 kV FLEX DG to the associated safety-related bus/busses in the above scenarios.

TVA Response

a) **TVA will provide the DG loading details for each of the scenarios considered in RAI 5.**

b) **A time-line based on plant procedures for connecting the proposed 6.9kV Flex DG will also be provided.**

NRC Draft RAI 7

Please clarify whether the FLEX DGs have been (or will be) tested to start and run loads that will be required for scenarios listed in Questions above.

TVA Response

- **Post Installation Testing**
  - **Phase Rotation Test**
  - **Run and load test to test bank (100%)**

- **TVA performs the following testing of the FLEX DGs consistent with NEI-1206**
  - **A monthly inspection,**
  - **Semi-annual inspection and start test,**
  - **Annual inspection – run and load test (30% load to test bank),**
  - **Three Year Inspection – run and load test (100% load to test bank)**

RAI 8

Transitioning to Phase 2 includes aligning and placing into service the pre-staged 480 V FLEX DGs and the 6.9 kV FLEX DGs.

Based on the information provided on the FLEX DGs, the Staff requests following additional information:

a) **Please confirm whether the 480 V FLEX DGs are part of the proposed extension request for DGs and will have the same requirements for testing and availability checks as the 6.9 kV FLEX DGs.**

b) **Assuming that it takes the proposed TS allowed time of 2 hours to establish the availability of the 6.9 kV FLEX DG, please provide a time line, 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 busses if an unplanned DG maintenance was being conducted and a LOOP event is experienced.**

c) **For the event postulated in item b) above, please confirm if the Unit with DG undergoing maintenance will first enter SBO procedures if the associated DG fails to start.**

TVA Response

a) **TVA does not consider the 480 v FLEX DG part of the proposed extension request.**

b) **TVA will provide a timeline supporting the 2-hour establishment of 6.9kV FLEX DG.**

c) **Upon lost of off-site and on-site power to the 6.9 kV shutdown boards the operator will enter ECA-0.0, Loss of All AC**

RAI 9

LCO 3.8.1 proposed Required Action (RA) B.2 uses the word ‘evaluate’ when assessing the availability of 6.9 kV FLEX DG. However this wording apparently disagrees with the basis written for RA B.2 which states that it is necessary to ‘verify’ that the availability of the FLEX DG. Per 10 CFR 50.36(a)(1) the basis is a summary statement or reasons for the specification. The proposed reasoning and basis used in the LAR is that the FLEX DG be available during the longer proposed CT for the standby DG.

Propose a reworded RA B.2 that agrees with the proposed basis.

TVA Response

TVA will provide wording so that the Required Action and the bases agree.

RAI 10

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.

a) **Explain how the proposed wording results in a SR that is equivalent in purpose to the existing SR.**

b) **In your answer address the question of 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 and if not why not?**

c) **Explain how both DGs of the same load group start if there is an accident and a LOOP event in one Unit only.**

TVA Response

a) **The proposed wording is equivalent in the test to the existing SR. This SR does not require simultaneous starting of the same power train**

b) **Each DG automatically starts on a loss of voltage on its respective shutdown board. A non-safety related common start circuit starts all DG once one is started but is not credited in any accident analysis.**

c) **See b) above.**

RAI 11

Table 2 in Enclosure 1 of the LAR provides an overview of historical record of DG Maintenance Activity Completion Times (hours). The staff notes that very low frequency (VLF) cable testing has consistently taken longer than maintenance activities associated with the DGs. If future cable testing is projected to take longer than the 6-year or 18-year maintenance testing, please provide a listing of cables and associated equipment that render the respective DG to be inoperable and the corresponding estimated time for each cable testing.

TVA Response

TVA has projected that the VLF cable testing in the future will not be limiting. The 6-year and 18-year maintenance testing will remain the schedule driver.

RAI 12

Section 3.12 “Work Control and Scheduling” of Enclosure 1 of the LAR provides the TVA method of risk assessment and work control. TS Bases Table 3.8.1-2 in Attachment 2 and 4 the LAR provides additional precautions that will be taken during the proposed extended CT for DG maintenance.

Please provide a succinct summary or listing of all compensatory actions (such as protected train concept, allowable entry and maintenance of offsite power system switchyard, elective maintenance activities, etc.) that have been considered and incorporated into procedures for extended DG outages.

TVA Response

TVA will provide a succinct summary or listing of all compensatory actions that have been considered and incorporated into procedures for extended DG outages.

RAI 13

In general, the LAR refers to the 6.9 kV FLEX DGs as “3 MWe FLEX DG 6.9 kV FLEX Generators.” Section 3.8 of the LAR states “Each FLEX DG is a 6.9 kV, 3-phase, 60 Hz synchronous machine with a continuous rating of 4062.5 kilovolt-amp (kVA) at 0.8 power factor, from MTU Onsite Energy” indicating that each DG has a continuous rating of 3.250 MW at 0.8 power factor. Please clarify the rating of the FLEX DGs and output power available from each DG to support safe shutdown of the Unit(s).

TVA Response

TVA will clarify the rating (3.25 megawatt) of the FLEX DGs and the output power available from each DG to support safe shutdown of the Unit(s).

Closing Remarks


TVA