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**Sent:** Wednesday, November 12, 2014 2:45 PM  
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**Subject:** Watts Bar 2 - RAIs - Degraded Voltage Relay Issue  
**Attachments:** Watts Bar DVR RAIs Final 11-12-2014.docx

Attached please find final RAIs from the Electrical Engineering Branch regarding the Watts Bar 2 Degraded Voltage Relay issue as discussed on 11/5/14 during the audit, and clarified on the 11/12/14 telecon.. Please acknowledge receipt of these questions, and that they contain no proprietary information.

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WATTS BAR NUCLEAR PLANT UNIT 2 (WBN-2) REQUEST FOR ADDITIONAL  
INFORMATION REGARDING CHAPTER 8, "ELECTRICAL POWER" - SUPPLEMENTAL  
SAFETY EVALUATION REPORT (SSER 22, OPEN ITEM 30)  
(TAC NO. ME2731)

The staff of the Electrical Engineering Branch (EEEB) of the Division of Engineering is reviewing the Tennessee Valley Authority (TVA) response to the NRC staff's request for additional information regarding the Degraded Voltage Relay (DVR) Settings.

The requirements for degraded voltage protection originate from the requirements of 10 CFR 50, Appendix A, "General Design Criteria (GDC) 17." Following the July 1976, event at Millstone involving degraded voltage conditions in the plant auxiliary systems, the NRC required all licensees to install degraded voltage protection systems as described in NRC Letter dated June 2, 1977, "Statement of Staff Positions Relative to Emergency Power Systems for Operating Reactors." Further, in Generic Letter (GL) 79-36, "Adequacy of Station Electric Distribution Systems Voltages," the NRC required all licensees, including Watts Bar, to review the electric power systems to determine analytically if, assuming all onsite sources of AC power are not available, the offsite power system and the onsite distribution system is of sufficient capacity and capability to automatically start as well as operate all required safety loads. For plants under construction, the requirements of the June 2, 1977, letter and staff guidance described in GL 79-36 were incorporated in NUREG-0800, "Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants," Appendix 8-A, "Branch Technical Position (BTP) PSB-1: Adequacy of Station Electric Distribution System Voltages," Rev. 2 (07/1981) which is part of the licensing basis for the Watts Bar Nuclear Plant. SRP BTP PSB-1 Position 1.a states that the selection of undervoltage and time delay setpoints for the degraded voltage relays shall be determined from an analysis of the voltage requirements of the Class 1E loads.

In addition, in Generic letter (GL) 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," staff defines sufficient voltage from offsite power source as generally related to the degraded voltage relay setpoints. An 'operable' offsite power system indicates compliance with GDC 17 requirements.

Also, the NRC issued Regulatory Issue Summary (RIS) RIS 11-12, "Adequacy of Station Electric Distribution System Voltages," Revision 1, to clarify the NRC staff's technical position on existing regulatory requirements. Specifically, this RIS clarifies voltage studies necessary for Degraded Voltage Relay (second level undervoltage protection) setting bases and Transmission Network/Offsite/Station electric power system design bases for meeting the regulatory requirements specified in GDC 17 to 10 CFR Part 50, Appendix A.

Since voltage afforded by the degraded voltage relay setpoint was not shown to be adequate to satisfy the voltage requirements of Class 1E motors, the existing calculation did not satisfy its stated objective of demonstrating conformance to BTP PSB-1 and 1977 NRC letter staff position B.1.a. In order to complete this review and prepare the supplement safety evaluation input, the staff requests additional information from the licensee, as described below:

1. Describe the analysis that was performed and the methodology used to demonstrate that for the worst-case design basis operating configuration, the existing DVR analytical limit (drop-out) of 6555 volts is adequate to automatically start as well as operate all required safety-related loads thus meeting the NRC staff positions established in SRP

BTP PSB-1 and comply with the requirements of GDC 17 concerning offsite power source.

2. If the analysis concludes that all safety-related loads cannot perform their intended safety functions, while relying on offsite power, at the DVR analytical limit of 6555 volts for the worst-case design basis operating configuration, identify the loads that are affected, the required safety function and explain the consequences of their failure to perform the intended safety functions. . In addition, provide all design basis operating configurations that TVA can demonstrate that all safety-related loads can perform their intended safety functions at the DVR analytical limit of 6555 volts.
3. WBN design requires a minimum of 432V on the 480V busses to satisfactorily mitigate the consequences of a design basis event coupled with degraded voltage conditions. The analytical studies indicate that the 480V board voltage may result in a voltage lower than the required 432V during medium voltage motor starts. The analyses assumes that either :
  - a. The grid is sufficiently viable to allow recovery to the Degraded Voltage Drop out value (6555), within 5 seconds the 480V system voltage will recover to greater than 432 Volts, OR
  - b. If the voltage does not reach the DVR drop out, then the voltage is inconsequential since it will result in a transfer to the DGs.Given that the 5 second limitation is related to plant operation on offsite power, explain the rationale for statement (b) above, whereby the plant may be on a degraded offsite power source for more than 5 seconds until transfer to the onsite power system.
4. Please provide the minimum grid voltage range(s) for the offsite power source(s) to be considered available and operable in accordance with the Plant Technical Specifications requirements and GL 2006-002 guidance. Also, provide the corresponding required minimum offsite power source voltage at the 6.9 kV safety-related buses for it to be considered available and operable. If the DVR analytical voltage limit is not the basis for the operability, provide technical and regulatory basis for not changing the existing analytical limit specified for the DVR.
5. Confirm that Watts Bar Units 1 and 2 will maintain the compliance with guidance provided in GL 2006- 02 concerning the use of protocols between the nuclear power plant and the transmission system operator (TSO) to determine the operability of offsite power systems under plant technical specifications requirements. In addition, describe the design basis requirements that will be established for dual unit operation at Watts Bar and the agreement that will be established between the Watts Bar Units and the grid operator to ensure that offsite power system has adequate capacity and capability to meet the GDC 17 requirements.
6. TVA Nuclear (TVAN) provided additional information in letter dated January 31, 2007 (ADAMS ML070330051) to supplement the responses to questions 1 and 5 in in GL 2006-02. The response to question 1 states "The DVR dropout point is based on the minimum safety buss voltage that provides adequate voltage to required safety loads

during worst-case loading conditions." Please provide an explanation for this statement based on the definition for operability of offsite power sources provided in GL 2006-02.

7. Please describe the plant operating and alarm response procedures, control room alarms and indications available to the operator to monitor the offsite power system availability and operability and take the required actions in accordance with plant operating and alarm response procedures.