July 10, 2013

Mr. W. Anthony Nowinowski, Program Manager
PWR Owners Group, Program Management Office
Westinghouse Electric Company
1000 Westinghouse Drive, Suite 380
Cranberry Township, PA 16066

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: PRESSURIZED WATER REACTOR OWNERS GROUP TOPICAL REPORT WCAP-17308-NP, REVISION 0, "TREATMENT OF DIESEL GENERATOR (DG) TECHNICAL SPECIFICATION FREQUENCY AND VOLTAGE TOLERANCES" (TAC NO. ME8689)

Dear Mr. Nowinowski:

By letters dated May 1 and September 11, 2012 (Agencywide Documents Access and Management System Accession Nos. ML12234A250 and ML12261A364, respectively), the Pressurized Water Reactor Owners Group submitted a topical report, WCAP-17308-NP, Revision 0, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," for U.S. Nuclear Regulatory Commission (NRC) staff review. Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. Mr. Chad Holderbaum, of your staff, and I agreed that the NRC staff will receive your response to the enclosed Request for Additional Information (RAI) questions within 45 days of the date of this letter. If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-4053.

Sincerely,

/RA/

Jonathan G. Rowley, Project Manager
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 694

Enclosure:
RAI questions

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION (RAI) QUESTIONS

PRESSURIZED WATER REACTOR (PWR) OWNERS GROUP

WCAP-17308-NP, REVISION 0

"TREATMENT OF DIESEL GENERATOR (DG) TECHNICAL SPECIFICATION

FREQUENCY AND VOLTAGE TOLERANCES"

BACKGROUND DOCUMENTS

1) PWR Owners Group Topical Report WCAP-17308-NP, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances"

Section 1.1, "Background," has the following statements:

The minimum and maximum frequency values of 58.8 hertz (Hz) and 61.2 Hz and voltage values of 3740 volts (V) and 4580 V typically contained in plant-specific Technical Specification (TS) Surveillance Requirements (SR) are equal to plus or minus (±) 2 percent of the 60 Hz nominal frequency and ±10 percent of the 4160 V nominal voltage (i.e., the plant specific transient range specified in the Technical Specifications). However, the ±2 percent frequency tolerance and ±10 percent voltage tolerance is only applicable to DG starting and loading transients, and does not apply to steady-state operation as discussed in Regulatory Guide (RG) 1.9, Revision 3. The WCAP states further that the frequency and voltage criteria are specified in the context of the capability of the DG to recover from a transient such as DG load sequencing.

Section 1.2, "Issue," has the following statements:

To be consistent with the safety analyses and DG steady-state loading calculations, the ±2 percent criterion on frequency and the ±10 percent criterion on voltage should not have been incorporated into the TS as steady-state operating criteria. In these analyses and calculations, the motors were assumed to be operating at nominal frequency and voltage; therefore, operating the DG at the extremes of frequency and voltage could have a significant impact on the safety analyses.

Section 1.3, "Approach," has the following statements:

Some licensees have addressed the issue of DG frequency and voltage variation in their safety analyses by assuming that the motors are operating at the extremes of transient frequency and voltage limits, and calculating the impacts on pump flows, developed head, DG steady-state loading, and resulting core response.

The joint team decided that a project authorization should be developed that reflects the following items:

1. The TS and Bases need to be revised to clarify that the ±2 percent frequency and ±10 percent voltage tolerances are for DG loading transients, in accordance with RG 1.9 and not steady-state operation.

2. The development of a generic methodology that addresses DG frequency and voltage tolerances, as well as test measurement uncertainties, will be adopted in the pump inservice testing program, so that the emergency core cooling system flows and safety analyses will not be impacted. The DG frequency and voltage tolerances will be treated as uncertainties and statistically combined with the test measurement instrument uncertainties and setpoint tolerances.

2) NUREGs 1430, 1431 and1432, "Technical Specifications"

The NUREGs have the following SR in Section 3.8.1.2:

Verify each DG starts from standby conditions and achieves *steady state voltage* **>** [3740] V and < [4580] V, and frequency > [58.8] Hz and **<** [61.2] Hz.

(It should be noted that the NUREGs provide typical range of values for steady state voltage and frequency of the Diesel Generators. The licensees are expected to use plant specific steady state voltage and frequency values based on the capability of the onsite power systems.)

3) Regulatory Guide 1.9, Revision 3, "Selection, Design, Qualification And Testing of Emergency Diesel Generator Units Used As Class 1E Onsite Power Systems At Nuclear Power Plants"

Section C 1.4 has the following recommendation:

The DG should be designed such that the frequency will not decrease, at any time during the *loading sequence*, to less than 95 percent of nominal and the voltage will not decrease to less than 75 percent of nominal. (A larger decrease in voltage and frequency may be justified for a diesel generator that carries only one large connected load.) Frequency should be restored to within 2 percent of nominal in less than 60 percent of each load-sequence interval for a stepload increase, and less than 80 percent of each load-sequence interval for disconnection of the single largest load. Voltage should be restored to within 10 percent of nominal within 60 percent of each load-sequence interval. The acceptance value of the frequency and voltage should be based on plant-specific analysis (where conservative values of voltage and frequency are measured) to prevent load interruption.

ELECTRICAL ENGINEERING BRANCH (EEEB) RAIs

EEEB-RAI 1

The transient voltage and frequency drops delineated in RG 1.9 are significantly larger than the typical steady state tolerances referenced in NUREGs -1430, -1431 and -1432 and clearly identify the applicability during the loading sequence. Explain why the WCAP considers that the steady state ±2 percent frequency tolerance and ±10 percent voltage tolerance as only applicable to DG starting and loading transients, and does not apply to steady-state operation.

EEEB-RAI 2

Provide confirmation that majority of plants participating in the PWR Owners Group will be able to demonstrate the capability of the DGs to maintain voltage and frequency in compliance with the proposed TS change in the WCAP during DG load sequencing transients.

EEEB-RAI 3

The DGs are designed to provide sufficient power for the electrical loads required for a safe shutdown of the plant. This includes the loads required to mitigate the effects of a design basis LOCA with a complete loss of off-site power. To validate the capability of the DGs to perform this function, the TS require a monthly surveillance run. In order to be considered operable, structures, systems and components (SSC) must be capable of performing the safety functions specified by its design, within the required range of design physical conditions, initiation times, and mission times. The staff recognizes that equipment may not be able to function at an absolute value and therefore specifies an acceptable range of parameters to demonstrate capability and operability of the equipment. The staff considers specified voltage and frequency parameters as one of the indicators that a DG will perform its intended function. Provide details on what parameters could be used to verify operability of a DG and hence the capability of the safety related equipment powered by the DG, if voltage and frequency range, as specified in current TSs, should not be required to demonstrate steady state operating capability.

EEEB-RAI 4

The WCAP recognizes that a DG operating at the extremes of frequency and voltage could have a significant impact on the safety analyses and that the original plant design assumed DGs operating at nominal voltage and frequency. The WCAP also states that licensees who have evaluated the issue of voltage and frequency variation in their safety analysis have used up significant analytical margin. Voltage and frequency are independently controlled by the exciter and the governor. A diesel generator operating at the lower end of the allowable steady state voltage and frequency will have an additive effect on the torque produced by a motor as depicted in Figures 2.4 and 2.5 of the WCAP report. The analytical methods used to calculate the available motor torque and pump speed at the extremes of the allowable range therefore provide a realistic value for performance capabilities of the diesel generators and the operating equipment. Explain why the method proposed in the WCAP will be conservative and provide assurance that the performance capabilities of the pumps and valves which may have little or no margin when operating at nominal design value will not adversely impact the safe shutdown capability of the plant.

EEEB-RAI 5

Explain why the safety analyses and available margins impacted by the capability of the DG operating in an allowable band should not be updated in view of reduced margins due to plant modifications associated with load growth, power uprates and component replacement.

EEEB-RAI 6

The WCAP proposes that the DG frequency and voltage tolerances be treated as random uncertainties. Typically, the uncertainty analysis associated with setpoint methodology for safety related components verifies that:

a) The analysis parameters and assumptions are consistent with the safety analysis, system design basis, TSs, plant design, and expected maintenance practices.

b) The relationships between the safety limit, analytical limit, the allowable value, the setpoint, the as-found limit and the as-left limit are clearly defined and provide assurance that controls and system variables maintain safety related systems within prescribed operating ranges.

If the DG voltage and frequency are considered random uncertainties, then provide details on methodology that the licensees should use to establish *the analytical limits* which ensure that the DGs are not overloaded, the load testing and fuel oil requirements in the technical specifications are bounding, and the equipment powered by the DGs will function satisfactorily at the extremes of allowable operating range.