From: Wiebe, Joel
Sent: Friday, October 9, 2020 8:17 AM
To: Taken, Jason C.:(Exelon Nuclear)
Subject: Preliminary RAIs for LAR Regarding Non-conservative TS EDG Frequency Tolerance

Preliminary RAIs are provided to ensure they are clear and understood. Let me know if by October 16, 2020, if a clarification call is needed. A response is requested within 30 days of this e-mail or within 30 days of the clarification call, if needed.

Joel

General Design Criterion (GDC)-17, "Electric power systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, requires, in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components (SSCs) that are important to safety.

The following information is needed to determine if the affected SSCs will function in the specified frequency band:

RAI EPNB-1

For the emergency diesel generator (EDG) lube oil pump and jacket water pump on the EDG skid, provide the (1) flow rate at 59.5 Hertz (Hz), 60 Hz, and 60.5 Hz, (2) the discharge pressure at 59.5 Hz, 60 Hz, and 60.5 Hz, and (3) required net positive suction head and available net positive suction head at 59.5 Hz, 60 Hz, and 60.5 Hz. Also provide the minimum required flow rate, the minimum required discharge pressure, and any low-pressure alarm settings for each pump.

RAI EPNB-2

For the fuel oil transfer pump, provide the (1) flow rate at 59.5 Hz, 60 Hz, and 60.5 Hz, (2) the discharge pressure at 59.5 Hz, 60 Hz, and 60.5 Hz, and (3) required net positive suction head and available net positive suction head at 59.5 Hz, 60 Hz, and 60.5 Hz.

RAI EPNB-3

Discuss whether or not any relief valves on the fuel oil transfer pump, engine driven lube oil pump, and engine driven jacket water pump discharge piping will lift due to the higher discharge pressure when the EDG is operating at 60.5 Hz.

EEOB RAI - 1

The licensee states in its June 26, 2020 (Agencywide Document Access and Management System (ADAMS) Accession Number ML20178A467) letter that the methodology outlined in WCAP-17308-NP-A was used to evaluate the impact of the EDG frequency and voltage variation on the performance of the affected equipment and existing safety analyses. Sections 3.1.1 and 3.1.2 of WCAP-17308-NP A provide guidance for evaluating the impact of frequency and voltage variations, respectively, on the EDG loading, as summarized below:

Frequency: By applying the upper bound of frequency (> 60 Hz) allowed by the EDG governor to the maximum inductive loads calculated for the DG, an additional power load can be calculated for the potential variation in frequency allowed by the EDG governor operating range.

Voltage: The voltage variation of the EDG voltage regulator at steady-state operation should be confirmed to be within the allowable operating voltage range for the motors powered by the EDG. The effect of voltage variation from the nominal voltage rating of the EDG would cause the current of the motor load circuits to decrease or increase accordingly. The net change in power required by the loads on the EDG should be evaluated for lower than nominal voltage and frequency conditions, where there is a change in the power factor and real and reactive portions of the current. Since the real power is a function of the governor controls and reactive power is controlled by the EDG exciter and voltage regulator, the overall impact of EDG output voltage should be considered for real and reactive components of the EDG loading evaluation.

Regarding the evaluation of the frequency and voltage variations on the EDG, the June 26, 2020, letter states that the licensee evaluated, in detail, the following miscellaneous loads to ensure the EDG frequency and voltage variances are acceptable:

- 125 VDC Battery Chargers
- UPS Inverters
- Required Heaters (including pressurizer heaters)
- 120 VAC Loads
- Control Room Refrigeration Units and Main Control Room chilled water (WO) pumps
- Containment Hydrogen Monitoring System Sample pumps
- Lighting
- Main Steam and Feedwater Isolation Valves

Confirm that the evaluations for the equipment above explicitly follow the WCAP-17308-NP-A guidance. In particular, whether a) the upper bound of frequency was applied to the maximum inductive loads to calculate the frequency variation; and b) the miscellaneous loads listed above represent all applicable loads used to calculate the net change in power in evaluating the impact of frequency and voltage variations.

EEOB RAI-2

The licensee's June 26, 2020, letter does not contain information describing the methodology and how the proposed tolerances for the EDG frequency and voltage are established and why these proposed tolerances are acceptable. Provide a discussion of how the proposed tolerances for the EDG frequency and voltage are established and why these tolerances are acceptable. In the response, include a summary of the performed calculation/analysis that demonstrates the proposed tolerances for the DG frequency and voltage are conservative and adequate for the worst-case voltage and frequency variations.

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