QUESTIONS FOR DECEMBER 15, 2015, TELECONFERENCE

LICENSE AMENDMENT REQUEST TO REVISE

EMERGENCY DIESEL GENERATOR SURVEILLANCE REQUIREMENTS (TAC NO. MF6060)

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

DOCKET NO. 50-346

By application dated April 1, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15091A143), as supplemented by letter dated October 14, 2015 (ADAMS Accession No. ML15287A251), FirstEnergy Nuclear Operating Company (the licensee) submitted a license amendment request (LAR) for the Davis-Besse Nuclear Power Station (Davis-Besse), Unit 1. The proposed change would revise the minimum voltage and frequency requirements for emergency diesel generator (EDG) testing specified in surveillance requirements (SRs) associated with Technical Specification (TS) 3.8.1, “AC Sources – Operating.” The licensee’s October 14, 2015, supplement was in response to an NRC request for additional information (RAI) issued on September 21, 2015 (ADAMS Accession Number ML15222A179).

BACKGROUND

The LAR indicates that the proposed changes to the EDG SR voltage setpoints are being made to:

1. Raise the minimum EDG starting voltage setpoint (SRs 3.8.1.8.a and 3.8.1.14.a) to ensure that there is sufficient voltage for the EDG output breaker to close, and

Position C.4 of Safety Guide 9 states (emphasis added):

Each diesel generator set should be capable of starting and accelerating to rated speed, in the required sequence, all the needed engineered safety feature and emergency shutdown loads. At no time during the loading sequence should the frequency and voltage decrease to less than 95 percent of nominal and 75 percent of nominal, respectively. During recovery from transients caused by step load increases or resulting from the disconnection of the largest single load, the speed of the diesel generator set should not exceed 75 percent of the difference between nominal speed and the overspeed trip set point or 115 percent of nominal, whichever is lower. Voltage should be restored to within 10 percent of nominal and frequency should be restored to within 2 percent of nominal in less than 40 percent of each load sequence time interval.

The LAR states (emphasis added):

The existing EDG minimum steady state voltage acceptance criteria in surveillance requirements 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and
3.8.1.15.c.3 would be increased to a more restrictive minimum voltage of \( \geq 4088 \text{ V} \) [volts]. The more restrictive minimum steady state voltage provides assurance that during EDG loading, the voltage response recommendations of Safety Guide 9 can be satisfied.

The NRC staff notes that:
1. SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3 are related to verification of steady state EDG voltage and frequency.
2. SRs 3.8.1.8.a and 3.8.1.14.a are for EDG starts and not steady state requirements.
3. The transient voltage and frequency drop and recovery parameters delineated in SG 9 are applicable during the load sequencing process.

DISCUSSION

The NRC staff’s RAI 1 was related to EDG performance during the load sequencing process and Safety Guide 9 compliance. In response to RAI 1, the licensee stated:

... “Evaluation of Davis Besse EDG Transient Response During Design Basis LOOP/LOCA [loss of offsite power/loss-of-coolant accident], LOOP Only and Appendix R Loading,” (hereafter referred to as the EDG Transient Response Analysis) demonstrates that the Safety Guide 9 acceptance criterion is satisfied with the EDG breaker closing at its permissive setpoint of 3990 volts (V) with a voltage set point of 4088 V. The proposed allowable voltage of 4070 V considers a setpoint of 3990 V with a maximum relay setting tolerance of 2 percent.

In Appendix 1 to the October 14, 2015, letter, the licensee included excerpts from the EDG Transient Response Analysis applicable to the voltage setpoint. The NRC staff reviewed these excerpts and noticed that the analyses used setpoints of 4088 V and 59.5/60.5 Hertz (Hz). For the LOOP/LOCA case, Section 3.4 of the analysis stated:

The voltage and frequency responses of the Davis-Besse EDGs to design basis LOOP/LOCA load sequencing with 4088 V set point and 59.5/60.5 Hz set points were analyzed using a transient analysis computer model. . . .

The analysis shows that Davis-Besse EDGs are capable of starting their dedicated engineered safety features loads in the required sequence. Figure 3-7 shows the voltage and frequency response for the design basis LOOP/LOCA loading sequence with 4088 V set point and 59.5 Hz set point. Figure 3-8 shows the voltage and frequency response for the design basis LOOP/LOCA loading sequence with 4088 V set point and 60.5 Hz set point.

Tabulated parameters for other cases indicate an initial and final setpoint of 4088 V.

Section 7.4, “Design Basis LOOP/LOCA with 4088 V Set Point and Minimum/Maximum Frequency Set Point,” of the analysis states (emphasis added):

Condition report CR09-67370 (Reference 61) describes a potentially non-conservative technical specification value for minimum EDG voltage. The Davis-Besse Technical Specifications Surveillance Requirements stipulate that the EDG steady state voltage must be greater than or equal to 3744 V. A preliminary
evaluation discovered that a minimum voltage set point of 4088 V (Reference 61) would satisfy the acceptance criteria of Safety Guide 9, i.e. that voltage does not dip below 75% and that recovery to 90% is within 40% of the specified load time step.

Cases 7 and 8 were created to verify that a voltage set point of 4088 V would continue to satisfy the acceptance criteria.

QUESTIONS

Based on information provided in Appendix 1 to the September 21, 2015, letter, it appears that the computer modelling of the Davis-Besse EDG system and related safety loads assumed an analytical limit of 4088 V to demonstrate the acceptance criteria of Safety Guide 9 and successful sequencing of EDG loads. The LAR states the EDG output breaker will close at 4070 V. It appears that during an emergency start, the EDG output breaker closes (at 4070 V) and loads that were not disconnected are sequenced immediately followed by the other large loads according to plant design. Thus, the load sequencing and voltage/frequency oscillations start at 4070 V. The information provided in Appendix 1 does not appear to support an initial (analytical) voltage of 4070 V.

Considering the discussion above, provide the following information:

a) The minimum voltage (initial and recovery point) required to satisfy Safety Guide 9 criterion during load sequencing.

b) Describe the relationship between the output breaker permissive setpoint (3990 V) and the EDG minimum starting voltage of 4070 V, with the 2 percent relay tolerance.

c) Describe the relationship between the output breaker permissive setpoint (3990 V) and the EDG minimum steady state voltage (4088 V).