



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

March 8, 2017

Mr. Bryan C. Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer (CNO)  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 – REQUEST FOR ADDITIONAL INFORMATION CONCERNING PROPOSED CHANGES TO REVISE LOSS OF VOLTAGE RELAY SETTINGS (CAC NOS. MF8381 AND MF8382) (RS-16-162)

Dear Mr. Hanson:

By letter dated September 12, 2016 (Agencywide Document Access Management System (ADAMS) Accession No. ML16258A146), Exelon Generation Company, LLC (Exelon, or the licensee) submitted a license amendment request for Quad Cities Nuclear Power Station, Units 1 and 2. The proposed amendment would revise the setpoint for detecting a loss of voltage on the 4160 volt essential service system buses.

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing your submittal and has determined that additional information is required to complete the review. The specific information requested is addressed in the enclosure to this letter. A draft request for additional (RAI) was transmitted by email to Mr. Ken Nicely on February 9, 2017. A clarification call was held between members of your staff and NRC staff on February 22, 2017. During the call, it was determined that a second clarification call would be needed; however, after subsequent review, Exelon concluded that a second call was not needed. No changes were made to the RAI as a result of the clarification call. Based on a discussion with Mr. Nicely on March 6, 2017, Exelon agreed to provide a response to the RAI within 45 days from the date of this letter.

The NRC staff considers that timely responses to requests for additional information help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources.

B. Hanson

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If circumstances result in the need to revise the requested response date, please contact me at (301) 415-1627.

Sincerely,

A handwritten signature in black ink that reads "Kimberly J. Green". The signature is written in a cursive style with a large, looped initial "K".

Kimberly J. Green, Senior Project Manager  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and  
50-265

Enclosure:  
Request for Additional Information

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

EXELON GENERATION COMPANY, LLC

QUAD CITIES NUCLEAR POWER STATION (QCNPS), UNITS 1 AND 2

DOCKET NOS. 50-254 and 50-265

By letter dated September 12, 2016, Exelon Generation Company, LLC (Exelon, EGC, or licensee), submitted a license amendment request (LAR) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16258A149). The proposed amendment would revise the loss of voltage (LOV) relay settings in technical specification (TS) Table 3.3.8.1-1, "Loss of Power Instrumentation." The additional information below is needed to support the NRC staff's continued technical review of the LAR.

1. On page 2 of Attachment 1 of the LAR, EGC has provided a summary of the problem statement and states, "[t]he concern was that, if the voltage at the 4.16 kV [kilovolt] safety related buses dropped to slightly above 75 percent of the nominal voltage, the operating motors would experience approximately a 28 percent increase in current." Exelon has further stated that, "[t]his voltage drop, complicated by potential motor starts, including the potential start of the motor-driven auxiliary feedwater pump if a plant trip occurred, could result in adverse consequences that had not been evaluated." The LAR does not discuss the impact of large motor starting during degraded voltage conditions and how the proposed setpoint of the LOV relays will preclude complications during plant shutdown.
  - a. Please provide details, including assumptions used, on the Quad Cities voltage drop evaluation that was performed to demonstrate the adequacy of the proposed LOV setpoint in combination with the existing setpoints (voltage and time) of the degraded voltage relay (DVR) for protecting safety related equipment following a plant trip and large motor (e.g., feedwater pump, drywell coolers, service water pumps) starts.
  - b. Please confirm if this voltage drop evaluation enveloped any process-related demand for a large motor start that can occur during the required design basis operational modes such as normal plant operation, controlled shutdown, anticipated operational occurrences or post-accident conditions with a unit trip and a fast bus transfer to the reserve auxiliary transformer. If the evaluation did not consider these, please explain why the proposed LOV relay settings are adequate. The staff notes that UFSAR Table 8.3-2 identifies that the CRD pump and service water pump are manually started after 10 minutes.
2. The NRC staff reviewed LAR Attachment 3, "Design Analysis QDC-6700-E-2173, 'Evaluation of Degraded Voltage 5 Minute Timer on Normally Running Safety-Related Loads,'" Revision 000, and made the following observations:

- Page 3 of 18 provides a listing of emergency core cooling system (ECCS) room coolers which are considered as “the only directly connected safety-related motors that may be running during normal operation.” The staff notes that loads such as drywell coolers, service water pump, and control room air handling units (AHU) or heating, ventilation and air conditioning (HVAC) systems are not included in the list.
- Page 8 of 18 states that the analysis will evaluate the safety-related motors that may be running during normal conditions during a severely degraded voltage condition that lasts for an extended period of time.
- Page 9 of 18 states that there are no normally running, safety-related 480 V switchgear motors or 4.16 kV switchgear motors.
- The Updated Final Safety Analysis Report, Chapters 6 and 9, provide details on equipment that may be operational during normal plant operation and/or shutdown.

The NRC staff notes that grid-related degraded voltage conditions can occur at any time during normal plant operation, controlled shutdown, anticipated operational occurrences or post-accident conditions and impact redundant trains of equipment. The evaluation included in the LAR considered only the ECCS-related AHU loads. The staff notes that there are other motors that are connected to switchgear buses and may be running during normal plant operation but were not evaluated for degraded voltage conditions in the analyses provided. Please confirm the following:

- a. The ECCS room coolers are single packaged units containing fans, coils, filters, dampers air conditioning compressors, etc., and external chillers or compressors are not required for room cooling and are therefore not considered in the DVR and LOV relay setpoint analyses.
  - b. If any control room related HVAC systems are normally operating and any compressors or chillers are required during normal operation and plant shutdown for postulated events.
  - c. Degraded voltage conditions resulting from grid-related events can occur on redundant safety buses and can adversely impact redundant equipment. Please explain if pumps and motors associated with cooling water systems such as station service water, reactor building closed cooling water, drywell coolers, etc., have been evaluated for low voltage conditions similar to the AHUs discussed in the LAR. If the loss of motors associated with cooling water systems have not been evaluated, then please confirm if loss of redundant trains of cooling water systems for an extended duration can adversely impact the plant systems during normal operation or during controlled shutdown with no accident signal postulated and station buses connected to offsite power.
3. Section 3.3.1 of Attachment 3 to the LAR states, “The results of the transient EDG [emergency diesel generators] voltage dip analyses from diesel loading calculations 9390-02-19-1, 9390-02-19-2, and 9390-02-19-3 are used in this calculation. The QCNPS Unit 1, Unit 2, and 1/2 diesel loading calculations are *not maintained* (emphasis

added) and have been superseded by ETAP calculation QOC-6700-E-1503 ... Furthermore, an exact value for the transient voltage dip is not needed as the results are used to show that margin exists between LOV relay setpoint and the transient voltage dips.” The NRC staff understands that raising the LOV relay setpoint can potentially impact EDG operation.

- a. Please explain the use of unmaintained diesel loading calculations for input into calculations maintained by a 10 CFR Appendix B “Design Control” program.
  - b. Please provide details on the margin between LOV relay setpoint and the largest voltage transient observed during motor starting.
  - c. QCNPS TS surveillance requirements such as 3.8.1.2 and 3.8.1.8 require that a minimum EDG steady state voltage of 3952 V be verified. Please confirm that the EDG voltage transient dips were evaluated based on a starting voltage of 3952 V and unlike the DVR setpoint analyses, an infinite bus is not connected to each of 4.16 kV essential service system buses in order to model a specific operating voltage.
4. In response to the request for supplemental information, EGC sent a letter dated November 21, 2016 (ADAMS Accession No. ML16326A200). Exelon’s response addressed clarifications regarding assumptions and provided a drift analysis. The NRC staff observed that the drift analysis did not identify how as-found values which are outside the allowed tolerances are addressed. Provide additional information to clarify how out of tolerance values are addressed. This information is requested to confirm compliance with 10 CFR 50.36(c)(ii)(A) and the guidance of Regulatory Guide 1.105, Revision 3.

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**NRR-106**

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