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

May 22, 2018

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

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 – REQUEST FOR ADDITIONAL INFORMATION REGARDING RISK-INFORMED TECHNICAL SPECIFICATION COMPLETION TIMES (CAC NOS. MF7415 AND MF7416; EPID L-2016-LLA-0001)

Dear Mr. Hanson:

By letter dated February 25, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16060A223), as supplemented by letters dated April 3, 2017 (ADAMS Accession No. ML17094A591), January 11, 2018 (ADAMS Accession No. ML18011A665), and January 18, 2018 (ADAMS Accession No. ML18018B340), Exelon Generation Company, LLC submitted a license amendment request proposing to modify the Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Technical Specification requirements to permit the use of risk-informed completion times.

The U.S. Nuclear Regulatory Commission staff is reviewing the submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information. The request for additional information was discussed with your staff on May 16, 2018, and it was agreed that your response would be provided within 30 days from the date of this letter.

If you have any questions regarding this matter, please contact me at (301) 415-2871 or Michael.Marshall@nrc.gov.

Sincerely,

Michael L. Marshall

Michael L. Marshall, Jr., Senior Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:
Request for Additional Information

cc: Listserv

REQUEST FOR ADDITIONAL INFORMATION

REGARDING RISK-INFORMED TECHNICAL SPECIFICATION COMPLETION TIMES

EXELON GENERATION COMPANY, LLC

CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-317 AND 50-318

By letter dated February 25, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16060A223), as supplemented by letters dated April 3, 2017 (ADAMS Accession No. ML17094A591), January 11, 2018 (ADAMS Accession No. ML18011A665), and January 18, 2018 (ADAMS Accession No. ML18018B340), Exelon Generation Company, LLC (the licensee) submitted a license amendment request (LAR) proposing to modify the Calvert Cliffs Nuclear Power Plant (Calvert Cliffs), Units 1 and 2, Technical Specification (TS) requirements to permit the use of risk-informed completion times.

The U.S. Nuclear Regulatory Commission (NRC) staff has determined that additional information is needed to complete its review of the LAR. The request for additional information (RAI) listed below is not a complete listing of the additional information needed to complete the NRC staff's review. Additional RAIs (i.e., numbers 1 through 19) were provided by separate correspondences dated November 13, 2017 (ADAMS Accession No. ML17304A941) and December 21, 2017 (ADAMS Accession No. ML17346A909).

RAI

Section 36(c)(2) of Title 10 of *Code of Federal Regulation* requires in part that limiting conditions of operations be included in TSs and that licensees shall follow any remedial action permitted by the TS until the condition can be met. The TSs for Calvert Cliffs, Units 1 and 2, contain limiting conditions of operations that prescribe completion times for remedial actions. The licensee has proposed using its probabilistic risk assessment (PRA) to determine risk-informed completion times that may be used in lieu of the prescribed completion times. Regulatory Guide (RG) 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed 51 Decisions on Plant-Specific Changes to the Licensing Basis," May 2011 (ADAMS Accession No. ML100910006) describes an acceptable risk-informed approach for assessing the nature and impact of proposed permanent licensing basis changes by considering engineering issues and applying risk insights. This RG also provides risk acceptance guidelines for evaluating the results of such evaluations. Revision 1 of RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications," May 2011 (ADAMS Accession No. ML100910008) describes an acceptable risk-informed approach specifically for assessing proposed TS changes. To ensure that any remedial actions are completed in a timely manner, consistent with RG 1.174 and RG 1.177, the PRA models used in the calculation of the risk-informed completion times need to be based on the as-built, as-operated and maintained plant, and reflect operating experience at the plant.

20. Enclosure 4 of the letter dated February 25, 2016, states that a total seismic core damage frequency (CDF) contribution of 1.1E-6/year and a seismic large early release frequency (LERF) contribution of 1.1E-7/year will be added to the configuration specific delta CDF and

delta LERF from the internal events and fire initiating event contributions to estimate the risk-informed completion time. The LAR states that these seismic estimates are based on the re-evaluated seismic hazard for Calvert Cliffs performed in response to the Near-Term Task Force 2.1 (ADAMS Accession No. ML14099A196) and an estimated plant level high confidence of low probability of failure (HCLPF) of 0.27 the acceleration due to Earth's gravity (g) peak ground acceleration (PGA) as used in the 2003 LAR entitled "Extension of Diesel Generator Required Action Completion Time" (ADAMS Accession No. ML031360410).

a. The staff notes that the Calvert Cliffs Expedited Seismic Evaluation Process Report (ESEP), submitted to the NRC on December 17, 2014 (ADAMS Accession No. ML14365A138), indicates that certain components, such as safety injection tanks, motor control centers, electrical buses, and main control room panels, would fail in a seismic event through interaction with nearby block walls, and those components were assigned a lower HCLPF of 0.175 g due to the block wall lower capacity. This lower HCLPF could increase the seismic CDF and LERF estimates provided in the LAR.

   Justify the plant level HCLPF of 0.27 g PGA, given the noted block walls failures at 0.175 g indicated in the ESEP, or provide, with justification, updated seismic CDF and LERF estimates.

b. The 2003 LAR for extension of emergency diesel generator (EDG) completion times shows differences in estimated seismic CDF and LERF between Unit 1 and Unit 2. According to the NRC Technical Evaluation Report for the Individual Plant Examination for External Events, because the EDGs dedicated to Unit 2 are more dependent on service water cooling, which has a low fragility, the CDF value is higher for Unit 2 than for Unit 1.

   Explain and justify how the seismic CDF and LERF estimates apply to both units.

To estimate the seismic LERF, the LAR assumes a 0.1 conditional large early release probability (CLERP) for seismic events, based on the internal events LERF to CDF ratio. The staff notes that a seismic event could lead to seismic-specific failures of structures, systems, and components, resulting in additional LERF sequences that are not in the internal events probabilistic risk assessment (PRA) model or potentially converting non-LERF sequences in the internal events PRA model to seismic LERF sequences. The LAR does not provide sufficient justification for the selected CLERP being able to capture or bound such considerations.

c. Justify the assumed value of 0.1 for CLERP. In the justification, explain why the containment is not expected to fail and other containment failure or bypass scenarios are not expected to be impacted by seismic events and therefore, would not noticeably affect the assumed 0.1 CLERP.

21. In RAI 10 (see letter dated November 13, 2017), the staff asked the licensee to explain how common cause failures (CCFs) are included in the PRA model and how the treatment of CCF either meets the guidance in RG 1.177 or meets the intent of this guidance when

quantifying a risk-informed completion time (RICT) for preventative maintenance for components from a CCF group of three or more components. The response to the RAI states "common cause failures are modeled as separate basic events, with common cause combinations in the fault tree as different basic events." The licensee further stated that the "common cause grouping is not dynamically changed when a component is removed from service for preventative maintenance" and that this is appropriate because "the component, though not out of service for a reason subject to common cause failure, remains a participant in the common cause events for the remainder of the component operation." It is unclear how the out of service component "remains a participant in the common cause events for the remainder of the component operation" and; therefore, it is unclear how the intent of RG 1.177 is met.

Explain clearly how CCFs are modeled in the Calvert Cliffs PRA and justify why adjusting the common cause grouping is not necessary for preventative maintenance. In the explanation, include examples of fault trees for a CCF group of three components and the associated numerical results.

22. In RAI 11.a (see letter dated November 13, 2017), the staff requested the licensee to confirm and describe how the treatment of CCF in the case of emergent failures either meets the guidance in RG 1.177 or meets the intent of this guidance when quantifying a RICT. In response to RAI 11.a the licensee stated that risk management actions will be implemented. However in the response to RAI 11.b the licensee added the option to "numerically account for the increased possibility of CCF in the RICT calculation" to the text for the Calvert Cliffs, Units 1 and 2, TS Administrative Section 5.5.18, without further justification on how it meets the intent of the guidance in RG 1.177 requested in RAI 11.a.

    a. Explain how the task to "numerically account for the increased possibility of CCF in the RICT calculation" will be performed for emergent failures.

    b. Justify how the treatment of CCF meets the intent of the guidance in RG 1.177.

23. In RAI 14 (see letter dated November 13, 2017), the staff requested explanation on how the containment spray and the containment cooling systems are modeled, and how a RICT based on CDF and LERF can be quantitatively determined for these systems. In response to RAI 14 the licensee stated that both systems are explicitly modeled in the PRA and that the PRA modeling "includes system components, such as pumps, valves and heat exchangers, and system dependencies, such as electrical and cooling water systems." The licensee further explained that the PRA success criteria is one of the two headers for the containment spray system, and two out of four air coolers for the containment air recirculation and cooling system. The licensee stated that these systems "can be numerally quantified for impact on CDF and LERF," however the licensee did not explain how these systems impact core damage or large early release. Since the containment spray and containment cooling systems are generally related to the long-term release sequences (not large early release), it is not immediately clear to the NRC staff the impact that these systems have on the core damage and large early release in the licensee's PRA model. Further, the iodine removal function of the containment spray system is not usually captured in the PRA.

    Explain and justify how these systems impact CDF and LERF.

24. Section 36(c)(5) of 10 CFR Part 50 requires, in part, that TSs contain administrative controls related to procedures and reporting necessary to assure operation of the facility in a safe manner. The licensee is proposing that a new program called Risk-Informed Completion Time Program be added to TS Section 5, "Administrative Controls" that describes the controls on the calculated risk-informed completion time that may be used in lieu of the prescribed completion time. Appropriate controls are needed to ensure that any changes to the PRA models used in the calculation of the risk-informed completion time be based on methods approved by the NRC, and be based on the as-built, as-operated and maintained plant, and reflect the operating experience at the plant, consistent with the guidance in RG 1.174, Revision 2.

    In RAI 15 (see letter dated November 13, 2017), the staff provided wording for a proposed license condition, consistent with the license condition included in NRC-approved Amendment Nos. 188 and 171 for the pilot risk-informed completion time LAR (ADAMS Accession No. ML15127A669). In response, the licensee proposed the following text to be added to the Calvert Cliffs, Units 1 and 2, TS Administrative Section 5.5.18:

    a. *A RICT must be calculated using the PRA and non-PRA methods approved by the NRC, including internal events, internal floods, and fire PRA. Changes to these PRA and non-PRA methods require prior NRC approval. The PRA maintenance and upgrade process will validate that changes to the PRA models used in the RICT program follow the guidance in Appendix 1-A of ASME/ANS RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications."*

    b. *A report shall be submitted following each PRA upgrade and associated peer review, and prior to using the upgraded PRA to calculate a RICT. The report shall describe the scope of the upgrade.*

    The license condition approved for the pilot contains both "methods" and "approaches." The proposed TS 5.5.18 text does not appear to be consistent with the approved precedent. Propose TS 5.5.18 text consistent with the approved precedent or the draft TSTF-505, Revision 2 (ADAMS Accession No. ML17290A003), or provide detailed technical justification for your proposal. This justification should describe, with examples, what constitutes a PRA and non-PRA methods and approaches that if changed, would require prior NRC approval.

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