From:	Marshall, Michael
To:	[Licensee] Ron Reynolds (Exelon)
Cc:	James Danna (James.Danna@nrc.gov); Kristensen, Kenneth J:(GenCo-Nuc)
Subject:	NINE MILE POINT, Unit 1 - REQUEST FOR ADDITIONAL INFORMATIO REGARDING REMOVAL OF BORAFLEX CREDIT FROM SPENT FUEL POOL LICENSE AMENDMENT REQUEST (L-2018-LLA-0039)
Date:	Tuesday, July 03, 2018 10:41:00 AM

Hello Ron,

By letter dated February 9, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18040A636), Exelon Generation Company, LLC (Exelon) submitted a license amendment request (LAR) for the Nine Mile Point Nuclear Station, Unit 1 (Nine Mile Point 1). The license plans to install permanent cell blockers in pre-determined spent fuel pool rack cells thus eliminating reliance on Boraflex for spent fuel pool reactivity control. The amendment would remove the Boraflex credit from the two remaining Boraflex storage racks located in the spent fuel pool.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the information provided in the LAR and has determined that additional information is needed to complete its review. Below is the NRC staff's request for additional information. The request for additional information was discussed with you and other representatives of Exelon on June 27, 2018, and it was agreed that your response would be provided within 45 days from the date of this email.

REQUEST FOR ADDITIONAL INFORMATION

1. In Section 2.2.3 of Attachment 3 of the licensee's submittal, the licensee indicates that CASMO-5 version 2.08.00 is being used to perform depletion calculations for the determination of isotopic compositions. However, Nine Mile Point 1 is a boiling water reactor (BWR), and CASMO-5 has only been reviewed and approval by the NRC for application to pressurized water reactors (PWRs). The NRC has not examined BWR fuel assembly validation data for CASMO-5 to assess the code's adequacy for performing depletion calculations. Accurate determination of isotopic compositions for spent fuel is necessary for the accurate prediction of assembly reactivity and assurance that the k_{eff} of the spent fuel storage racks does not exceed 0.95 as per the regulatory requirement in 10 CFR 50.68(b)(4).

   The limiting depletion conditions for the nuclear criticality safety (NCS) analysis presented in the licensee's submittal occur at conditions of relatively low burnup at 0 percent void in the presence of gadolinia, which is characteristic of PWR conditions. Given this, the NRC approval of CASMO-5 for PWRs may be applicable to Nine Mile Point Unit 1 for the narrow set of limiting depletion conditions, provided there is reasonable assurance the code will predict acceptable isotopic compositions for BWR fuel.

   Provide information justifying that the CASMO-5 predictions of isotopic compositions for BWR fuel are consistent with NRC-approved applications of depletion codes for the narrow set of depletion conditions used in the present NCS analysis.

2. In Section 2.2.2 of Attachment 3 of the licensee's submittal, the licensee indicates trend analyses of the MCNP5-1.51 validation benchmarks were performed in order to

determine the maximum bias and bias uncertainty associated with determining k_{eff}. Based on similar NCS analyses reviewed by the NRC (ADAMS Accession No. ML15343A126), an additional uncertainty may be necessary to account for the lack of validation for k_{eff} calculations of burned fuel systems containing minor actinides and fission products.

While the licensee indicates in the Criticality Analysis Checklist table of Appendix C of Attachment 3 that a bias in fission product and minor actinide reactivity worth is considered, the magnitude of the bias and how it was determined does not appear to be discussed in the LAR or listed in Table 7.1. The uncertainty/bias associated with predicting the reactivity worth of fission products and minor actinides in spent fuel has a direct impact on the determination of assembly reactivity and on the assurance that the k_{eff} of the spent fuel storage racks does not exceed 0.95 as per the regulatory requirement in 10 CFR 50.68(b)(4).

Provide a discussion on the uncertainty and bias in reactivity worth of fission products and minor actinides associated with MCNP5-1.51 k_{eff} calculations. Specifically, address the magnitude of the uncertainty and bias (incl., how it was determined and how it is incorporated into the uncertainties and biases of the NCS analyses).

3. In Section 7.1 of Attachment 3 of the licensee's submittal, the licensee indicates that screening calculations were performed using CASMO-5 for all legacy and current fuel designs to determine the most reactive lattices. According to the discussion in Section 7.1, seven lattices were selected as having "reactivity higher than other lattices." However, the licensee does not indicate within the LAR what screening criterion was used to set these seven lattices apart. The NRC staff notes that several of the lattices screened out possess in-rack k_{-inf} reactivity predictions greater than two of the seven selected lattices. Even though conservatively biased super lattices are developed as part of the NCS methodology, screening in lattices that do not have the highest in-rack k_{inf} reactivities for the design basis calculations may result in an under-estimation of the in-rack k_{eff} and the amount of margin that may be available to the regulatory requirements. This would result in decreased assurance that the actual k_{eff} of the spent fuel storage racks does not exceed 0.95 as per the regulatory requirement in 10 CFR 50.68(b)(4).

   Provide a discussion on the screening criterion used to determine the most reactive lattices and its threshold. Within the discussion: a) justify that the screening criterion threshold used is sufficient to ensure the most reactive design basis lattice is included, and b) justify why several lattices with in-rack k_{inf} reactivity predictions greater than two of the selected lattices were screened out.

4. In Section 2.3.2 of Attachment 3 of the licensee's submittal, the licensee considered the impact of core operating parameters on the design basis lattice selection by using four different sets of core operating parameters in the screening calculations. These sets of core operating parameters were selected because they are considered the most likely candidates for limiting conditions. However, once the bounding set of core operating parameters was selected, the licensee did not do specific sensitivity studies that vary the individual parameters to verify that the selected value for each would result in the

most positive lattice reactivity. The reactivity impact of specific core operating parameters may vary for different fuel lattice designs, impacting the selection of the design basis lattice. Although conservatively biased super lattices are developed, selecting a design basis lattice that is not the most reactive may result in an under-estimation of the in-rack k_{eff} and the amount of margin that may be available to the regulatory requirements. This would result in decreased assurance that the actual k_{eff} of the spent fuel storage racks does not exceed 0.95 as per the regulatory requirement in 10 CFR 50.68(b)(4).

Provide a discussion explaining why parameter-specific sensitivity studies are not needed to provide assurance that the in-rack k_{eff} and the amount of margin available to the regulatory requirements have not been under-estimated. If parameter-specific sensitivity studies were conducted, provide a summary description of the studies.

5. Section 2.3 of Attachment 3 of the licensee's submittal Indicates that the standard cold core geometry (SCCG) methodology shows that future lattices are bounded by lattices used in the peak reactivity methodology and therefore all future lattices "within the current fuel design" are qualified for storage in the Nine Mile Point Unit 1 spent fuel pool (SFP). However, Section 7.1 of Attachment 3 of the licensee's submittal states that "the SCCG methodology is not an exact methodology since it cannot be concluded that all lattices with a SCCG k_{inf} reactivity of 1.31 correspondingly have the same reactivity in the SFP. NRC staff examination of Figure B.1 and Figure B.2, which show MCNP5-1.51 design-basis reactivity predictions for lattices in both the SCCG and in-rack geometry, confirms this statement; relative to each other, some lattices are less reactive in the in-rack geometry than the SCCG while others are more reactive. In light of this, it may be possible that future lattices for which NCS analyses have not been performed (e.g, as a result of a new number of Gd rods or new Gd rod locations) may not be bounded by the lattices developed in the peak reactivity method, even if the future lattices are within the current fuel design. This would result in decreased assurance that, with these future lattices in-place, the actual k_{eff} of the spent fuel storage racks does not exceed 0.95 as per the regulatory requirement in 10 CFR 50.68(b)(4).

   Provide a discussion of the various aspects of the design basis lattice developed in the peak reactivity methodology that provide assurance it represents the highest reactivity lattice in the in-rack configuration for lattices with a SCCG k_{inf} of 1.31.

Best Regards,

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Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

301-415-2871

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