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

May 12, 2016

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 RELATED TO LICENSE AMENDMENT FOR
SPENT FUEL POOL CRITICALITY METHODOLOGY FOR FUEL CHANNEL
BOW/BULGE (CAC NOS. MF7160 AND MF7161)

Dear Mr. Hanson:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated December 14, 2015, Exelon Generation Company, LLC submitted a request to amend the Renewed Facility Operating Licenses for for the Quad Cities Nuclear Power Station, Units 1 and 2.

The 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. As discussed with Mr. Ken Nicely of your staff, a response is expected within 30 days from the date of this letter.

Enclosure 1 is a non-proprietary version of the request for additional information (RAI). The RAI transmitted as Enclosure 2 contains proprietary information in accordance with Section 2.390 of Title 10 of the *Code of Federal Regulations*. When separated from Enclosure 2 this document is decontrolled.

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

Enclosure 2 to this letter contains Proprietary Information. Upon separation from
Enclosure 2, this letter is DECONTROLLED.

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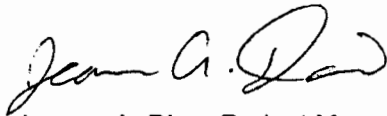
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B. Hanson

- 2 -

If circumstances result in the need to revise the requested response date, please contact me at (301) 415-1349.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeanne A. Dion". The signature is fluid and cursive, with the first name "Jeanne" being more prominent.

Jeanne A. Dion, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosures:

1. Request for Additional Information, non proprietary
2. Request for Additional Information, proprietary

cc w/o Enclosure 2:

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING PROPOSED LICENSE AMENDMENT REQUEST

SPENT FUEL STORAGE POOL CRITICALITY METHODOLOGY

FOR FUEL CHANNEL BOW/BULGE

EXELON GENERATION COMPANY, LLC

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-254 AND 50-265

By application dated December 14, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15348A396), Exelon Generation Company, LLC (the licensee) submitted a license amendment request (LAR) for Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2 (Reference 1). The proposed amendment revises the design bases in the updated final safety analysis report to reflect the use of a new criticality safety assessment (CSA) fuel channel bow/bulge methodology to support the performance of criticality safety evaluation for ATRIUM-10XM fuel design in the spent fuel pool.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the information the licensee provided that supports the proposed amendment and would like to discuss the following issues to clarify the submittal.

Nuclear Performance and Code Review, Division of Safety Systems (SNPB)

Background

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.68, states, in part, that the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. In your LAR (Reference 1), you have provided information from a nuclear criticality safety (NCS) analysis performed for the ATRIUM 10XM fuel design, using a methodology that the NRC has previously approved for QCNPS, Units 1 and 2 (Reference 2), in license amendments Nos. 253 and 248 (respectively). It appears that this information is intended to show that the approved methodology, with necessary modifications to account for the differences between the previously used SVEA-96 Optima2 fuel design and the ATRIUM 10XM fuel design, demonstrates that the Technical Specification 4.3.1.1.c limit is sufficient to ensure compliance with 10 CFR 50.68. The NRC staff has identified some instances where it is not clear if the reactivity impact due to specific conditions was adequately addressed in the NCS analysis. Because the potential reactivity impacts may be positive, the staff requests additional information to verify that the regulatory limit will not be challenged by these potential impacts.

Enclosure 1

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RAI-1:

In the LAR (Reference 1), the licensee states that no bias or uncertainty needs to be calculated because information from AREVA report FS1-0024092 indicates that fuel geometry changes are not expected to occur for the ATRIUM 10XM fuel design at the relatively low burnups being considered. The NRC staff notes that section 4.4 of the AREVA report states that the data presented is intended to provide statistics that will reasonably bound the observed population of channels for each exposure range. The statistics provided for the exposure range of interest does not indicate a non-zero channel bulge/bow. Provide additional detail supporting the statement that fuel geometry changes are not expected to occur.

RAI-2:

In the LAR (Reference 1), Attachment 3, Table 2, lists the uncertainties and biases calculated for the ATRIUM 10XM, with the intent of demonstrating that the total reactivity effect from all biases and uncertainties for the ATRIUM 10XM fuel are bounded by the SVEA-96 Optima2 fuel from the previously approved NCS analysis. A review of the NCS analysis report associated with license amendments Nos. 253 and 248 for QCNPS, Units 1 and 2 (Reference 2), shows a comparable list of uncertainties and biases that were totaled to obtain the total reactivity effect for the SVEA-96 Optima2 fuel. The ATRIUM 10XM data appears to be missing the bias and uncertainty associated with []. Describe whether the value designated as "ATRIUM 10XM Total Uncertainties and Biases" in this table includes the bias and uncertainty associated with [], and if not, provide a justification for not including this reactivity effect in Table 2.

RAI-3

In the LAR (Reference 1), Attachment 3, Table 2, lists the uncertainties and biases calculated for the ATRIUM 10XM, with the intent of demonstrating that the total reactivity effect from all biases and uncertainties for the ATRIUM 10XM fuel are bounded by the SVEA-96 Optima2 fuel from the previously approved NCS analysis. One of the listed biases is for the "eccentric positioning and fuel assembly channel reactivity effect bias." The NRC staff understands this bias to cover the maximum reactivity increase due to a combination of: (1) eccentric positioning and (2) whether the fuel assembly is channeled or not. Confirm the staff's understanding, or provide clarification as to the intent of this bias.

References:

1. "Quad Cities, Units 1 and 2 – Request for License Amendment Regarding Spent Fuel Storage Pool Criticality Methodology for Fuel Channel Bow/Bulge." Dated December 14, 2015, ADAMS Accession No. ML15348A396.
2. NRC Letter to TVA, Dated December 31, 2014 "Quad Cities Nuclear Power Station, Units 1 and 2- Issuance of Amendments Regarding NETCO Inserts (TAC. NOS. MF2489 AND MF2490)(RS-13-148), ADAMS Accession No. ML14346A306.

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B. Hanson

- 2 -

If circumstances result in the need to revise the requested response date, please contact me at (301) 415-1349.

Sincerely,

/RA/

Jeanne A. Dion, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosures:

1. Request for Additional Information, non proprietary
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ADAMS Accession Nos. Proprietary ML16130A572

Non-Proprietary ML16130A570
*via E-mail

OFFICE	DORL/LPL3-2/PM	DORL/LPL3-2/LA	DORL/LPL3-2/B (A)*	DORL/LPL3-2/PM
NAME	JDion	SRohrer	EMiller	JDion
DATE	5/11/16	5/9/16	5/12/16	5/12/16

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