

10 CFR 50.90

RS-21-113

November 3, 2021

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Response to Supplemental Request for Information Related to Request for Licensing Amendment Regarding Transition to GNF3 Fuel

- References:
1. Letter from P.R. Simpson (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Request for Licensing Amendment Regarding Transition to GNF3 Fuel," dated September 14, 2021 (ML21257A420)
 2. Letter from B. Venkataraman (U.S. Nuclear Regulatory Commission) to D. P. Rhoades (Exelon Generation Company, LLC), "Quad Cities Nuclear Power Station, Units 1 and 2 - Supplemental Information Needed for Acceptance of Requested Licensing Action Re: License Amendment Request Regarding Transition to GNF3 Fuel (EPID L-2021-LLA-0159)," dated October 26, 2021 (ML21294A003)

In the Reference 1 letter, Exelon Generation Company, LLC, (EGC) requested an amendment to Renewed Facility Operating License Nos. DPR-29 for Quad Cities Nuclear Power Station (QCNPS), Unit 1 and DPR-30 for QCNPS, Unit 2. The proposed change supports the transition from Framatome (formerly AREVA) ATRIUM 10XM fuel to Global Nuclear Fuel – Americas, LLC (GNF) GNF3 fuel at QCNPS.

Attachment 1 contains the response to the Reference 2 request for supplemental information. Attachment 2 provides a revised Technical Specifications (TS) mark-up which supersedes the previous version provided in Reference 1. Attachment 3 is a retyped clean version of the affected TS pages and also supersedes the version previously provided in Reference 1.

EGC has reviewed the information supporting a finding of no significant hazards consideration, and the environmental consideration, that were previously provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the bases for concluding

that the proposed license amendment does not involve a significant hazards consideration. In addition, the information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

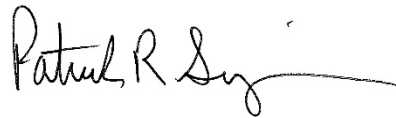
EGC is notifying the State of Illinois of this response related to a previous application for a change to the operating license by sending a copy of this letter and its attachments to the designated State Official in accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b).

There are no regulatory commitments contained within this letter.

Should you have any questions concerning this letter, please contact Ms. Rebecca L. Steinman at (630) 657-2831.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 3rd day of November 2021.

Respectfully,



Patrick R. Simpson
Sr Manager Licensing
Exelon Generation Company, LLC

Attachments:

1. Response to Request for Supplemental Information
2. Marked-up QCNPS, Units 1 and 2 Technical Specifications pages
3. Retyped QCNPS, Units 1 and 2 Technical Specifications pages

cc: U.S. NRC Region III, Regional Administrator
U.S. NRC Senior Resident Inspector, Quad Cities Nuclear Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1
Response to Request for Supplemental Information

Background:

By application dated September 14, 2021, (Agencywide Document Access and Management System (ADAMS) Accession No. ML21257A420), Exelon Generation Company, LLC (EGC, or the licensee) submitted a license amendment request (LAR) with a proposed change that supports the transition from Framatome ATRIUM 10XM fuel to GNF3 fuel at Quad Cities Nuclear Power Station, Units 1 and 2 (Quad Cities). The proposed change includes revising Technical Specifications (TS) 5.6.5, "Core Operating Limits Report [COLR]," paragraph b, to add a report that supports the General Electric Standard Application for Reactor Fuel (GESTAR) analysis methodology to the list of approved methods to be used in determining the core operating limits in the COLR. The licensee also plans to utilize Framatome RODEX2A methodology with an additional thermal conductivity degradation penalty in mixed core thermal-mechanical calculations. Additionally, in support of the proposed transition to GNF3 fuel, EGC proposes to revise the alternative source term loss-of-coolant accident analysis to use a bounding core inventory.

During the NRC staff's acceptance review of the requested license amendment, the NRC staff found the application insufficient, and more information is needed to accept the application for review. The NRC staff concluded that the following items are necessary to enable the staff to make an independent assessment regarding the acceptability of the proposed amendment.

Item 1

By application dated September 14, 2021, Exelon proposed to insert a reference to GNF Report NEDC-33930P, Revision 0, "GEXL98 Correlation for ATRIUM 10XM Fuel, dated February 2021 (NEDC-33930P) included in the application, and retain the remaining TS Core Operating Limits Report (COLR) References in Section 5.6.5 of the Quad Cities TS. The references list already contains a reference to the General Electric Standard Application for Reactor Fuel (GESTAR-II), which is necessary, among other things, to perform cycle-specific analysis and determine parameter operating limits for the proposed Global Nuclear Fuel (GNF) GNF-3 fuel bundle design.

While evaluating the acceptability of the license amendment request, the NRC staff reviewed the Quad Cities Updated Final Safety Analysis Report (UFSAR), Chapter 15, "Accident and Transient Analyses" (ML19319A941). Excepting (1) historical information; (2) radiological consequences analyses; and (3) Chapter 15.8, "Anticipated Transients Without SCRAM," the analyses described therein are based on General Electric and Framatome (AREVA) analytic methods.

In addition, the NRC staff also reviewed the most recent Quad Cities COLRs. The Unit 1, Cycle 27, report reflects that the current Unit 1 core is comprised entirely of Framatome fuel (ADAMS Accession No. ML21090A153). The Unit 2, Cycle 26, report states that "...some legacy analyses by Westinghouse are still applicable for OPTIMA2 fuel as described in Reference 2" (ADAMS Accession No. ML20112F148). Based on this statement, the NRC staff infers that this coresident fuel will be removed in an upcoming cycle.

Therefore, both the COLR and the UFSAR reflect safety analyses that are performed using both the existing, Framatome fuel, and the proposed, General Electric fuel. 10 CFR 50.36(b)

ATTACHMENT 1
Response to Request for Supplemental Information

requires that the TSs shall be derived from the safety analysis report. In addition, the definition of the COLR in Section 1.1 of the Quad Cities TSs reflects the enabling language contained in NRC Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits from Technical Specifications" (ADAMS Accession No. ML031130447) stating in part, "These cycle-specific limits shall be determined for each reload cycle in accordance with Specification 5.6.5."

As it appears that the Westinghouse methods will no longer be in use to determine cycle-specific core operating limits, and are not included in the UFSAR, their retention in the TS is inappropriate. Please update the proposed TS revisions pages to reflect consistency with the Quad Cities UFSAR, the current and upcoming Quad Cities core designs, 10 CFR 50.36(b) requirements, and the guidance provided in GL 88-16, by removing references that will be unused and inapplicable, specifically those intended for use with Westinghouse fuel designs.

EGC Response to Item 1

Technical Specifications (TS) 5.6.5.b contains a list of methodology references used in the Core Operating Limits Report (COLR). This list currently contains eight Westinghouse topical reports that after the 2022 Unit 2 refueling outage will no longer be used to support COLR evaluations. Since the proposed amendment, if approved, is scheduled for implementation in 2023, these unused references can be removed from the TS listing. Attachment 2 provides a revised TS mark-up to indicate the removal of the associated Westinghouse references, in addition to the addition of the GEXL98 reference described in the Exelon letter dated September 14, 2021 (ADAMS Accession No. ML21257A420). This version of the TS mark-up supersedes the previous version provided in ML21257A420 in its entirety. Attachment 3 is a retyped clean version of the affected TS pages and also supersedes the version previously provided.

Item 2

The NRC staff has reviewed Section 3.4 of the LAR and concluded that necessary analysis/calculations to update the Environmental Qualification (EQ) documentation has not been updated as a result of the revised dose. As the EQ documentation is not complete, it's not clear to the NRC staff how the licensee can:

- 1) draw a conclusion that the EQ equipment is not adversely impacted and,
- 2) demonstrate that they continue to comply with 10 CFR 50.49.

Please discuss the technical basis for the EQ conclusions in the LAR.

EGC Response to Item 2

The core inventory changes associated with the transition to GNF3 fuel cause the numerical value of the accident dose used in the Quad Cities Environmental Qualification (EQ) Program to be revised. The resulting accident radiation dose changes have been evaluated and found to be acceptable. All EQ program equipment's tested and/or analyzed radiation resistance envelopes the GNF3 fuel's calculated accident radiation dose, calculated or measured normal operating radiation dose, and EQ program required margins. This new analysis will be used to update existing EQ program documents. This new analysis impacts nearly all of the EQ

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packages that document qualification of equipment in the program need to be revised to ensure continuity of design basis information. However, it was impractical to complete all of these EQ documentation revisions prior to submittal of the proposed amendment request.

The Engineering Technical Evaluation that compared the revised Total Integrated Dose (TID), which includes both normal, accident, and margin dose components, to the current qualified TID was prepared to evaluate the radiological impacts of the fuel transition on the Quad Cities EQ Program. The results of this evaluation were used as the basis for the radiological impact conclusions included in Section 3.4 of the letter dated September 14, 2021 (ADAMS Accession No. ML21257A420). The statements regarding the impacts of the fuel transition on other environmental parameters such as temperature, pressure, humidity, and chemical spray are based on vendor prepared documentation that were reviewed and accepted under Exelon procedural guidance as being accurate and applicable to Quad Cities. These two documents are sufficient to support the conclusion that the fuel transition does not compromise the ability of any qualified equipment to continue to perform its required safety function and thus continued compliance with 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to safety for Nuclear Power Plants."

Although the two existing documents are adequate to support continued compliance with 10 CFR 50.49, the EQ documentation updates should be updated to support continuity of design information related to the EQ Program. The EQ documentation revisions are being tracked and prioritized using the appropriate internal processes to ensure timely revision.

ATTACHMENT 2

**QUAD CITIES NUCLEAR POWER STATION
UNITS 1 AND 2**

Docket Nos. 50-254 and 50-265

Facility Operating License Nos. DPR-29 and DPR-30

MARKED-UP OF QCNPS, UNITS 1 AND 2 TECHNICAL SPECIFICATIONS PAGES

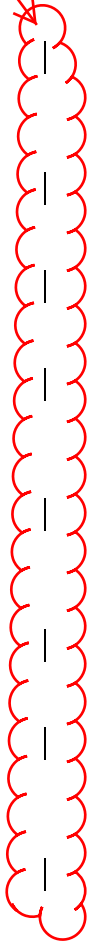
5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

3. The LHGR for Specification 3.2.3.
 4. Control Rod Block Instrumentation Setpoint for the Rod Block Monitor–Upscale Function Allowable Value for Specification 3.3.2.1.
 5. The OPRM setpoints for the trip function for SR 3.3.1.3.3.
- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel."
2. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August 1996.
- ~~3. CENPD-300-P-A, "Reference Safety Report for Boiling Water Reactor Reload Fuel."~~
- ~~4. WCAP-16081-P-A, "10x10 SVEA Fuel Critical Power Experiments and CPR Correlation: SVEA-96 Optima2."~~
- ~~5. WCAP-15682-P-A, "Westinghouse BWR ECCS Evaluation Model: Supplement 2 to Code Description, Qualification and Application."~~
- ~~6. WCAP-16078-P-A, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel."~~
- ~~7. WCAP-15836-P-A, "Fuel Rod Design Methods for Boiling Water Reactors - Supplement 1."~~
- ~~8. WCAP-15942-P-A, "Fuel Assembly Mechanical Design Methodology for Boiling Water Reactors Supplement 1 to CENPD-287."~~
- ~~9. CENPD-390-P-A, "The Advanced PHOENIX and POLCA Codes for Nuclear Design of Boiling Water Reactors."~~

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5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

- ~~10. WCAP-16865-P-A, "Westinghouse BWR ECCS Evaluation Model Updates: Supplement 4 to Code Description, Qualification and Application," Revision 1, October 2011.~~
- 3. XN-NF-81-58(P)(A) Revision 2 and Supplements 1 and 2, "RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model," Exxon Nuclear Company, March 1984.
- 4. ANF-89-98(P)(A) Revision 1 and Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," Advanced Nuclear Fuels Corporation, May 1995.
- 5. EMF-85-74(P) Revision 0 Supplement 1 (P)(A) and Supplement 2 (P)(A), "RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model," Siemens Power Corporation, February 1998.
- 6. BAW-10247PA Revision 0, "Realistic Thermal-Mechanical Fuel Rod Methodology for Boiling Water Reactors," AREVA NP, February 2008.
- 7. XN-NF-80-19(P)(A) Volume 1 and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronic Methods for Design and Analysis," Exxon Nuclear Company, March 1983.
- 8. XN-NF-80-19(P)(A) Volume 4 Revision 1, "Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology to BWR Reloads," Exxon Nuclear Company, June 1986.
- 9. XN-NF-80-19(P)(A) Volume 3 Revision 2, "Exxon Nuclear Methodology for Boiling Water Reactors, THERMEX: Thermal Limits Methodology Summary Description," Exxon Nuclear Company, January 1987.
- 10. EMF-2158(P)(A) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation, October 1999.

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5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

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11. EMF-2245(P)(A) Revision 0, "Application of Siemens Power Corporation's Critical Power Correlations to Co-Resident Fuel," Siemens Power Corporation, August 2000.
12. EMF-2209(P)(A) Revision 3, "SPCB Critical Power Correlation," AREVA NP, September 2009.
13. ANP-10298P-A Revision 1, "ACE/TRIUM 10XM Critical Power Correlation," AREVA, March 2014.
14. ANP-10307PA Revision 0, "AREVA MCPR Safety Limit Methodology for Boiling Water Reactors," AREVA NP, June 2011.
15. XN-NF-84-105(P)(A) Volume 1 and Volume 1 Supplements 1 and 2, "XCOBRA-T: A Computer Code for BWR Transient Thermal-Hydraulic Core Analysis," Exxon Nuclear Company, February 1987.
16. ANF-913(P)(A) Volume 1 Revision 1 and Volume 1 Supplements 2, 3, and 4, "COTRANSA2: A Computer Program for Boiling Water Reactor Transient Analyses," Advanced Nuclear Fuels Corporation, August 1990.
17. EMF-2361(P)(A) Revision 0, "EXEM BWR-2000 ECCS Evaluation Model," Framatome ANP, May 2001.
18. EMF-2292 (P)(A) Revision 0, "ATRIUM™-10: Appendix K Spray Heat Transfer Coefficients," Siemens Power Corporation, September 2000.
19. ANF-1358(P)(A) Revision 3, "The Loss of Feedwater Heating Transient in Boiling Water Reactors," Framatome ANP, September 2005.
20. EMF-CC-074(P)(A) Volume 4 Revision 0, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2," Siemens Power Corporation, August 2000.

The COLR will contain the complete identification for each of the TS referenced topical reports used to prepare the COLR (i.e., report number, title, revision, date, and any supplements).

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21. NEDC-33930P Revision 0, "GEXL98 Correlation for ATRIUM 10XM Fuel," February 2021

ATTACHMENT 3

**QUAD CITIES NUCLEAR POWER STATION
UNITS 1 AND 2**

Docket Nos. 50-254 and 50-265

Facility Operating License Nos. DPR-29 and DPR-30

RETYPE QCNPS, UNITS 1 AND 2 TECHNICAL SPECIFICATIONS PAGES

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5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

8. XN-NF-80-19(P)(A) Volume 4 Revision 1, "Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology to BWR Reloads," Exxon Nuclear Company, June 1986.
9. XN-NF-80-19(P)(A) Volume 3 Revision 2, "Exxon Nuclear Methodology for Boiling Water Reactors, THERMEX: Thermal Limits Methodology Summary Description," Exxon Nuclear Company, January 1987.
10. EMF-2158(P)(A) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation, October 1999.
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18. EMF-2292 (P)(A) Revision 0, "ATRIUMTM-10: Appendix K Spray Heat Transfer Coefficients," Siemens Power Corporation, September 2000.
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21. NEDC-33930P Revision 0, "GEXL98 Correlation for ATRIUM 10XM Fuel," February 2021.

The COLR will contain the complete identification for each of the TS referenced topical reports used to prepare the COLR (i.e., report number, title, revision, date, and any supplements).

- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.
