

**From:** Vaidya, Bhalchandra  
**Sent:** Friday, May 6, 2022 9:17 AM  
**To:** Taken, Jason C.:(Exelon Nuclear); 'david.gullott@exeloncorp.com'; Lueshen, Kevin:(Constellation Nuclear)  
**Subject:** May 5, 2022, DRAFT Request for Additional Information (RAI), EPID-L-2021-LLA-0124 re: New GNF-3 Fuel and SFP Criticality Methodology

**SUBJECT: LASALLE UNITS 1 AND 2 –REQUEST FOR ADDITIONAL INFORMATION (RAI)  
RE: License Amendment Request Regarding New Fuel Storage Vault and Spent Fuel Storage Pool Criticality Methodologies, with Proposed Changes to Technical Specifications Sections 4.3.1 and 5.6.5 (EPID-L-2021-LLA-0124)**

Jason and David,

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated June 30, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21183A169), as supplemented by letter dated November 4, 2021 (ADAMS Accession No. ML21312A457), Exelon Generation Company, LLC (THE LICENSEE, the licensee) submitted a request for amendments to Renewed Facility Operating License Nos. NPF-11 and NPF-18 for LaSalle County Station (LSCS), Units 1 and 2, respectively. On February 1, 2022 (ADAMS Accession No. ML22032A333), Exelon Generation Company, LLC was renamed Constellation Energy Generation, LLC (CEG, or the licensee). Specifically, the licensee is proposing to use a new criticality safety analysis (CSA) methodology for performing the criticality safety evaluation for legacy fuel types in addition to the GNF3 reload fuel in the spent fuel pool (SFP). The licensee is also proposing a change to the new fuel vault (NFV) CSA to utilize the GESTAR II methodology for validating the NFV criticality safety for GNF3 fuel in the General Electric (GE) designed NFV racks. In addition, the licensee is proposing to change both LSCS Technical Specifications (TS) 4.3.1, "Criticality," and TS 5.6.5, "Core Operating Limits Report (COLR)," to reflect conditions present upon license amendment approval.

The U.S. Nuclear Regulatory Commission (NRC) staff currently reviewing your application and has identified areas where additional information is needed to complete its review. The Request for Additional Information (RAI) is provided below.

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**DRAFT REQUEST FOR ADDITIONAL INFORMATION  
OFFICE OF NUCLEAR REACTOR REGULATION**

**CONSTELLATION ENERGY GENERATION, LLC**

**DOCKET NOS. 50-373, AND 50-374  
EPID: L-2021-LLA-0124**

**STSB RAIs:**

**RAI-STSB-1:**

In letter dated June 30, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21183A170), as supplemented by letter dated November 4, 2021 (ADAMS Accession No. ML21312A457), the licensee submitted a license amendment request

that proposed changes to LaSalle Technical Specification (TS) 5.6.5. The proposal eliminates NRC approved methods associated with Framatome fuel, leaving only an approved GE method in the TS. The LAR did not provide a technical justification for this change.

10 CFR 50.36 requires that the TS be derived from the analyses and evaluations included in the safety analysis report. At LaSalle, TS 5.6.5, Core Operating Limits Report (COLR), requires that core operating limits be established prior to each refueling cycle and specifies the NRC approved topical reports that define the methods that are used for determination of the core operating limits.

Provide a basis for the proposal to delete the Framatome topical reports from TS 5.6.5. Verify that fuel not evaluated by the remaining topical report will not be loaded or reloaded into the core without previous NRC approval and that the methods associated with the topical reports proposed for deletion from TS 5.6.5 are no longer used for establishing COLR criteria.

### **SFNB RAIs:**

#### **Regulatory Requirements**

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix A, Criterion 5 requires, "Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown."

10 CFR Part 50, Appendix A, Criterion 62 requires, "Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations."

Paragraph 50.68(a) of 10 CFR requires, "Each holder of a construction permit or operating license for a nuclear power reactor issued under this part or a combined license for a nuclear power reactor issued under Part 52 of this chapter, shall comply with either 10 CFR 70.24 of this chapter or the requirements in paragraph (b) of this section." The licensee has chosen to comply with Paragraph 50.68(b) of 10 CFR.

Paragraph 50.68(b)(1) of 10 CFR requires, "Plant procedures shall prohibit the handling and I will keep these as they are specific to SFP storage at any one time of more fuel assemblies than have been determined to be safely subcritical under the most adverse moderation conditions feasible by unborated water."

Paragraph 50.68(b)(2) of 10 CFR requires, "The estimated ratio of neutron production to neutron absorption and leakage (k-effective) of the fresh fuel in the fresh fuel storage racks shall be calculated assuming the racks are loaded with fuel of the maximum fuel assembly reactivity and flooded with unborated water and must not exceed 0.95, at a 95 percent probability, 95 percent confidence level. This evaluation need not be performed if administrative controls and/or design features prevent such flooding or if fresh fuel storage racks are not used."

Paragraph 50.68(b)(3) of 10 CFR requires, "If optimum moderation of fresh fuel in the fresh fuel storage racks occurs when the racks are assumed to be loaded with fuel of the maximum fuel assembly reactivity and filled with low-density hydrogenous fluid, the k-effective corresponding to this optimum moderation must not exceed 0.98, at a 95 percent probability, 95 percent

confidence level. This evaluation need not be performed if administrative controls and/or design features prevent such moderation or if fresh fuel storage racks are not used.”

Paragraph 50.68(b)(4) of 10 CFR requires, in part, “If no credit for soluble boron is taken, the  $k_{\text{eff}}$  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.”

The LSCS SFP Criticality Safety Analysis (NCA) does not take credit for soluble boron, so the 50.68(b)(4) requirements regarding soluble boron do not apply.

In addition, paragraph 50.36(c)(4) of 10 CFR requires, “Design features. Design features to be included are those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered in categories described in paragraphs (c) (1), (2), and (3) of this section.”

#### **RAI-SFNB-1:**

In Section 2.2 New Fuel Vault Criticality Safety Analysis of Attachment 1 to the licensee’s June 30, 2021, letter it states, “The LSCS NFV racks are General Electric (GE) designed low density racks with an interrack spacing of 12.25 inches (see section 9.1.1.2 of LSCS UFSAR). The NFV rack CSA coverage for the new GNF3 fuel will be the GESTAR II (Reference 6.4) analysis for GE designed low density NFV racks upon approval of this proposed license amendment. The applicability of GESTAR II to the GNF3 fuel type is documented in the GNF3 GESTAR II validation report (Reference 6.6). The LSCS NFV interrack pitch is  $\geq 10.5$  inches (the criteria listed in GESTAR II) and thus the racks may be utilized to store new GNF fuel with in-rack  $SCCG_{k_{\text{inf}}} \leq 1.31$  (Reference 6.4).”

However, neither Reference 6.4 “GE Licensing Topical Report NEDE-24011-P-A, "GESTAR II" - Implementing Improved GE Steady-State Methods, Revision 31 (TAC No. MA6481) (ML20330A197)” (contained in ADAMS Package Accession No. ML20330A195) nor Reference 6.6 “NEDC-33879P, Revision 4, “GNF3 Generic Compliance with NEDE-24011-P-A (GESTAR II), August 2020 ML20244A105)” contained in (ADAMS Package Accession No. ML20244A104) contain a nuclear criticality safety methodology or nuclear criticality safety analysis. Please provide the following:

- NFV criticality safety analysis methodology used in the analysis.
- Criticality safety analysis that sets the limits for the LSCS NFV.
- Criticality safety analysis that demonstrates GNF3 fuel meets the limits for the LSCS NFV.

#### **RAI-SFNB-2:**

LSCS UFSAR section 9.1.1.2 indicates the NFV racks have a nominal center to center pitch that is considerably less than 10.5 inches. Explain and clarify this apparent discrepancy.

#### **RAI-SFNB-3:**

The LSCS NFV center to center pitch is critical to maintaining the geometric spacing of fuel assemblies to ensure CFR50.68(b)(2) is met. Describe the controls LSCS has in place to ensure the LSCS NFV center to center spacing is maintained?

**RAI-SFNB-4:**

In Section 4.1 Applicable Regulatory Requirements/Criteria of Attachment 1 to the licensee's June 30, 2021, letter states, in part "The regulation also states that for the optimum moderation case the  $k_{\text{eff}}$  must not exceed 0.98 at a 95 percent probability, 95 percent confidence level. The optimum moderation case is not applicable to LaSalle's NFV as it is a moderation controlled area (see Section 9.1.1.3 of the LSCS UFSAR)." In Section 9.1.1.3 of the LSCS UFSAR states, "The new fuel storage vault will be covered during periods when construction or maintenance activities are underway on the refueling floor." However, 10 CFR 50.68(b)(3) requires optimum moderation be prevented to forgo complying with the k-effective portion of the paragraph. It is unclear how covering the NFV for part of the time is sufficient to preclude an optimum moderation condition all of the time. Explain how an optimum moderation condition is precluded at all times.

**RAI-SFNB-5:**

The measures LSCS has to ensure NFV optimum moderation condition is precluded at all times are essential to forgoing the NFV optimum moderation k-effective analysis otherwise stipulated in CFR50.68(b)(3). Describe the controls LSCS has in place to ensure those measures are not compromised?

**RAI-SFNB-6:**

The description of the analysis in NEDC-33931P Revision 1 (Attachment 2 to the licensee's November 4, 2021, letter) Section 5.5.2 Normal Bias Cases provides a brief description of the analysis performed to evaluate the 'No Boron/Inserts on the rack periphery' issue. The analysis considers perturbed scenarios referenced to a non-perturbed scenario. NEDC-33931P Revision 1 Section 5.5.3 Abnormal/Accident Bias Cases provides a brief description of the analysis performed to evaluate the 'Abnormal positioning of fuel assembly outside the fuel storage rack.' This analysis also considers perturbed scenarios referenced to a non-perturbed scenario. The descriptions provided indicates the non-perturbed scenario values in both the 'No Boron/Inserts on the rack periphery' and the 'Abnormal positioning of fuel assembly outside the fuel storage rack' evaluations should be identical. However comparison of the information listed in Tables 13/14 to Tables 15/16 indicate they are not identical. Explain the differences between the non-perturbed scenario values in these tables.

**RAI-SFNB-7:**

In Section 1.0 INTRODUCTION of NEDC-33931P Revision 1 (Attachment 1 to the licensee's November 4, 2021, letter) it states, "A maximum Standard Cold Core Geometry (SCCG), uncontrolled peak in-core  $k_{\infty}$  of 1.275 as defined by the lattice physics code TGBLA06 (Reference 1) is set as the limit for this analysis." However, NEDC-33931P Revision 1 Reference 1 does not have a clear nexus to how TGBLA06 calculates a SCCG. Additionally, NEDC-33931P Revision 1 Reference 1 is dated November 10, 1999, which predates GNF3 fuel by at least a decade. Provide the methodology or appropriate reference for how TGBLA06 calculates SCCG and the analysis or appropriate reference for how TGBLA06 is an appropriate code for modeling GNF3.

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Please contact me to schedule a clarification telephone call between the NRC staff and licensee to ensure that the licensee clearly understand the NRC staff concerns and also provides a firm commitment for the response.

If you have any questions, please contact me at (301) 415-3308, or by email at [bhalchandra.vaidya@nrc.gov](mailto:bhalchandra.vaidya@nrc.gov)

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