



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

May 18, 2020

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 –  
AUDIT PLAN IN SUPPORT OF REVIEW OF LICENSE AMENDMENT  
REQUEST REGARDING ACCIDENT TOLERANT FUEL LEAD TEST  
ASSEMBLIES (EPID L-2019-LLA-0282)

Dear Mr. Hanson:

By letter dated December 12, 2019 (Agencywide Documents Access and Management System Accession No. ML19347A779), Exelon Generation Company, LLC (the licensee) submitted a license amendment request (LAR) for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (Calvert Cliffs). The proposed amendments would modify the renewed facility operating licenses to permit the use of accident tolerant fuel lead test assemblies (LTAs) and make an administrative change to the technical specifications. Up to two LTAs of the Framatome PROtect™ fuel design would be loaded into the Calvert Cliffs reactors for up to three cycles, commencing with the approval of the LAR. The key features of the PROtect™ LTAs are the chromium-coated M5® cladding and chromia-doped fuel pellets.

During the initial review of the LAR, the U.S. Nuclear Regulatory Commission (NRC) staff identified several items that required further clarification and detailed explanations. The NRC staff will conduct a regulatory audit to support its review of the LAR in accordance with the enclosed audit plan.

A regulatory audit is a planned activity that includes the examination and evaluation of primarily non-docketed information. The audit will be conducted to increase the NRC staff's understanding of the LAR and identify information that will require docketing to support the NRC staff's regulatory finding. The audit will be conducted using video conferencing and an eDocs web portal (also known as an online portal, electronic portal, ePortal, electronic reading room) from June 15 to June 19, 2020. The logistics and scope of this audit were discussed with your staff on April 29, 2020. The audit plan is enclosed.

B. Hanson

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If you have any questions, please contact me by telephone at 301-415-2871 or by e-mail to [Michael.Marshall@nrc.gov](mailto:Michael.Marshall@nrc.gov).

Sincerely,

*/RA/*

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:  
Audit Plan

cc: Listserv



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AUDIT PLAN

REGARDING ACCIDENT TOLERANT FUEL LEAD TEST ASSEMBLIES

EXELON GENERATION COMPANY, LLC

CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-317 AND 50-318

1.0 BACKGROUND

By letter dated December 12, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19347A779), Exelon Generation Company, LLC (Exelon) submitted a license amendment request (LAR) for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (Calvert Cliffs). The proposed amendments would modify the renewed facility operating licenses to permit the use of accident tolerant fuel lead test assemblies (LTAs) and make an administrative change to the technical specifications. Up to two LTAs of the Framatome PROtect™ fuel design would be loaded into the Calvert Cliffs reactors for up to three cycles, commencing with the approval of this request. The key features of the PROtect™ LTAs are the chromium-coated M5® cladding and chromia-doped fuel pellets.

Attachment 2 of the LAR documents the technical justification in a Framatome report entitled "PROtect Lead Test Assemblies for Calvert Cliffs, Licensing Report" (non-public/proprietary).

2.0 REGULATORY AUDIT BASES

A regulatory audit is a planned license or regulation-related activity that includes the examination and evaluation of primarily non-docketed information. The audit is conducted with the intent to gain understanding, to verify information, and to identify information that will require docketing to support the basis of a licensing or regulatory decision. Performing a regulatory audit is expected to assist the U.S. Nuclear Regulatory Commission (NRC) staff in efficiently conducting its review and gaining insights to the licensee's processes and procedures. Information that the NRC staff relies upon to make the safety determination must be submitted on the docket.

The audit is based on the Exelon LAR to insert PROtect™ LTAs at Calvert Cliffs. The format of the audit is based on NRC Office Instruction, LIC-111, "Regulatory Audits" (ADAMS Accession No. ML19226A274).

The regulatory audit is based on the following regulations and NRC guidance, as indicated by the licensee in its LAR:

- Section 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors"
- Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50

In addition, the NRC staff has identified the following regulations and NRC guidance that the review and audit will also include:

- 10 CFR 50.36, "Technical specifications"
- Appendix A, "General Design Criteria for Nuclear Power Reactors," to 10 CFR Part 50 (GDC) Criterion 10, "Reactor Design"
- GDC Criterion 35, "Emergency Core Cooling"
- 10 CFR Part 100, "Reactor Site Criteria"
- NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition," Section 4.2, "Fuel System Design"

### 3.0 SCOPE

The scope of this regulatory audit is the technical and the regulatory areas covered by the LAR and any associated documentation, analyses, and calculations that support the assertions made in the LAR. In particular, the NRC staff will focus on the items listed in Section 4.0 below.

### 4.0 INFORMATION AND OTHER MATERIAL NECESSARY FOR THE REGULATORY AUDIT

The licensee is requested to compile all the information identified in this section prior to the audit so that it is readily available to the staff. The documentation can be provided by presentations, documents, or calculation details.

The following are the planned major areas of focus for detailed discussion and document review. All the Framatome engineering calculations supporting the technical justification within PROtect™ LTAs for the Calvert Cliffs licensing report. Specifically, focus on the following areas:

- COPERNIC modifications and benchmarks
- Nuclear cross-section libraries and core physics predictions
- Fuel rod thermal-mechanical design calculations
- Loss-of-coolant accident calculations and assessments
- Non-loss-of-coolant accidents calculations and assessments
- Fuel handling and storage

To support the staff's confirmatory FAST fuel rod thermal-mechanical design calculations, the licensee is requested to provide the information below.

- Description of modifications to COPERNIC to represent chromia-doped fuel
- Advanced CE14x14 HTP fuel rod description (dimensions, materials, density, etc.) and manufacturing tolerances
  - See fuel rod design parameters below
- LTA fuel rod characteristics different from above
- Reactor conditions
  - Reactor coolant system pressure
  - Coolant inlet temperature
  - Coolant mass flux
- Simplified, bounding steady-state fuel rod power histories (radial and axial power distribution versus burnup)
- Simplified, bounding transient overpower fuel rod power profiles (radial and axial power distribution versus burnup)
- Fuel rod parameters
  - Rod size
    - Rod fabrication axial zoning
    - Outer diameter
    - Inner diameter
    - Pellet diameter
    - Stack length
    - Plenum length
  - Spring dimensions:
    - Spring outer diameter
    - Spring wire diameter
    - Number of spring turns
  - Pellet shape
    - Pellet height
    - Central hole radius zoning
    - Constant central hole radius
    - Dish radius
    - Dish depth
    - Chamfer width
    - Chamfer height
  - Pellet fabrication
    - Pellet density
    - Open porosity
    - Pellet surface roughness
    - Expected density increase
    - Sintering temperature
  - Cladding fabrication
    - Cladding type
    - Cladding cold work
    - Cladding surface roughness
    - Cladding texture factor
    - Hydrogen in cladding
  - Rod fill conditions
    - Fill gas pressure
    - Fill gas

In addition, the staff would like to see sample calculations during the audit with COPERNIC for both a standard fuel rod and an EATF fuel rod.

Additional information needs identified during the audit will be communicated to the designated point of contact as quickly as possible. The NRC staff may request that the licensee to provide appropriate documents to the NRC docket that would enable an accelerated and effective review of the LAR. The deliberations during the audit, along with the original contents of the LAR and the supplemental information, will be used to generate or refine requests for additional information in order to complete the comprehensive review of the LAR.

## 5.0 AUDIT TEAM

The members of the audit team are anticipated to be:

- Paul Clifford, Team Leader and Risk Analyst, NRC
- Andrew Proffitt, Reliability and Risk Analyst, NRC
- Michael Marshall, Project Manager, NRC
- Ken Geelhood, Principal Engineer, Pacific Northwest National Laboratory

## 6.0 LOGISTICS

The audit will be conducted using video conferencing and an eDocs web portal (also known as an online portal, electronic portal, ePortal, electronic reading room) from June 15 to 19, 2020. During the audit, information should be shared using video conference and telephone conference. The audit kickoff meeting will be held at 11:00 a.m. on June 15, 2020. Daily meetings will be scheduled at 4:00 p.m. to discuss progress and information needs. In addition, representatives of Exelon and Framatome are requested to be available for additional video conferences with an one hour advance notice. The NRC project manager will coordinate any changes to the audit schedule and location with the licensee.

The NRC staff would like remote access to the available documents listed in Section 4.0 above through eDocs web portal by June 1, 2020. For the documents that may not be available by June 1, 2020, Exelon should inform the NRC project manager on their expected availability through normal status discussion between Exelon and the NRC project manager.

The following conditions associated with the online portal must be maintained throughout the duration that the NRC staff and contractors have access to the online portal:

- The online portal will be password-protected, and separate passwords will be assigned to the NRC staff and contractors who are participating in the audit.
- The online portal will be sufficiently secure to prevent the NRC staff and contractors from printing, saving, downloading, or collecting any information on the online portal.
- Conditions of use of the online portal will be displayed on the login screen and will require acknowledgement by each user.

User name and password information should be provided directly to the NRC staff and contractors. The NRC project manager will provide Exelon the names and contact information of the NRC staff and contractors who will be participating in the audit. All other communications should be coordinated with the NRC project manager. NRC staff and contractor access to the eDocs web portal should be terminated 14 days after the end of the regulatory audit.

## 7.0 DELIVERABLES

An audit summary, which may be public, will be prepared within 60 days of the completion of the audit. The audit report will be provided to the licensee in draft form for proprietary review prior to issuance. If the NRC staff identifies information during the audit that is needed to support its regulatory decision, the staff will issue requests for additional information to the licensee after the audit.

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 ASSEMBLIES (EPID L-2019-LLA-0282) DATED MAY 18, 2020

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 AProffitt, NRR  
 PClifford, NRR

**ADAMS Accession No.: ML20098G965**

**\* by e-mail**

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DATE	04/27/2020	05/18/2020		

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