

REGULATORY AUDIT REPORT

BYRON STATION, UNIT 2 LICENCE AMENDMENT REQUEST TO ALLOW INSERTION OF ACCIDENT TOLERANT FUEL LEAD TEST ASSEMBLIES

DOCKET NO. 50-455

1. BACKGROUND

By letter dated March 8, 2018, as supplemented by letters dated July 2, 2018, and December 18, 2018, (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML18067A431, ML18184A270, and ML18352B117) Exelon Generation Company, LLC (Exelon), the licensee, requested an amendment to the Byron Station, Unit 2, operating license that would allow accident tolerant fuel (ATF) lead test assemblies (LTAs) to be utilized at the plant. The proposed amendment would insert a license condition permitting the use of two such LTAs in Byron Unit 2 during cycles 22, 23, and 24.

2. REGULATORY AUDIT OBJECTIVES

The December 18 supplement identifies a transient analyzed in the UFSAR during which the LTAs may be the limiting bundles in the core. The NRC performed a regulatory audit in accordance with the Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits," to better understand these calculations and in order to expedite the review of this supplement, given the short time available before the refueling outage.

The audit took place at Westinghouse's Rockville office on January 4, 2019. A list of participants in the audit is provided in Table 1.

Table 1: List of Audit Attendees

Name	Affiliation
Josh Whitman	NRR/DSS/SNPB
Paul Clifford	NRR/DSS
Reed Anzalone	NRR/DSS/SRXB
Andrew Bowman	Westinghouse
Tim Crede	Westinghouse
Bob Oelrich	Westinghouse
Radu Pomirleanu	Westinghouse
William Gassmann	Exelon

3. DISCUSSION

During the audit the following topics were discussed:

- 1) The Westinghouse staff provided additional context regarding the transient described in supplement 2 to the LAR. They described that, in one case (out of thousands run to cover the entire operating domain allowed by the TS), the ADOPT™ LTR leads the core in LHGR following an unintended boron dilution with rods in manual control. This ADOPT™ rod is still well below the LHGR safety limit (protecting against fuel centerline melt). This LTR leads the core due to the lack of axial blankets in the LTR (and thus the higher enrichment in the top and bottom 8" of the fuel rod). This, coupled with the extreme bottom peaked power shape experienced during the particular boron dilution transient run in question led to a higher nodal LHGR than the co-resident fuel.
- 2) Westinghouse provided context to the changes made to the licensing fuel performance code for the ADOPT™ pellets, and re-iterated that the behavior of ADOPT™ (including melting temperature) is well understood. ADOPT™ pellets have been used for several BWR reloads in the European market, indicating a high level of confidence in the performance of the fuel.
- 3) The proposed license condition was discussed. NRC staff identified a potential conflict between the proposed license condition and the analysis result presented in supplement 2. Exelon stated their intent to address this concern by supplementing the LAR with a new license condition and/or TS amendment, and to clarify how the ADOPT™ fuel is analyzed. NRC staff recommended a publicly noticed phone call to discuss the proposed language before submitting a supplement on the docket in order to avoid any setbacks that would challenge Exelon's schedule for loading fuel unnecessarily.

The following preliminary RAls were discussed during the closing of the audit:

- 1) As discussed in the supplement dated December 18, 2018, the ADOPT™ LTRs may be limiting in certain transient conditions. Please clarify why this is consistent with Byron TS 4.2.1 or provide appropriate proposed updates to the technical specifications, with justification.
- 2) GDC 10-Reactor Design, states: The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. The following information is needed to demonstrate compliance with this GDC.

Page 12 of 20 of Exelon's March 8, 2018 (ADAMS Accession No. ML18067A431), letter states that the current PAD code is capable of modeling ADOPT™ fuel pellets. The letter then subsequently discusses the material properties and fuel performance models that are being updated for coated cladding and uranium silicide fuel, resulting in a fuel performance code designated as PAD-ATF. Separately on page 14 of 20, there is a paragraph discussing the fuel performance of the ADOPT™ pellets that states that the

ADOPT™ pellet has essentially the same heat capacity, thermal diffusivity, thermal expansion coefficient, and melting temperature as standard uranium dioxide.

Clarify these statements to state whether or not PAD-ATF is applicable to the ADOPT™ pellet or if the current PAD code (without the modifications for uranium silicide and the coated clad) is applicable to the ADOPT™ pellet. Include a list of which models (if using PAD-ATF) or inputs (if using PAD) are changed for ADOPT™ pellets vs standard UO₂ pellets. Please state whether the known ADOPT™ material properties, including irradiated properties, have been considered in the LTR design and safety assessments.

The licensee agreed to supplement the LAR with additional information needed as described in the preliminary RAIs. There are no other open items from this audit.

4. CONCLUSION

The audit accomplished the objectives listed in the audit plan. The NRC will wait for the licensee to either supplement the LAR or request a publicly noticed phone call to discuss their supplement before it is submitted on the docket.