



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

November 3, 2021

Mr. Gary Peters, Director  
Licensing and Regulatory Affairs  
Framatome Inc.  
3315 Old Forest Road  
Lynchburg, VA 24501

SUBJECT: REPORT FOR SEPTEMBER 13, 2021, REGULATORY AUDIT REGARDING  
FRAMATOME INC. TOPICAL REPORT, ANP-10353P, REVISION 0,  
"INCREASED ENRICHMENT FOR PWRs" (EPID L-2021-TOP-0004)

Dear Mr. Peters:

By letter dated January 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21035A074), Framatome, Inc. (Framatome) submitted Topical Report (TR) ANP-10353P, Revision 0, "Increased Enrichment for [Pressurized Water Reactors] PWRs" (ADAMS Package No. ML21035A073), to the U.S. Nuclear Regulatory Commission (NRC) for review and approval.

The NRC staff conducted a virtual regulatory audit to increase their level of knowledge and understanding of the topic and associated methodologies on September 13, 2021. The results of the audit will provide additional support for the NRC staff safety evaluation of the TR. The audit report is enclosed.

If you have any questions, please contact me at (301) 415-6695 or [Ngola.Otto@nrc.gov](mailto:Ngola.Otto@nrc.gov).

Sincerely,

*/RA/*

Ngola Otto, Project Manager  
Licensing Projects Branch  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 99902041

Enclosure: Audit Report (Non-Proprietary)

REPORT FOR SEPTEMBER 13, 2021, AUDIT  
REGARDING FRAMATOME TOPICAL REPORT ANP-10353P, REVISION 0  
INCREASED ENRICHMENT FOR PWRs  
PROJECT NO. 728  
EPID L-2021-TOP-0004

**1.0 BACKGROUND**

By letter dated January 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21035A074), Framatome, Inc. (Framatome) submitted Topical Report (TR) ANP-10353P, Revision 0, "Increased Enrichment for PWRs" (ADAMS Package No. ML21035A073), to the U.S. Nuclear Regulatory Commission (NRC) for review and approval. ANP-10353P, Revision 0, seeks to expand the range of applicability of several Topical Reports to higher than 5 weight-percent (wt%) Uranium (U)-235. The TRs referenced in ANP-10353P include those in areas such as neutronics, thermal hydraulics, mechanical, non-loss-of-coolant accident (LOCA) and LOCA models, and decay heat models. ANP-10353P provides additional analysis and justification where necessary to show that current codes and methods can reliably model fuel behavior at increased enrichment in PWRs.

A virtual regulatory audit was conducted on September 13, 2021, to clarify the NRC staff's understanding of content within the TR. The audit also served to assist the NRC staff in drafting request for additional information (RAI) questions, which were issued on September 21, 2021 (ADAMS Package No. ML21258A346). The scope of the audit included all sections of the TR. This audit was held in accordance with the Office of Nuclear Reactor Regulation (NRR) procedure as described in LIC-111, "Regulatory Audits."

**2.0 REGULATORY AUDIT OBJECTIVES**

The objective of this audit was to increase review process efficiency through direct interaction with Framatome's technical experts. More specifically, the audit allowed the NRC staff to prepare RAI questions that could be presented to Framatome for discussion and clarification. Those who participated in the audit are listed below.

<b>Name</b>	<b>Affiliation</b>
Brandon Wise	NRC
Kevin Heller	NRC
Paul Clifford	NRC
Ngola Otto	NRC
Kent Able	Framatome
Mike Aldrich	Framatome
Buck Barner	Framatome
Morris Byram	Framatome
Alex Cheng	Framatome
Steven Cole	Framatome
Dick Deveney	Framatome
Dwayne Fitts	Framatome

<b>Name</b>	<b>Affiliation</b>
Michelle Guzardo	Framatome
Will Maxson	Framatome
Kevin McCoy	Framatome
Roberto Rubilar	Framatome
Kevin Segard	Framatome
Gordon Wissinger	Framatome

### **3.0 REGULATORY AUDIT BASES**

Regulatory guidance for the review of fuel system materials and designs and adherence to Title 10 of the *Code of Federal Regulations*, Appendix A to Part 50, General Design Criteria (GDC)-10, "Reactor Design," GDC-11, "Reactor Inherent Protection," and GDC-13, "Instrumentation and Control," is provided in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), Section 4.3, "Nuclear Design." In accordance with SRP Section 4.3, the objectives of the nuclear designs safety review is to provide reasonable assurance that: (1) acceptable fuel designs limits are not exceeded, (2) limiting power distributions are not exceeded, (3) analytical methods should be representative of the state of the art, and (4) the experiments used to validate the analytical methods should be adequate representations of fuel designs in the reactor and encompass a sufficient range of variables and operating conditions.

### **4.0 DISCUSSION**

In the audit plan, the NRC listed several topics that needed clarification. Most of these topics were directly linked to potential RAI questions. The major discussion topics during the audit are described below.

- The enrichment of critical benchmark experiments did not appear to adequately cover the range of increased enrichments. Many of the enrichments were of a single enrichment.
- Framatome stated that depletion calculations remain applicable at higher enrichments because the equations are not changing. The NRC staff noted that while the equations may not change, their uncertainties may.
- It was not abundantly clear in the TR how some uncertainties related to peaking factors were affected by increased enrichment and how they relate to each other.
- Framatome provided a list of neutronic parameters related to the ARITA and AREA methodologies. Framatome's claim was that none of the listed neutronic parameters were affected by increased enrichment in terms of how they were used in the methodology. The NRC staff generally agreed with Framatome's assessment for most parameters, however some could be affected depending on how they were used in the methodology.
- Framatome changed some Small-Break LOCA(SBLOCA) Evaluation Model input values. The NRC staff requested further clarification on what parameters were being changed and how this might affect the methodology.
- Some graphs included as part of the decay heat analysis appeared to show some non-conservatism. The NRC staff requested further clarification on the apparent non-conservatism.

Framatome prepared presentations for each of the above topics. The NRC staff were able to prepare RAI questions based on information from the audit and the TR. The draft RAI questions were shared with Framatome for further discussion and clarification, and then issued to Framatome on September 21, 2021.

## **5.0 SUMMARY**

The NRC staff found Framatome's presentations on the above topics regarding ANP-10353P informative. The discussions held during the audit provided the NRC with the necessary clarity to establish a path forward in the review. The NRC staff acquired a deeper understanding of the relevant technical and regulatory issues associated with the above topics. No regulatory decisions were made during the audit.

SUBJECT: REPORT FOR SEPTEMBER 13, 2021, REGULATORY AUDIT REGARDING FRAMATOME INC. TOPICAL REPORT, ANP-10353P, REVISION 0, "INCREASED ENRICHMENT FOR PWRs" (EPID L-2021-TOP-0004) DATED NOVEMBER 3, 2021

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Morris.Byram@framatome.com

**ADAMS Accession No.: ML21305A032 (Audit Report)**

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