

**AUDIT PLAN FOR FRAMATOME**  
**TOPICAL REPORT ANP-10297P(A), REVISION 0, SUPPLEMENT 1,**  
**“THE ARCADIA® REACTOR ANALYSIS SYSTEM FOR PWRs**  
**METHODOLOGY DESCRIPTION AND BENCHMARKING RESULTS”**  
**PROJECT NO. 728/DOCKET 99902041**  
**CAC NO. MF6469/EPID: L-2015-TOP-005**

## **1.0 INTRODUCTION**

By letter dated June 26, 2015 (Reference 1), Framatome (formerly AREVA NP, Inc.) submitted Topical Report (TR) ANP-10297P(A), Revision 0, Supplement 1, “The ARCADIA® Reactor Analysis System for PWRs [Pressurized Water Reactors] Methodology Description and Benchmarking Results” (Reference 2) to the U.S. Nuclear Regulatory Commission (NRC) for review and approval. ANP-10297P(A), Revision 0, Supplement 1 (Supplement 1) is the first supplement to the ARCADIA® Code System (ARCADIA®) TR, ANP-10297P-A, Revision 0 (Reference 3). The main purpose of Supplement 1 is to seek approval for changes that have been incorporated into the ARCADIA® methodology to support the development of non-loss-of-coolant accident (non-LOCA) methodologies, reduce uncertainties, and extend ARCADIA’s® range of applicability to include fuel designs using enriched reprocessed uranium. To that end, Supplement 1 details new models and methods and updates to existing models and methods while providing expanded benchmarks. In addition to seeking approval for these changes, Supplement 1 also addresses Limitation 3 of the of the ARCADIA® safety evaluation (SE) that restricted use of ARCADIA® to fuel types with non-Inconel grids unless additional verification of uncertainties is conducted, quantified, and accounted for in licensing calculations on a plant-specific basis.

The NRC staff has proposed to conduct a regulatory audit at this point in the review process in an effort to aid in the closure of outstanding technical issues. The NRC staff has therefore developed an audit plan. The regulatory audit will be held in accordance with the Office of Nuclear Reactor Regulation procedure as described in LIC-111, “Regulatory Audits.”

## **2.0 REGULATORY AUDIT BASIS**

Supplement 1 was developed primarily to satisfy the following NRC regulatory requirements established in Title 10, “Energy,” of the *U.S. Code of Federal Regulations* (CFR), Part 50, “Domestic Licensing of Production and Utilization Facilities”:

- 10 CFR 50.34, “Contents of Applications; Technical Information,” which provides the requirements for the Final Safety Analysis Report required for each plant, and includes the requirements for licensees to perform analysis of transients and postulated accidents to demonstrate safety of their facilities.

- 10 CFR Part 50 Appendix A, "General Design Criteria," which establishes the minimum requirements for principal design criteria for the facility. In particular, General Design Criterion (GDC) 10, "Reactor Design," requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to ensure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.
- 10 CFR Part 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," which requires that transient and accident analysis methods that are important to the safety of nuclear power plants be maintained under a quality assurance program.

These requirements are met by satisfying interim acceptance criteria defined in Chapter 4.2, "Fuel System Design" and Chapter 15.0.2, "Review of Transient and Accident Analysis Methods" of the Standard Review Plan.

The NRC staff will audit Supplement 1 and supporting documentation, to identify appropriate additional information necessary to close outstanding technical issues. Such information would need to determine (1) whether the proposed modifications presented within Supplement 1 are supported by the assessments and technical justifications provided by AREVA, and (2) whether the updated analysis methodology, as described in Supplement 1, is sufficient to meet the aforementioned regulatory requirements and NRC guidance.

### **3.0 REGULATORY AUDIT SCOPE**

The purpose of this audit is to enable the NRC staff to close outstanding technical issues identified during the review of Supplement 1 and the development of the staff's safety evaluation. In the present case, outstanding technical issues were identified with regard to updates made to APOLLO2-A, the lattice physics code used in the ARCADIA® Reactor Analysis System.

#### **3.1. Review of Cross-Section Adjustments**

Framatome made adjustments to several cross-sections within the APOLLO2-A lattice physics code. The exact nature of the adjustments in both approach and magnitude were not explicitly stated. Based on experience and the descriptions provided within the TR, the NRC staff has identified several possible approaches by which these adjustments could be made. The NRC staff cannot confirm which of the possible approaches are actually being implemented without additional information. To that end, the NRC staff intends to examine documentation during the audit to identify the specific approaches and magnitudes being used and to assess the associated justifications.

#### **3.2. Additional Discussion and Exit Meeting**

The NRC staff would like Framatome to make available the appropriate engineer(s) with intimate knowledge of Supplement 1 and can address any comprehension questions by the NRC staff. Engineers with expertise in any of the coupled codes used within the ARCADIA® Reactor Analysis System should be available if needed.

At the conclusion of the audit, an exit meeting will be held to summarize the additional information, if any, that Framatome will be requested to submit to continue the review. Other appropriate next steps, such as an update to the TR review schedule, will be discussed if needed.

#### **4.0 TEAM AND REVIEW ASSIGNMENTS**

<u>NAME</u>	<u>AFFILIATION</u>
Kevin Heller	NRC, Technical Reviewer
Jonathan Rowley	NRC, Project Manager
Michelle Guzzardo	Framatome
Kevin Segard	Framatome
Joshua Parker	Framatome
Nathan Hottle	Framatome

#### **5.0 LOGISTICS**

The audit will take place on Thursday, January 18, 2018, at the NRC Headquarters in Rockville, MD.

#### **6.0 DELIVERABLES**

A regulatory audit summary will be provided within 90 days of the completion of the audit.

#### **7.0 REFERENCES**

1. Request for Review and Approval of ANP-10297P(A), Revision 0, Supplement 1, "The ARCADIA® Reactor Analysis System for PWRs Methodology Description and Benchmarking Results Topical Report," June 26, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15187A263 (Publically Available)).
2. ANP-10297P(A), Revision 0, Supplement 1, "The ARCADIA® Reactor Analysis System for PWRs Methodology Description and Benchmarking Results," June 2015 (ADAMS Accession No. ML15187A268/ML15187A269 (Publically Available/Non-Publically Available)).
3. ANP-10297P-A, Revision 0, "The ARCADIA® Reactor Analysis System for PWRs Methodology Description and Benchmarking Results," February 2013 (ADAMS Package Accession No. ML14195A145).