



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

September 25, 2019

MEMORANDUM TO: Hanh Phan, Chief
Advanced Reactor Technical Branch
Division of Advanced Reactors
Office of New Reactors

FROM: Boyce Travis, Reactor Systems Engineer */RA/*
Advanced Reactor Technical Branch
Division of Advanced Reactors
Office of New Reactors

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF EPRI TOPICAL
REPORT "Uranium Oxycarbide (UCO) Tristructural Isotropic (TRISO)
Coated Particle Fuel Performance"

By letter dated May 31, 2019, the Electric Power Research Institute (EPRI) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review, "Uranium Oxycarbide (UCO) Tristructural Isotropic (TRISO) Coated Particle Fuel Performance, Topical Report EPRI-AR-1" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19155A173). This Topical Report describes the proposed basis for establishing a foundation for qualifying the TRISO fuel form.

The audit will take place at Idaho National Laboratory, Idaho Falls, Idaho. The audit entrance will be held on October 8, 2019. The contents of the audit plan are provided as an enclosure.

Enclosure:
Audit Plan

CONTACT: Boyce Travis, NRO/DAR/ARTB
301-415-4149

SUBJECT: AUDIT PLAN FOR THE REGULATORY AUDIT OF EPRI TOPICAL REPORT
"Uranium Oxycarbide (UCO) Tristructural Isotropic (TRISO) Coated Particle Fuel
Performance". DATED September 25, 2019

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**UNITED STATES NUCLEAR REGULATORY COMMISSION
AUDIT PLAN FOR THE REGULATORY AUDIT OF
TOPICAL REPORT “Uranium Oxycarbide (UCO) Tristructural
Isotropic (TRISO) Coated Particle Fuel Performance”**

APPLICANT: Electric Power Research Institute, Inc.

DATES: October 8 and 9, 2019

LOCATION: Idaho National Laboratory, Idaho Falls, Idaho

A. Background and Purpose:

By letter dated May 31, 2019, the Electric Power Research Institute (EPRI) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review, “Uranium Oxycarbide (UCO) Tristructural Isotropic (TRISO) Coated Particle Fuel Performance, Topical Report EPRI-AR-1” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19155A173). During the course of the technical review, NRC staff has identified areas where additional information and detail are needed to make a safety finding. The purpose of the audit is to review the relevant reports, calculations, and sources to verify the information and conclusions in the topical report.

B. Regulatory Audit Basis

10 CFR 50.34(a)(3)(i) requires in part that an applicant for a construction permit to build a power reactor provide principal design criteria for the facility. Similar regulatory requirements exist for design certification, combined license, and standard design approvals (10 CFR 52.47(a)(3)(i), 10 CFR 52.79(a)(4)(i), and 10 CFR 52.137(a)(3)(i), respectively).

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 assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. Although GDC 10 applies only to light water reactor (LWR) designs, the staff expects non-LWR designs to have a similar GDC. Establishing fuel design limits and ensuring these limits are not exceeded represent a fundamental underpinning of the safety assessment of a nuclear power plant required by 10 CFR 50.34(a)(1). The topical report discussed here forms the basis for establishing the design limits for TRISO fuel.

Further, 10 CFR 50.34(a)(1)(ii)(C) requires an applicant describe the extent to which the reactor incorporates unique, unusual or enhanced safety features having a significant bearing on the probability or consequences of accidental release of radioactive materials. TRISO fuel presents a unique safety case in a “functional containment” approach for reducing the release of radioactive materials, and the mechanisms by which TRISO fuel restricts the release of radioactive materials are described in this topical report.

Enclosure

The NRC staff will follow NRO Office Instruction NRO-REG-108 (Revision 0), "Regulatory Audits," (ADAMS Accession No. ML081910260) in performing the audit of the reports and calculations cited below.

C. Regulatory Audit Scope

Staff expects discussions will center on the following areas:

1. Advanced Gas Reactor (AGR) post-irradiation examination (PIE) that is referenced in the topical report;
2. The particle characterization dataset development leading to the topical report Table 5-3;
3. Further detail related to data used to develop topical report Table 5-5;
4. Temperature margin test data sets discussed in the topical report;
5. Context on the quality assurance program used in data acquisition for the data used in the topical report;
6. Additional information related to strontium, europium, and silver releases during "normal operation" (as defined in the topical report);
7. The role of the topical report in defining acceptable peak accident conditions as opposed to any transient conditions (e.g. rapid temperature changes);
8. The role of the topical report in defining specified acceptable system radionuclide release design limits (SARRDLs); and
9. The planned use of future AGR data to support the conclusions referenced in the report.

D. Information and Other Material Necessary for the Regulatory Audit

Staff expects discussions will center on the areas identified above in the Regulatory Audit Scope section, and documents pertaining to these areas are to be made available to the NRC staff, as applicable based on the discussion.

Other documents will be requested based on the progress of the staff's review.

Appropriate handling and protection of proprietary information shall be acknowledged and observed throughout the audit.

E. Audit Team

The following are the NRC audit team members:

1. Jeff Schmidt, Senior Reactor Systems Engineer (NRC)
2. Chris Van Wert, Senior Reactor Systems Engineer (NRC)
3. Boyce Travis, Reactor Systems Engineer (NRC)
4. Antonio Barrett, Reactor Systems Engineer (NRC)
5. Jordan Hoellman, Project Manager (NRC)

The following are the applicant contacts:

1. Steve Nesbit (LMNT Consulting)
2. Andrew Sowder (EPRI)
3. Cristian Marciulescu (EPRI)

F. Logistics

The NRC staff will address in the audit report the technical areas identified in the Regulatory Audit Scope of this audit plan along with presenting the audit outcomes.

The audit will be conducted in support of the schedule for completion of the topical report review, with an entrance on October 8, 2019, and an exit on October 9, 2019.

The NRC staff acknowledges the potential for the proprietary nature of some of the information requested. It will be handled appropriately throughout the audit. NRC staff will take notes that will be marked as proprietary and will not remove hard copies or copy electronic files.

G. Special Requests

If necessary, any circumstances related to the performance of the audit will be communicated to the applicant.

H. Deliverables

At the completion of the audit, the NRC staff will prepare an audit report within 45 days that will be declared and entered as an official agency record in ADAMS. The audit outcome may be used to identify any additional information to be submitted for making regulatory decisions and will assist the NRC staff in the issuance of request for additional information (RAI), if necessary, in completing its review of the topical report. With the anticipated exit teleconference on October 9, 2019, the audit report is expected to be completed by November 22, 2019.