

Periodic Review

Regulatory Guide Number: 2.3, Revision 2

Title: Quality Verification for Plate-Type Uranium-Aluminum Fuel Elements for Use in Research Reactors

Office/division/branch: NRR/DANU/UNPL
Technical Lead: Patrick Boyle

Staff Action Decided: Reviewed with issues identified for future consideration.

1. What are the known technical or regulatory issues with the current version of the Regulatory Guide (RG)?

Regulatory Guide (RG) 2.3, Revision 2 (Rev. 2), "Quality Verification for Plate-Type Uranium-Aluminum Fuel Elements for Use in Research Reactors," issued in May 2013, establishes the NRC's position for an acceptable approach for verifying the quality of plate-type uranium-aluminum fuel elements used in research and test reactors (RTRs). RG 2.3 Rev. 2, finds that American National Standards Institute, Inc. /American National Standard (ANSI/ANS)-15.2-1999 (R2009), "Quality Control for Plate-Type Uranium- Aluminum Fuel Elements," provides an acceptable method for complying with the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) section 50.34(a)(7) in regard to establishing and executing a quality assurance program for verifying the quality of plate-type uranium-aluminum fuel elements for use in RTRs.

ANSI/ANS 15.2 defines the fuel core as aluminum-uranium alloy, or a dispersion of U_3O_8 , UAl_x , or U_xSi , in aluminum. The NRC staff has been informed by the Department of Energy that a new plate-type fuel with uranium-aluminum is being developed for use in RTRs. The new fuel is a zirconium coated monolithic uranium-molybdenum aluminum clad plate fuel. The quality control for this new plate-type fuel can be met by the quality control specified in ANSI/ANS 15.2. Quality control elements such as cladding and core thickness and fuel homogeneity remain of significant importance.

RG 2.3 provides an approach acceptable to the NRC for ensuring quality control for plate-type uranium-aluminum fuel currently in use in RTRs. Consideration should be given to updating the guide once the new plate fuel becomes available for use in RTRs. The revised guidance will need to address the performance of blister testing and its potential to impact the zirconium layer in the fuel to determine if blister testing remains appropriate.

2. What is the impact on internal and external stakeholders of not updating the RG for the known issues, in terms of anticipated numbers of licensing and inspection activities over the next several years?

RG 2.3, Rev. 2, remains acceptable for use for the currently operating reactors. The RG should be revised once the new plate-type fuel becomes available for use in RTRs. The new plate-type fuel is planned to allow conversion of the reactors with highly enriched uranium fuel to low enriched uranium fuel. The guidance should be updated to support the implementation of the low enrichment uranium fuel. Failure to revise the guidance will create uncertainty related to the acceptable method to ensure quality of the new plate-type fuel for use in RTRs.

3. What is an estimate of the level of effort needed to address identified issues in terms of full-time equivalent (FTE) and contractor resources?

It is expected that approximately 0.5 FTE would be required to review any changes to ANS 15.2 regarding the new plate-type fuel. The review would also need to consider the actions identified in ANS 15.2 to ensure the quality of the monolithic plate fuel. Contractor support is not considered in this estimate.

4. Based on the answers to the questions above, what is the staff action for this guide?

Reviewed with issues identified for future consideration.

5. Provide a conceptual plan and timeframe to address the issues identified during the review.

Although the NRC does not currently plan a revision to this RG, the NRC plans to complete a detailed evaluation to ensure quality of the new plate-type fuel once it is approved for use. The current schedule from the Department of Energy indicates that the qualification plan for the new fuel will be submitted in FY2024. The NRC staff review should follow within 6-months of the submittal.

REFERENCES

1. ANSI/ANS 15.2-1999 (R2009), "Quality Control for Plate-Type Uranium-Aluminum Fuel Elements."
2. "Memorandum of Understanding Between U.S. Nuclear Regulatory Commission and U.S. Department of Energy National Nuclear Security Administration of Low-Enrichment Fuel Qualification," ML20241A205, dated November 18, 2020.

NOTE: This review was conducted in September 2023 and reflects the staff's plans as of that date. These plans are tentative and subject to change.