

Regulatory Guide Periodic Review

Regulatory Guide Number: 3.21 Revision 0

Title: Quality Assurance Requirements for Protective Coatings Applied to Fuel Reprocessing and to Plutonium Processing and Fuel Fabrication Plants

Office/Division/Branch: NMSS/DFM/IOB and NRR/DNRL/NLIB

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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 3.21 Revision 0, issued in March 1974, describes an acceptable method to comply with the NRC regulations with regard to protective coatings applied to ferritic steels, aluminum, stainless steel, zinc coated (galvanized) steel, concrete, or masonry surfaces of fuel reprocessing or plutonium processing and fuel fabrication plants. It endorses the use of the American National Standards Institute (ANSI) standard N101.4-1972, "Quality Assurance for Protective Coatings Applied to Nuclear Facilities," subject to certain clarifications and exceptions, as an acceptable method for meeting the applicable regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants" as well as Sections 70.22(f), "Contents of applications," and 70.23(b), "Requirements for the approval of applications." RG 3.21 further states that ANSI N101.4-1972 should be used in conjunction with RG 3.3, "Quality Assurance Program Requirements for Fuel Reprocessing Plants and for Plutonium Processing and Fuel Fabrication Plants," which endorses the standard ANSI N45.2-1971, "Quality Assurance Program Requirements for Nuclear Power Plants."

A periodic review of RG 3.21 was performed in 2013 and no issues were identified. However, during this review of RG 3.21 the staff has identified technical and administrative issues such as noting that the abovementioned standards ANSI N45.2-1971 and ANSI N101.4-1972 are outdated. ANSI formally withdrew ANSI N101.4-1972 in 1988 and transferred the responsibility for updating, rewriting, and issuing appropriate replacement standards to the American Society for Testing and Materials (ASTM). ASTM has developed standard ASTM D 3843-00, "Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities" to replace ANSI N101.4-1972 and to reflect the current industry practice. This and other ASTM standards for protective coatings are endorsed in RG 1.54, "Service Level I, II, III, and In-Scope License Renewal Protective Coatings Applied to Nuclear Power Plants." ANSI N45.2 has been replaced by ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications," which is endorsed in RG 1.28, "Quality Assurance Program Criteria (Design and Construction)."

As RG 3.21 has not been updated since 1974, the overall structure and formatting is outdated and there are likely significant technical issues related to the adequacy of this guidance for both fuel reprocessing plants and plutonium processing and fuel fabrication plants. While the full extent of the technical issues is unknown at this time, the NRC staff plans to conduct a review of the ASTM standards endorsed in RG 1.54 for applicability to fuel reprocessing plants and plutonium processing and fuel fabrication plants.

For fuel reprocessing facilities, one additional issue stems from the fact that RG 3.21 was written to address aqueous reprocessing techniques. Since RG 3.21 was issued, industry has expressed an interest in other reprocessing techniques, particularly electrochemical processing. Because the technique involves different safety issues than aqueous techniques, RG 3.21 may need to be supplemented with guidance for this technique. In addition, RG 3.21 may need to be updated to reflect operating experience in other countries that use reprocessing, variations in aqueous reprocessing techniques that have emerged since the document was issued, and potentially other types of reprocessing techniques. Future plutonium processing and fuel fabrication plants could also employ substantially different technologies than those that were envisioned or in use on an industrial scale in the 1970's. For example, the modern tri-structural isotropic fuel technology could be utilized for plutonium fuel fabrication.

Certain regulatory issues likely exist in the current revision of this RG, stemming from the licensing framework that would be applicable for reprocessing facilities, including changes in the applicable regulations and related regulatory guidance since RG 3.21 was issued. As background, 10 CFR Part 50 establishes requirements for the licensing of production and utilization facilities. In SECY-09-0082, "Update on Reprocessing Regulatory Framework – Summary of Gap Analysis," (Agencywide Documents Access and Management System (ADAMS) Accession No. ML091520243) the staff provided a summary of the regulatory gap analysis for developing the necessary framework to license reprocessing facilities. In SECY-11-0163, "Reprocessing Rulemaking: Draft Regulatory Basis and Path Forward," (ADAMS Accession No. ML113202350) the staff provided a draft regulatory basis document that addressed the 23 regulatory gaps identified in SECY-09-0082.

In SECY-13-0093, "Reprocessing Regulatory Framework – Status and Next Steps," (ADAMS Accession No. ML13178A233) the staff recommended finalization of the draft regulatory basis document and development of a reprocessing-specific rule (e.g., 10 CFR Part 7x). However, in SECY-21-0026, "Discontinuation of Rulemaking – Spent Fuel Reprocessing," (ADAMS Accession No. ML20301A387) the staff recommended that the rulemaking activity be discontinued because the effort was not cost-justified based on the limited interest expressed or expected from potential applicants for reprocessing facilities. The staff further concluded that licensing a reprocessing facility could be adequately accomplished under the existing 10 CFR Part 50 framework, recognizing that there would be a need for exemptions. In SRM-SECY-21-0026 (ADAMS Accession No. ML21175A0634), the Commission approved the staff's recommendation to discontinue the Spent Fuel Reprocessing rulemaking activity.

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?

While there are currently no holders of fuel reprocessing plant or plutonium processing and fuel fabrication plant licenses, the staff anticipates a limited number of applicants in the next several years. Applicants for these facilities, particularly those using electrochemical reprocessing techniques, would not have current guidance and acceptance criteria for their proposed facilities, so they may not initially provide the appropriate scope and depth of their applications. The staff would also not have current guidance that can be used to review the applications, reducing regulatory predictability and efficiency of the reviews. This situation would likely increase the level of effort and engagement needed by staff to complete the application reviews for the proposed facilities.

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?

This RG periodic review is being conducted now as it is part of the NRC's systematic process for ensuring the agency has adequate guidance. Separate from this periodic review, the staff has a working group that is holistically assessing the regulatory framework for reprocessing. The holistic assessment is also considering what other RGs pertaining to reprocessing may need updating. The staff plans to determine resources needed for updating RG 3.21 as part of the holistic assessment of the reprocessing regulatory framework and will identify the FTE and contract dollars at that time.

4. Based on the answers to the questions above, what is the staff action for this guide (Reviewed with no issues identified, Reviewed with issues identified for future consideration, Revise, or Withdraw)?

Reviewed with issues identified for future consideration.

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

The NRR staff formed an agency working group in May 2023 to conduct an evaluation of the existing regulatory framework for reprocessing facilities and develop the following items:

1. Areas where existing guidance documents that apply to reprocessing facilities would require updates and/or instances where new guidance needs to be developed. Guidance updates may be needed to bring existing RGs in line with current regulatory requirements and/or to incorporate technology-neutral considerations.
2. A high-level description of the updates needed to the existing regulatory guidance and infrastructure.
3. A recommendation regarding the use of contractor resources.
4. A recommendation on further communications with the Commission.

The working group is developing a plan for any infrastructure updates and RG 3.21 will be appropriately prioritized and scheduled in accordance with that plan.