

REGULATORY ANALYSIS

DRAFT REGULATORY GUIDE DG-1373 Fresh and Spent Fuel Criticality Analysis (Proposed New Regulatory Guide)

1. Statement of the Problem

The U.S. Nuclear Regulatory Commission (NRC) is considering issuing a new regulatory guide (RG) to provide applicants and licensees subject to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” or 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” with guidance on methods and procedures for performing criticality analyses of fuel storage in spent fuel pool storage racks and fresh fuel vaults at light-water reactor (LWR) power plants. These criticality analyses are integral to the technical foundation for the design of nuclear fuel storage structures, systems, and components, and the associated technical specifications in applications (i.e., license amendment requests (LARs)) submitted to the NRC for review and approval. The guide would provide comprehensive and durable guidance for performing criticality analyses that assure criticality safety and demonstrate compliance with 10 CFR 50.68(b).

In 2011, the NRC issued interim staff guidance DSS-ISG-2010-01, “Staff Guidance Regarding the Nuclear Criticality Safety Analysis for Spent Fuel Pools,” (Agencywide Document Access Management System (ADAMS) Accession Number ML110620086). The intent of DSS-ISG-2010-01 was to clarify ambiguity in existing guidance and build upon lessons learned based on the NRC staff’s then-recent licensing reviews. While DSS-ISG-2010-01 provided updated guidance to the NRC staff that was responsive to the increased complexity of more recent spent fuel pool license application analyses and operations, it does not comprehensively consider all aspects of performing criticality analyses of fuel storage at light-water reactor (LWR) power plants. Therefore, there is a need for a comprehensive and more specific guidance document for performing criticality analyses of fuel storage at LWR power plants.

The Nuclear Energy Institute (NEI), in collaboration with the Electric Power Research Institute (EPRI), developed NEI 12-16, “Guidance for Performing Criticality Analyses of Fuel Storage at Light-Water Reactor Power Plants,” to fill this regulatory need. This guidance document represents NEI’s effort to outline current practices in nuclear criticality analyses for fuel storage in vaults or pools and to establish a technical basis for certain positions. The most recent version of NEI 12-16, Revision 4, (ADAMS Accession No. ML19269E056), incorporated the final NRC-approved version of the EPRI methodology in Technical Report 3002010613, “Benchmarks for Qualifying Fuel Reactivity Depletion Uncertainty – Revision 1,” (ADAMS Accession No. ML18088B397), and the NRC issued a final safety evaluation for the topical report in a letter dated July 19, 2019 (ADAMS Accession No. ML19189A112). On September 26, 2019, NEI submitted NEI 12-16, Revision 4, to the NRC (ADAMS Accession No. ML19269E056), and NEI seeks its endorsement by the NRC through a RG. This draft guide proposes to endorse, with clarifications and exceptions, the guidance described in NEI 12-16, Revision 4, as one acceptable approach to demonstrate compliance with 10 CFR 50.68(b).

2. Objective

The objective of this regulatory action is to update NRC guidance and provide 10 CFR Parts 50 and 52 licensees and applicants with a method to demonstrate compliance with the requirements of 10 CFR Part 50.68(b) for performing criticality analyses of fuel storage at LWR power plants.

3. Alternative Approaches

The NRC staff considered the following alternative approaches:

1. Do not develop a Regulatory Guide on performing criticality analyses of fuel storage at LWR power plants.
2. Develop a Regulatory Guide on performing criticality analyses of fuel storage at LWR power plants.

Alternative 1: Do Not Develop a Regulatory Guide

Under this alternative, the NRC would not issue additional guidance, and the current temporary guidance would be retained. If NRC does not take action, there would not be any changes in costs or benefits to the public, licensees, or the NRC. However, the “no-action” alternative would not address identified concerns due to the absence of more comprehensive NRC guidance for performing criticality analyses. The NRC would continue to review each application on a case-by-case basis. This may result in increased NRC staff review time and the need for NRC staff to request additional information from licensees and applicants. Licensees and applicants would then have to expend resources in responding to the requests for additional information. In addition, the continued use of the temporary guidance in DSS-ISG-2010-01 is not an ideal situation for long-term regulatory stability compared to permanent types of guidance, such as a RG. This alternative is considered the “no-action” alternative and provides a baseline condition from which any other alternatives will be assessed.

Alternative 2: Develop a Regulatory Guide

Under this alternative, NRC would develop a RG to provide guidance for 10 CFR Part 50 and 52 licensees and applicants that must perform criticality analyses of fuel storage at LWR power plants to comply with the requirements of 10 CFR 50.68(b). The impact to the NRC would be the costs associated with preparing and issuing the new regulatory guide endorsing the guidance in NEI 12-16, Revision 4. The impact to the public would be the voluntary costs associated with reviewing and providing comments to the NRC during the public comment period. The value to the NRC staff and its applicants would be the benefits associated with enhanced efficiency and effectiveness in using a common guidance document as the technical basis for applications and other interactions between the NRC and its regulated entities. In addition, this RG would provide a more comprehensive and durable guidance that updates and supersedes the temporary guidance in DSS-ISG-2010-01. Although current licensees that use DSS-ISG-2010-01 may continue using it as long as they do not change their licensing bases relative to that guidance. Presumably, this new RG would reduce the need for the NRC staff to request additional information from licensees and applicants.

Conclusion

Based on this regulatory analysis, the NRC staff concludes that issuance of a new regulatory guide is warranted. The action would enhance a licensee's and applicant's ability to perform criticality analyses of fuel storage at LWR power plants to meet the 10 CFR 50.68(b) criticality safety requirements. Issuing a RG would also replace the temporary guidance, identified above, with a more comprehensive RG. This action could also lead to cost savings for the industry, especially with regard to NRC staff review time and the need for requests for additional information when reviewing license amendment requests, applications for standard plant design certifications, and combined licenses.