



SCREENING REVIEW

10CFR70, 10CFR71, 10CFR72, NUREG-1609, NUREG-1520, NUREG-1617,
NUREG-2215 AND SELECTED INTERIM STAFF GUIDANCE DOCUMENTS

by NEI Licensing Task Force Subcommittee 2

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Screening Review of 10CFR70, 10CFR71, 10CFR72, NUREG-1609, NUREG-1520, NUREG 1617, NUREG-2215 and Selected Interim Staff

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INTRODUCTION AND BACKGROUND

The Nuclear Regulatory Commission’s (NRC) “Draft Project Plan to Prepare the U. S. Nuclear Regulatory Commission to License and Regulate Accident Tolerant Fuel,” issued in early 2018, proposed four preparatory tasks. Task 2: ‘Fuel Cycle, Transportation, and Storage Regulatory Framework’ was to address out-of-reactor regulatory framework in support of 1) batch loading of Accident Tolerant Fuel (ATF) into NRC-regulated power plants, and 2) crediting the safety enhancements of ATF in the licensing basis of NRC-regulated power plant.

Following the issuance of the NRC’s first draft plan, Subcommittee 2 was formed under the NEI ATF Licensing Task Force to screen for potential ATF impacts in 10CFR70, 10CFR71, 10CFR72, various NUREGs, and fabrication/transport/storage-related Regulatory Guides. Phase 1 of the review effort resulted in NEI issuing “Screening Review 10CFR71, NUREG-1609, NUREG-4775, and Shipping Related Regulatory Guides” in December 2018. This Phase 1 report presents the results of the screening completed in 2018 by Subcommittee 2, which focused on near-term ATF concepts for un-irradiated shipments.

In September 2018 the NRC issued Version 1.0 of the project plan. Section 8, Table 8.1 of the NRC project plan presents the regulatory and guidance documents identified by the NRC as potentially requiring changes for ATF, outside of 10CFR70/71/72. These are NUREG-1609 “Standard Review Plan for Transportation Packages for Radioactive Material”, NUREG-1617 “Standard Review Plan for Transportation Packages for Spent Nuclear Fuel”, NUREG-1520 “Standard Review Plan for Fuel Cycle Facilities License Applications,” and “Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities”, and a link to 25 Interim Staff Guidance (ISG) documents. Phase 2 reviewed these documents for impacts and the results are described below. Note: the impacts of enrichments above 5 weight percent U-235 or burnups greater than currently licensed levels were not reviewed.

2019 PHASE 2 REVIEWS

The ATF Licensing Task Force Subcommittee 2 has completed a review of regulatory documents pertaining to fabrication of fuel, non-irradiated fuel transportation, irradiated fuel transportation, and partially for dry cask storage for most of the identified ATF concepts. Since the documents were reviewed looking for specific references to UO₂ pellets and zirc-based clads, those concepts that deviate from those traditional fuel characteristics would be included in the gap analysis. Those regulations reviewed were:

10CFR70	Domestic Licensing of Special Nuclear Material
10CFR71	Packaging and Transportation of Radioactive Material
10CFR72	Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-level Radioactive Waste, and Reactor-Related Greater than Class C Waste
NUREG-1609	Standard Review Plan for Transportation Packages for Radioactive Fuel
NUREG-1520	Standard Review Plan for Fuel Cycle Facilities License Applications
NUREG-1617	Standard Review Plan for Transportation Packages for Spent Nuclear Fuel
NUREG-2215	Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities

ISG DOCUMENTS IDENTIFIED IN THE NRC PROJECT PLAN

SFST-ISG-1, Revision 2	Damaged Fuel
SFST-ISG-2, Revision 2	Fuel Retrievability
SFST-ISG-3	Post-Accident Recovery and Compliance with 10 CFR 72.122(l)
SFST-ISG-4, Revision 1	Cask Closure Weld Inspections
SFST-ISG-5, Revision 1	Confinement Evaluation
SFST-ISG-6	Establishing Minimum Initial Enrichment for the Bounding Design Basis Fuel Assembly(s)
SFST-ISG-7	Potential Generic Issue Concerning Cask Heat Transfer in a Transportation Accident
SFST-ISG-8, Revision 3	Burnup Credit in the Criticality Safety Analyses of PWR Spent Fuel in Transport and Storage Casks

continued

ISG DOCUMENTS IDENTIFIED IN THE NRC PROJECT PLAN

SFST-ISG-9, Revision 1	Storage of Components Associated with Fuel Assemblies
SFST-ISG-10, Revision 1	Alternatives to the ASME Code
SFST-ISG-11, Revision 3	Cladding Considerations for the Transportation and Storage of Spent Fuel
SFST-ISG-12, Revision 1	Buckling of Irradiated Fuel Under Bottom End Drop Conditions
SFST-ISG-13	Real Individual
SFST-ISG-14	Supplemental Shielding
SFST-ISG-15	Materials Evaluation
SFST-ISG-16	Emergency Planning
SFST-ISG-17	Interim Storage of Greater Than Class C Waste
SFST-ISG-18, Revision 1	The Design and Testing of Lid Welds on Austenitic Stainless Steel Canisters as the Confinement Boundary for Spent Fuel Storage
SFST-ISG-19	Moderator Exclusion Under Hypothetical Accident Conditions and Demonstrating Sub-criticality of Spent Fuel Under the Requirements of 10 CFR 71.55(e)
SFST-ISG-20	Transportation Package Design Changes Authorized Under 10 CFR Part 71 Without Prior NRC Approval
SFST-ISG-21	Use of Computational Modeling Software
SFST-ISG-22	Potential Rod Splitting Due to Exposure to an Oxidizing Atmosphere During Short-Term Cask Loading Operations in LWR or Other Uranium Oxide Based Fuel
SFST-ISG-23	Application of ASTM Standard Practice C1671-07 when performing technical reviews of spent fuel storage and transportation packaging licensing actions
SFST-ISG-24	The Use of a Demonstration Program as a Surveillance Tool for Confirmation of Integrity for Continued Storage of High Burnup Fuel Beyond 20 Years
SFST-ISG-25, Revision 0	Pressure Test and Helium Leakage Test of the Confinement Boundary for Spent Fuel Storage Canister

The subcommittee's review did not identify any changes needed for 10CFR70, 10CFR71, or 10CFR72. The regulations were general enough in their wording that they could be used for each of the ATF concepts to ensure all requirements would be met. For both un-irradiated and irradiated fuel shipping, each vendor's shipping container Certificate of Compliance (CoC) must be reviewed to ensure it can be used for the specific ATF concept, or if a revised (or new) CoC will be required. Vendors will address any necessary revisions to shipping container CoCs individually.

The review of NUREG-1609, NUREG-1520, and NUREG-1617 did not identify any required revisions. NUREG-2215 was initially planned to be reviewed, however it was identified that NEI and the Dry Cask Task Force provided comments on an existing revision which had its comment period closed. It is intended that following issuance of the latest revision of NUREG-2215 another review of all identified ATF concepts be performed.

The review of the ISGs identified that three guidance documents would need to be revised by the NRC and another nine would require vendor analyses for their specific ATF concept but do not require ISG revision. Those identified as needing revision include ISG-5, ISG-15, and ISG-22, with specific information listed below. Those identified as requiring vendor analysis consideration are ISG-3, ISG-5, ISG-7, ISG-8, ISG-11, ISG-12, ISG-15, ISG-22, and ISG-24.

ISG-5 is related to Dry Cask Storage Confinement and page 6 of the ISG does reference UO₂ fuel related to inert gas environments. Page 10 contains a table with release fraction values from NUREG/CR-6487 that could be impacted by fuel/clad changes.

ISG-15 is related to the material properties of cask components and fuel for both Dry Cask Storage and Spent Fuel Transportation applications. Paragraph X.4.4 provides specific criteria for Zircaloy clad fuel and references PNL-4835 (Technical Basis for Storage of Zircaloy-Clad Spent Fuel in Inert Gases, Sept 1983). This would need to be updated for non-Zircaloy clad fuel. Paragraph X.5.4.1 also references Zircaloy along with advanced alloy cladding and has broader applicability. This section needs to be reviewed further and also references NUREG-1536.

ISG-22 is related to both Dry Cask Storage and Spent Fuel Transportation for potential rod splitting during loading operations for UO₂ base fuel. A revision to address non-UO₂ fuel or non-Zircaloy clads are likely needed.

CONCLUSION

- In general, 10CFR70/71/72 were written to be performance-based regulations and, as a result, less prescriptive than Part 50. The regulation uses defined terms, such as uses defined terms, such as "special nuclear material," so that the performance requirements are determined without regard of the physical form of material (e.g., metal, powder, UO₂, U₃O₈, etc.). However, the physical form may be important in the assessment of the ability to meet a performance requirement.
- The NUREGs reviewed also did not identify any gaps that would require revision; however NUREG-2215 should be reviewed once the latest revision is issued by the NRC.
- The review of the Interim Staff Guidance documents referenced in the NRC Project Plan have identified three ISGs that will require revision or a new ISG to account for ATF concepts. Additionally ISG-15 should be evaluated further along with its reference to NUREG-1536.



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