

Spent Fuel Storage and Transportation Scoping and Implementation Plan for Risk-Informing Regulatory Activities

Background:

The Nuclear Regulatory Commission (NRC) risk-informs a variety of operating and new nuclear reactor regulatory activities. This practice is rooted in probabilistic risk assessment (PRA), a highly detailed quantitative method. The resources required to develop PRA models are dependent on the complexity of the systems the models are simulating. The resources used to develop PRAs are justified for nuclear power plants given their complexity, system and component failure probabilities, and the potential significant consequences of severe accidents. The NRC and the Electric Power Research Institute (EPRI) each completed a pilot PRA of dry cask storage systems, which are considerably less complex than nuclear power plants. Both pilot PRAs indicated the risk of dry spent fuel storage is extremely low.

The Office of Nuclear Material Safety and Safeguards has developed a document titled "Risk-Informed Decisionmaking for Nuclear Material and Waste Applications" (RIDM) (ADAMS Accession Number ML080720238) that contains concepts that can be used to:

- Supplement decision-making approaches on regulatory relief, safety considerations, and additional requirements.
- Apply the RIDM framework to a wide range of nuclear material and waste regulatory issues.
- Develop a step-by-step procedure based on specific examples in the RIDM to help the staff consistently and effectively apply a risk-informed approach on a case-by-case basis for regulatory decision-making.

Agency activities and stakeholder interactions prompted the initiative to evaluate the use of risk-informing and risk insights in Spent Fuel Storage and Transportation (SFST) regulatory activities. For example, the Nuclear Energy Institute sent Petition for Rulemaking (PRM) 72-7 to the NRC in October 2012. This PRM requested the NRC to make changes to 10 CFR 72 "based on experience and risk insights gained since the regulations were developed in the 1980s and modified in 1990 pursuant to the Nuclear Waste Policy Act." Also, NUREG-2150, "A Proposed Risk Management Regulatory Framework," was issued in April 2012 to guide development of a strategic vision and options for adopting a more comprehensive, holistic, risk-informed, performance-based regulatory approach across the spectrum of NRC regulated activities, including SFST. In response to the recommendations made in NUREG-2150, the NRC is developing a revised agency risk policy regarding the use of risk-informing and defense-in-depth approaches across the spectrum of NRC's regulatory activities.

Goal:

The goal of this SFST effort is to develop a risk-informed framework to better enable the staff to focus SFST regulatory efforts, improve guidance, streamline casework activities, help assess 10 CFR 72.48 changes, and evaluate requests for exemptions to the regulations while maintaining appropriate margins of safety and security. This effort should be informed by, and consistent with, the agency direction given in any (draft and final) agency risk policy and respond to the recommendations listed in NUREG-2150. The recommendations in NUREG-2150 relative to SFST activities are:

Recommendation S-R-1: While elements of the proposed risk management approach have been used in the spent nuclear fuel (SNF) storage regulatory approach to evaluate the acceptable level of risk and the sufficiency of defense-in-depth (physical barriers, controls or margins) more consistently, the NRC should develop the necessary risk information, the corresponding decision metrics, and numerical guidelines. This is important in guiding further changes to the existing SNF storage regulatory approach and the evaluation of strategies for extended SNF storage activities.

Recommendation S-R-2: As part of the implementation of the proposed risk management regulatory framework, the NRC should more consistently consider the concept of defense-in-depth explicitly and evaluate its proper use in the SNF storage regulatory program. The NRC should also improve appropriate parts of staff training to make this concept a central part of such training.

Recommendation T-R-1: Considering the strong international regulatory basis for transportation and the need to conform U.S. standards to those of the International Atomic Energy Agency (IAEA) and other member states, application of the proposed risk management regulatory framework should focus on implementation guidance.

Recommendation T-R-2: The risk management process should be used to influence the future outcome of IAEA deliberations on proposed changes in international transportation regulations.

Recommendation T-R-3: The NRC should explore the value of using risk insights to justify regulations different from the IAEA's for domestic use only, such as regulations dealing with domestic storage and transportation of high burnup fuel. Risk information could be used to develop a more flexible approach toward implementing and making gradual changes to current transportation regulations.

Approach:


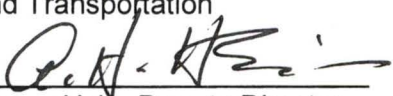


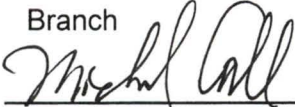
The approach outlined below is a high-level description of the activities needed to define a qualitative risk-informed framework for dry cask storage. Spent fuel transportation activities will follow after the storage strategy has been developed, tested through pilots, finalized, and implemented. The following outline for risk-informing dry cask storage activities is consistent with the storage recommendations listed above from NUREG-2150, and with the draft plan of action developed by the Risk Management Regulatory Framework (RMRF) Working Group. Some steps in the outline may require resources from the Office of Nuclear Regulatory Research or other internal and external sources to develop new information or tools to aid risk-informing SFST activities. The development of a risk-informed approach for regulating spent nuclear fuel in dry casks will engage outside stakeholders in working groups and/or public meetings as needed.

This effort is a first-of-a-kind activity; the projected completion dates and sequencing of activities below are based on the best estimate of the staff at the time of the plan's issuance. Completion dates and sequencing of activities may be adjusted as the risk-informing activity progresses.

1. Collect Available Risk Information **(Completion: 10/1/2014)**
 - a. Identify and collect potential information sources (e.g., applicable PRAs, summaries of Integrated Safety Analyses, Human Reliability Analyses, Standard Review Plan prioritization information, etc.)
2. Define the Current Application of Defense-in-Depth (DID) and Reasonable Assurance for Dry Cask Storage **(Completion: 2/1/2015)**
 - a. Identify and document insights from collected sources applicable for defining DID
 - b. Draft DID document
 - c. Solicit input from internal and external stakeholders
 - d. Document appropriate DID for dry cask storage
3. Define Decision Metrics and Acceptable Risk Criteria for Storage **(Completion: 7/1/2015)**
 - a. Identify and document insights from collected sources applicable for defining decision metrics and risk criteria
 - b. Review how decision metrics are defined and applied in other regulatory contexts within the agency.
 - c. Develop guidelines/basis for decision metrics and determine acceptable risk limits for dry cask storage.
 - d. Determine how changes in risk will be evaluated qualitatively.
 - e. Engage stakeholders to solicit input
 - f. Issue decision metrics for storage
4. Develop the Preliminary Risk-Informing Approach for Storage **(Completion: 11/1/2015)**
 - a. Review applicable risk-informing approaches from collected sources
 - b. Refine Defense-in-Depth as necessary
 - c. Draft an approach/process for storage consistent with the RMRF decision-making process, as appropriate.
 - d. Identify and document insights from collected sources applicable for defining decision metrics and risk criteria
 - e. Determine how and when to apply the process, e.g., updating review/inspection guidance, addressing new issues, or casework review.
 - f. Engage stakeholders to solicit input
 - g. Issue preliminary approach
5. Apply Preliminary Risk-Informing Approach to a Pilot **(Completion: 2/28/2016)**
 - a. Engage stakeholders to solicit input
 - b. Select an activity to pilot the approach
 - c. Apply the pilot.
 - d. Review the results of the pilot. Determine effectiveness of the pilot and what improvements can be made.
 - e. Identify necessary changes to the preliminary approach and obtain any additional information or risk tools needed to improve the preliminary risk-informing approach.
 - f. Engage stakeholders to solicit input
 - g. Document lessons learned from the pilot

6. Finalize Risk-Informing Approach (**Completion: 6/1/2016**)
 - a. Incorporate lessons learned from the pilot and any new information or tools into the final risk-informing approach.
 - b. Engage stakeholders to solicit input
 - c. Issue final risk-informing approach for storage
7. Develop Staff Training (**TBD**)
 - a. Identify and evaluate currently available training courses on these topics for applicability for risk-informing storage (e.g., P-400 – Introduction to Risk Assessment in NMSS).
 - b. Identify any additional training needs.
 - c. Develop training resources, e.g., guidance, classes, necessary to meet the identified needs.

Stakeholders (e.g., industry, members of the public, Department of Energy, etc.) will be engaged throughout the process to ensure their perspectives are factored into the process.

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