

Risk Tool for Spent Fuel Dry Storage

Spent Fuel Margins Workshop
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Risk Tool for Spent Fuel Dry Storage

Intent and Purpose

- Expand the use of risk information in our regulatory activities
- Suggest level of review, based on risk insight
- Allow for a more consistent review process and improve efficiency and safety
- Provide a means to document and incorporate new risk information from future reviews

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Additional Purpose

RIRP N-20-0X

Recommendation II-1: NRC should develop an Acceptance Review Grading process that would assign varying levels of review to an application, from the time it is initially received, based on risk insights. This is a Category 2 recommendation which would require NRC to revise its internal review guidance and practices. This would not be a formal guidance but more of a suggestion for level of review.

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Expectations

(Defining Spent Fuel Performance Margins)

Develop a grading process that:

- ▶ Requires no rulemaking
- ▶ No development of formal guidance
- ▶ Achievable in a relatively short period of time

Risk Tool for Spent Fuel Dry Storage

What is the INL Dry Cask Risk Tool?

- ▶ Provides a basic risk-informed framework that can be used to support recommendations of the depth and breadth of LAR reviews
- ▶ Provides the user with a rationale behind the risk estimation of each specific change
- ▶ A methodology that incorporates available risk insights and supports the identification and prioritization of safety significance in licensing changes

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How will it be used

- Informal guidance for staff reviewer
- Provide a preliminary risk-informed estimation for each specific change in a LAR
- Supplement insights from staff subject matter experts
- Support review decisions along with other considerations: complexity, regulatory requirements, quality of applications, etc.

Risk Tool for Spent Fuel Dry Storage

Three Components in the Risk Tool

- ▶ **Grades** (green, yellow, red, blue)
- ▶ **Flow chart and gates** for identifying licensing action and associated risk significance
- ▶ **Rationale document** provide the bases behind risk estimation

Risk Tool for Spent Fuel Dry Storage Grades

Risk Significance	LAR Review Process	Risk Significance Determination Criteria
Low	Efficient	<ul style="list-style-type: none"> → Redundancy of preventive measures or multiple conditions necessary for accident initiation. Failure of redundant systems, or independent concurrent conditions required for accident initiation. → If quantitative data is available: Insignificant increase (by a factor of less than one order of magnitude) of release of radioactive isotopes theoretically possible. → Standard reevaluation process of the system that requires only an adaption of new parameters. → Low chance of making a significant evaluation error during safety evaluations by the licensee and high chance of catching such error by the reviewer. → No direct effect on the system or current operation procedures.
Medium	In Detail	<ul style="list-style-type: none"> → Detection of evaluation error or flaw likely (e.g., due to surveillance). → No immediate danger to public or personnel due to significant safety margins. → If quantitative data is available: Medium increase (by a factor of less than two orders of magnitude) of release of radioactive isotopes theoretically possible.
High	Extensive, Thorough, Very Detailed	<ul style="list-style-type: none"> → Error in risk safety evaluations could directly lead to an accident that includes a release of radioactive material, criticality, or undetected issue, and significantly increased radiation exposure of the public or operating personnel. → No reliable redundancy in the system. → If quantitative data is available: Significant increase (by a factor larger than two orders of magnitude) of release of radioactive isotopes theoretically possible.
See Rationale	Based on Extensive Risk Significance Determination	<ul style="list-style-type: none"> → No risk significance estimation possible without consideration of additional factors.

Risk Tool for Spent Fuel Dry Storage Rational Document

► Rational Example:

1.2.3.5. Cask Hardware

Cask hardware includes keepers, lanyards, small bolts and nuts, cotter pins, etc. Further, the cask hardware is classified as a Category C item in NUREG/CR-6407 (J. W. McConnell 1996). It is part of the structure of a dry storage system, and a hardware modification does not significantly affect the confinement, shielding, heat removal, or criticality control capabilities of the dry storage system.

Thus, the risk significance associated with a LAR item that includes a modification of the cask hardware is determined as low.

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Other Considerations

- Complexity of change
- Regulatory requirements
- Possible cumulative effect for combination of multiple changes

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Implementation

- Risk tool is expected to be completed in July
- WG will brief staff reviewers on the methodology for grading reviews
- A preliminary procedure will be developed to pilot the risk tool; pilot effort is targeted to begin in the fall
- WG will evaluate the effectiveness of the risk tool and results will be made public at future public meetings
- The risk tool will be updated periodically to incorporate new risk insights

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Questions?



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► What has changed since NUREG-1864?

- Modern cask designs
- Increased capacity
- Hotter spent fuel (2 years vs 10 years)
- Absorber plates
- More complicated loading patterns
- Licensing duration 20 to 40 years
- Uncertain path forward
 - Interim Storage Sites
 - Storage in-place