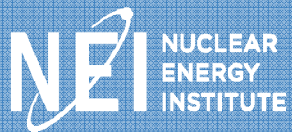


Defining Used Fuel Performance Margins

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US NRC REG CON

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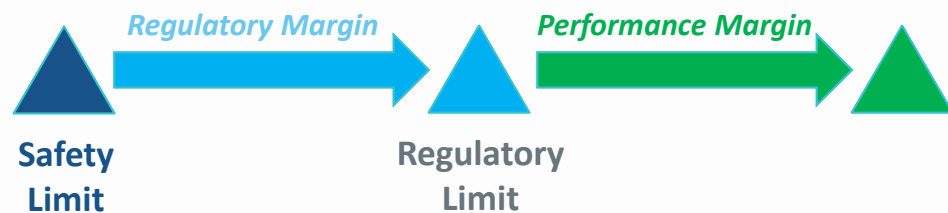
Why Understanding Margin Is Important

- Memorandum from NMSS Director Mark Dapas to NMSS Staff
1/15/2019
 - “Reviewers should consider the relative margin to any applicable regulatory limits pertaining to the item under review. If the licensee or applicant has **reasonably demonstrated** that there is **significant margin** from the regulatory limits, then a **detailed review of the item may not be warranted** beyond confirming the adequacy of the licensee’s or applicant’s models, codes, and/or approach, including any key parameters and assumptions, used to demonstrate that significant margin exists.”
 - “Regulatory standards should already include the appropriate margin the Commission previously deemed necessary to provide for adequate protection. **There is no requirement or expectation for additional margin beyond these regulatory standards**, even if additional margin is reflected in any “acceptance criteria” contained within guidance documents.”

Where Does Margin Exist?

UNF performance margin can be divided into two categories:

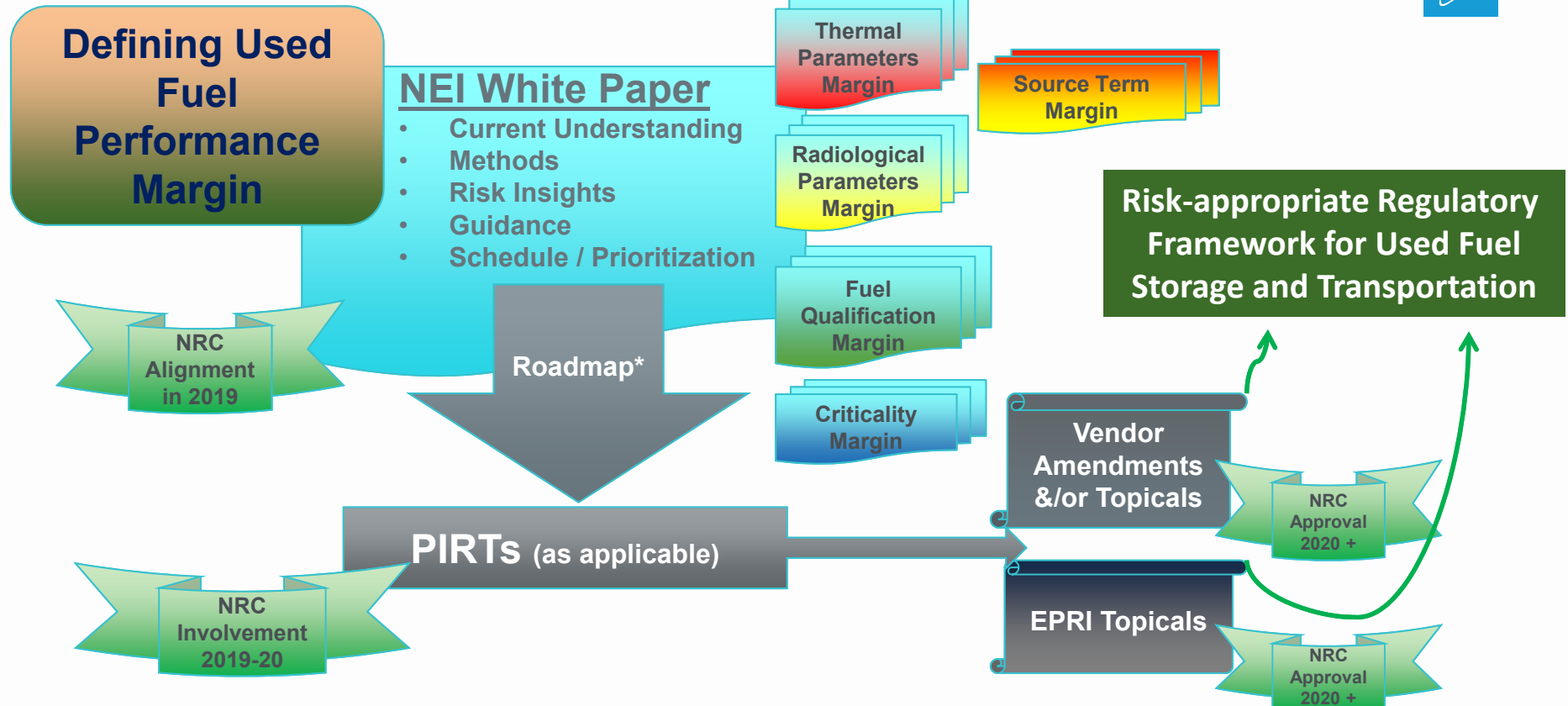
- Performance margin in the UNF itself, i.e. the UNF has more capacity than we assign it in our evaluations; and
- Margin that exists in the methods used to evaluate UNF storage safety
 - Instances where we use approaches in our analyses that include conservatisms to account for a number of uncertainties or unknowns, or to provide a bounding evaluation to simplify the analyses



Understanding Enables Transformation

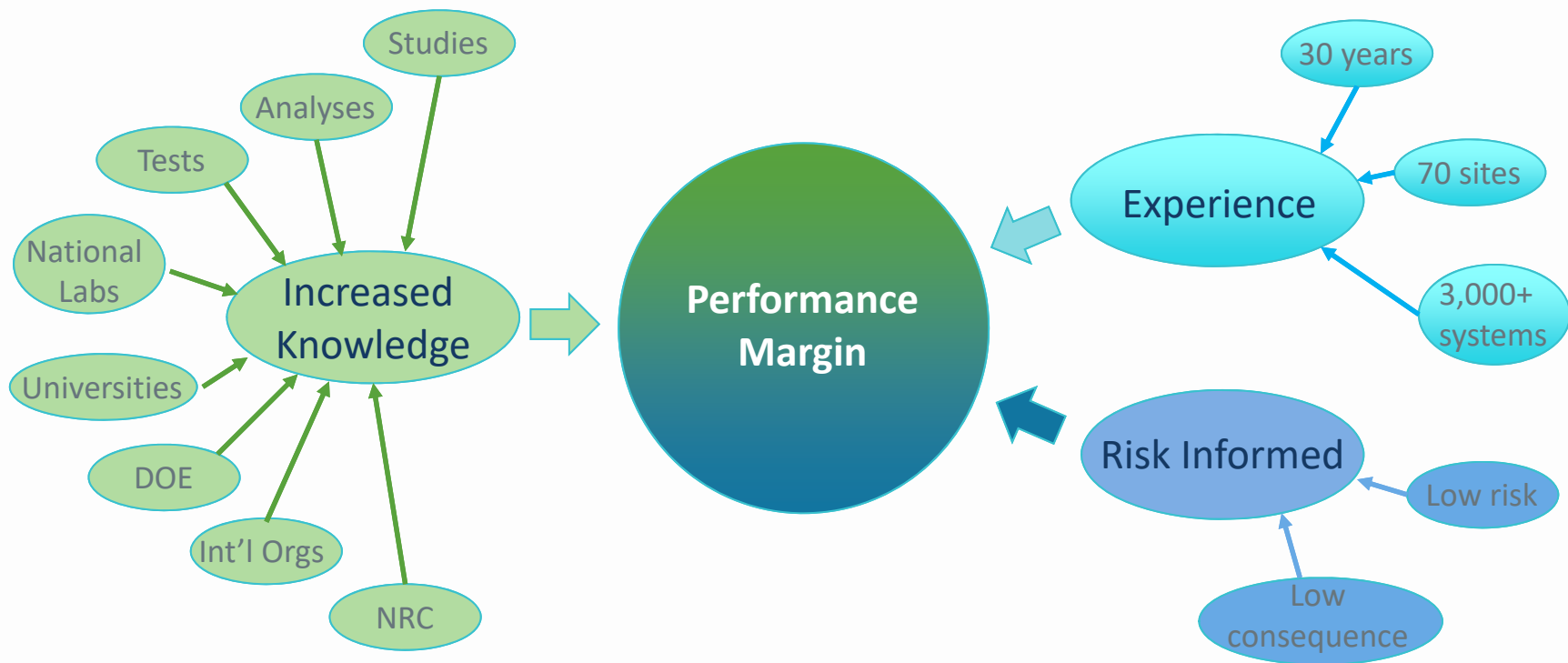


White Paper Concept



*Not all elements of the roadmap will be addressed in the same manner or at the same pace

Resources for Identifying Margin



White Paper Contents

- I. Introduction
- II. Risk Insights
- III. Guidance for Further Advancing the Definition of Performance Margin for Source Terms
- IV. Guidance for Further Advancing the Definition of Performance Margin for Thermal Parameters
- V. Guidance for Further Advancing the Definition of Performance Margin for Radiological Parameters
- VI. Guidance for Further Advancing the Definition of Performance Margin for Fuel Qualification
- VII. Guidance for Further Advancing the Definition of Performance Margin for Criticality
- VIII. Applications
- IX. Conclusion
- X. Recommendations

Recommendations

Recommendations are made that can be grouped into 3 categories

- Category 1 – Actions that industry can take within the confines of existing regulations and guidance
- Category 2 – Actions that NRC can take by tailoring their regulatory guidance and their review and inspection practices to recognize the existence of performance margin
- Category 3 – Actions for which industry and NRC should engage in a dialogue to develop improved regulatory tools and guidance

Note the following recommendations are draft and may change prior to finalization of the White Paper

Category 1 Recommendations

- Source Term Recommendation 1: Licensees/CoC holders define and utilize more realistic source terms, supported by conservative modeling in the downstream calculations, in their applications to demonstrate the adequacy of dry storage system design.
- Source Term Recommendation 2: In cases where conservative source term calculations demonstrate compliance with 72.104 and 72.106, licensees/CoC holders should not also apply a source term uncertainty (i.e. burnup uncertainty) in their applications.
- Thermal Recommendation 3: Assess how thermal modeling is done and what can be simplified. Develop an industry consensus based thermal modeling methodology and document this as a best practices guide.
- Fuel Qualification Recommendation 1: CoC holders should amend their CoCs to follow the precedent established through Regulatory Issue Resolution Protocol I-16-01 wherein a graded approach was developed to apply risk insights which resulted in a pilot amendment (#16) to Standardized NUHOMS® Certificate of Compliance No. 1004 for Spent Fuel Storage Casks (Docket 72-1004) that achieved a 90% reduction in the amount of information requiring NRC approval in the Fuel Qualification Table and reduced the overall size of the CoC by 33%. *(Note: NRC would then have the action to review graded approach amendments as they are submitted)*

Category 2 Recommendations

- Source Term Recommendation 3: In cases where applicants have applied conservative source terms, conservative modeling, and source term uncertainty (i.e. burnup uncertainty) in their applications NRC should conduct a much less detailed review (i.e. simply check that sound methodologies have been applied instead of trying to independently repeat results).
- Thermal Recommendation 2: In cases where applicants have applied the results of the PIRT described in Recommendation IV-1, NRC should revise its internal review guidance to limit the review to verification that the results of the PIRT have been appropriately applied instead of trying to independently repeat results.
- Radiological Recommendation 1: Revise the guidance in Section 6.4 of NUREG-1536 to 1) request typical/realistic/representative instead of bounding dose rates, consistent with the reduced safety significance of the presented results and to 2) remove or appropriately modify the discussion that implies that the dose and dose rates provided in the FSAR demonstrate that the design is sufficient to meet the regulatory dose requirements.

Category 3 Recommendations

- Thermal Recommendation 1: Define the parameters on which thermal modeling should be focused, by developing a Phenomena Identification and Ranking Table; use it to identify (a) the inputs, modeling approaches/techniques that have large impact on the results, and (b) those that don't and hence don't require scrutiny (i.e. a reasonable value can be assumed and not questioned). For this to be successful, industry, NRC, and the scientific community, would have to engage in the PIRT process.
- Thermal Recommendation 4: Determine a peak cladding temperate limit (PCT) that is based on more scientific information. Consider a higher ultimate limit structured with stepped lower limits. Further, evaluate what is the best fuel parameter to use to set thermal limits for canisters. This will require significant engagement between industry and NRC and will likely result in the development of regulatory guidance.
- Criticality Recommendation 1: Align approaches in criticality safety analyses for dry cask storage systems with current practices in spent fuel pools (full fission-product burnup credit, 100% credit for neutron absorber capability). Industry and NRC will need to engage in a dialogue to determine the best way to accomplish this.
- Criticality Recommendation 2: Develop a more realistic approach to the modeling of fuel reconfiguration scenarios in criticality analysis. Industry and NRC will need to engage in a dialogue to determine the best way to accomplish this.

Schedule



Action Plan: NEI White Paper												
	2019											2020
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Define	Industry Focus Group sets expectations for White Paper											
Align		RIC session on topic	Public Meeting	NEI Used Fuel Mgmt Conf								
			Industry Ltr on Approach	NRC Responds to Approach				NRC Reg Con		Submit Draft White Paper	Course Correct if Needed	
Develop			Draft White Paper							Review Draft		
Close											Finalize White Paper	NMSS Bus. Line Comm. Brief

Conclusions and Next Steps

- Changes are needed to improve the efficiency of the UNF regulatory process and maintain focus on safety significant issues and operations
- Industry has made significant progress in the development of a White Paper to identify and quantify used nuclear fuel performance margins
- Recommendations are being developed for methods to use this margin in future regulatory activities
- Later this year industry will be submitting the White Paper to NRC seeking to advance this goal