

Workshop:
Enhancements to
the Storage Dry
Cask Program

Welcome! The meeting will start soon.

Link for Video and Slides (No audio):
<https://usnrc.webex.com/usnrc/onstage/g.php?MTID=e64bdf8155a35d4a3ca22497012048d29>

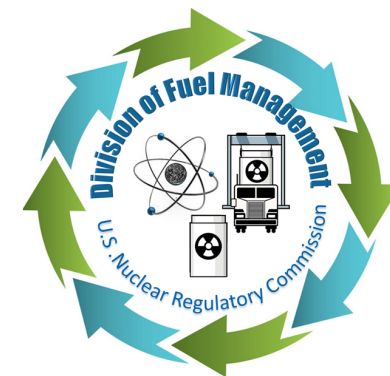
Audio Call-in: (888) 282-0567;
Passcode: 9824795

PUBLIC MEETING AGENDA

Workshop between the U.S. Nuclear Regulatory Commission and Nuclear Energy Institute on Spent Fuel Performance Margins

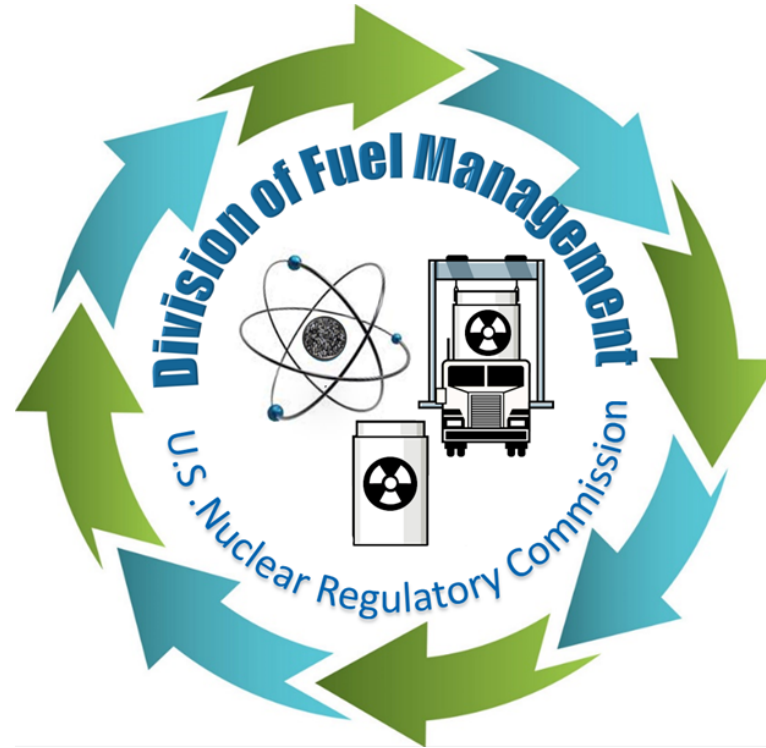
April 13, 2021, 01:00 PM to 04:30 PM

Webinar



<i>Time</i>	<i>Topic</i>	<i>Speaker</i>
1:00-1:10 PM	Introduction & Opening Remarks	NRC/NEI
1:10-2:10 PM	Criticality Recommendations	NRC/NEI
2:10-2:15 PM	Break	
2:15-3:45 PM	Status update of ongoing activities	NRC/NEI
3:45-4:00 PM	Summary of recommendations & Action Items	NRC
4:00-4:15 PM	Opportunity of Public Comments	
4:15-4:30 PM	Closing Remarks	

Introduction and Opening Remarks





Spent Nuclear Fuel Performance Margins Workshop Opening Remarks

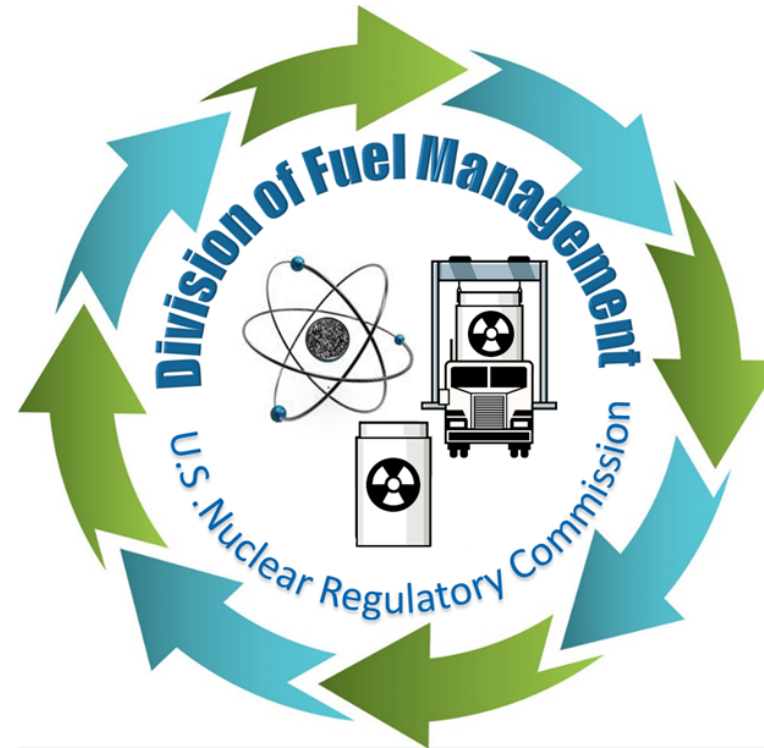
Mark Richter

APRIL 13, 2021

Opening Remarks

- Look how far we've come!
- 2021 is an important year
- Moving forward with plans for remaining recommendations
- Implementation is the key to success
- Increased safety focus and improved licensing practices will be the measure of our shared success

NRC Considerations on Criticality Recommendations from NEI Whitepaper



Andrew Barto
Nuclear Analysis and Risk Assessment Branch
April 13, 2021

Whitepaper Recommendations on Criticality

- VII-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).
- VII-2: Develop a more realistic approach to the modeling of fuel reconfiguration scenarios in criticality analysis.
- VII-3: Develop a safety-focused definition of the term “gross rupture” through a graded or risk-informed approach that maintains reasonable assurance of adequate protection of the public health and safety as required by 10 CFR Part 72.122h. This definition should be clear and have a well-established basis so that it does not evolve over time.



Recommendation VII-1



Background on Full Fission Product Burnup Credit:

- NUREG-2215 and -2216 recommend crediting 28 actinide and fission product nuclides which are stable or long-lived, not gaseous or soluble, and for which sufficient radiochemical assay data exists for depletion code validation.
 - Based on years of research evaluating available radiochemical assay data and approaches for depletion code validation, culminating in NUREG/CR-7108, “An Approach for Validating Actinide and Fission Product Burnup Credit Criticality Safety Analyses—Isotopic Composition Predictions”
 - Additional research on critical experiments applicable to spent fuel in storage and transportation casks culminated in NUREG/CR-7109, “An Approach for Validating Actinide and Fission Product Burnup Credit Criticality Safety Analyses—Criticality (keff) Predictions
 - Results from these research efforts were incorporated into ISG-8, Revision 3, subsequently incorporated into the SRPs
- NEI 12-16, “Guidance for Performing Criticality Analyses of Fuel Storage at Light-Water Reactor Power Plants”, endorsed with exceptions in NRC Regulatory Guide 1.240, “Fresh and Spent Fuel Pool Criticality Analyses.”
 - NEI 12-16 not reviewed by NMSS/DFM for applicability to storage and transportation
 - NEI 12-16 was recently endorsed by NRR in March 2021

Recommendation VII-1, Continued



Background on Full Fission Product Burnup Credit, continued:

- Burnup Credit guidance in NUREG-2215 and -2216 states that additional minor actinides and fission products represent small contribution to Δk_{eff} , which is maintained as an additional margin for depletion uncertainty.
- For all nuclides credited in SFP analyses, depletion uncertainty bounded by large margin due to soluble boron loading in PWR pools, or peak reactivity approach in BWR pools, as well as sufficient means to detect and mitigate criticality (compared to storage and transportation scenarios).

Next Step:

- Staff are receptive to considering industry proposals for alternative approaches to crediting solid, non-soluble, stable or long lived minor actinides and fission products, provided there is adequate consideration of depletion uncertainties associated with modeling these nuclides.
 - Implementation is dependent on staff available resources for review and discussion
 - Prioritizing ongoing Whitepaper activities
 - Given that additional minor actinides and fission products represent small contribution to Δk_{eff} collectively, we need to consider the work needed to justify this versus the potential benefits



Recommendation VII-1, Continued

Background on 100% credit for neutron absorber capability:

- NUREG-2215 and -2216 recommend:
 - 75% credit for the minimum required poison material in neutron absorbers, due to potential for streaming effects between particles in certain absorber types
 - Up to 90% credit is recommended when subject to adequate acceptance and qualification testing
 - 10% margin maintained for potential criticality validation and poison uniformity materials issues
 - Increase in credit would likely have little impact on Δk_{eff} , but could result in lower required ^{10}B loadings

Next Step:

- NRC staff considering research effort to evaluate criticality validation and materials issues to see if this amount of margin is warranted
 - Depending on Division resource availability

Recommendation VII-2



Background on Fuel Reconfiguration:

- Failed fuel in failed fuel cans are modeled in a conservative manner, given the wide range of fuel conditions expected to be loaded (e.g., fuel fragments, broken rods)
- Undamaged fuel, as defined in ISG-1, typically modeled with clad, and with expanded pitch to bound possible reconfiguration scenarios for such fuel

Next Steps:

- Possibility exists for undamaged fuel to have less bounding representation in cask criticality models from currently accepted approach
- NRC staff planning to wait for the results of the Gross Rupture PIRT before deciding on a path forward, since this activity may result in changes to fuel condition definitions

Recommendation VII-3



Background on Gross Rupture:

- 10 CFR 72.122(h)(1) states: *The spent fuel cladding must be protected during storage against degradation that leads to gross ruptures or the fuel must be otherwise confined such that degradation of the fuel during storage will not pose operational safety problems with respect to its removal from storage. This may be accomplished by canning of consolidated fuel rods or unconsolidated assemblies or other means as appropriate.*
- Ongoing Gross Rupture PIRT to develop a safety-focused definition of gross rupture through a graded or risk-informed approach that maintains reasonable assurance of adequate protection of the public health and safety.

Next Step:

- Complete the PIRT

Next Steps for Discussion With Industry

Recommendation VII-1

- Fission product burnup credit:
 - Staff to consider industry proposals for alternative approaches to crediting minor actinides and fission products.
 - solid, non-soluble, stable or long lived
 - adequate consideration of depletion uncertainties associated with modeling these nuclides
 - Dependent on available staff review time – begin after conclusion of ongoing Whitepaper activities
- 100% credit for neutron absorber capability:
 - Research to evaluate criticality validation and materials issues associated with absorber credit
 - May begin late FY22, provided resources are available



Next Steps, continued



Recommendation VII-2

- Staff to await the results of the Gross Rupture PIRT before deciding on a path forward for fuel reconfiguration in criticality models

Recommendation VII-3

- Gross Rupture PIRT is ongoing



Spent Nuclear Fuel Performance Margins Workshop Criticality

APRIL 13, 2021

Defining Spent Fuel Performance Margins



- Recommendation VII-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.
- Recommendation VII-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.

NUREG-2125 – published 2014

Revisiting spent fuel criticality analysis in the accident condition

- NUREG-2125 Section 5.6 takes a risk informed view of the potential for criticality in a transport cask accident.
- Only scenario with a plausible chance of getting water in the cask. (Other conditions, i.e. normal transport, storage, tip-over, etc. would be far less likely for water intrusion.)
- The accident scenario, > 60 mph impact with impenetrable surface followed by submersion in water. The probability of water being below a location of hard rock is very low (0.009 for truck and unknown for rail).
- Combined probability is on the order of 10^{-15} .
 - Seal failure in accident probability is 4×10^{-10}
 - Cask flooding with failed seal probability is 10^{-5}
- “Given these extremely low probabilities, it can be deduced that a criticality event is not credible.”

Industry Vision

- Part 72 is generally aligned with Part 50 for criticality
- Dry storage future needs for higher burnup and increased enrichment spent fuel is efficiently managed
- Additional conservatisms in dry storage result in similar requirements for dry and wet storage
- Criticality concerns only during cask loading in pool

Desired Outcomes

- Full burnup credit
- Full credit for neutron absorber performance
- Reasonable modeling of failed fuel configuration scenarios
- Level of staff review and analysis reflects credit commensurate with experience and provides for reasonable assurance of adequate protection of public health and safety (i.e., not absolute assurance)

Integrating the Deliverables



In Pool

Part 50 governs pool racks Part 72 governs cask loading in pool
Why is fuel treated differently?

In Storage on Pad
Part 72 governs

In Transit
Part 71 governs

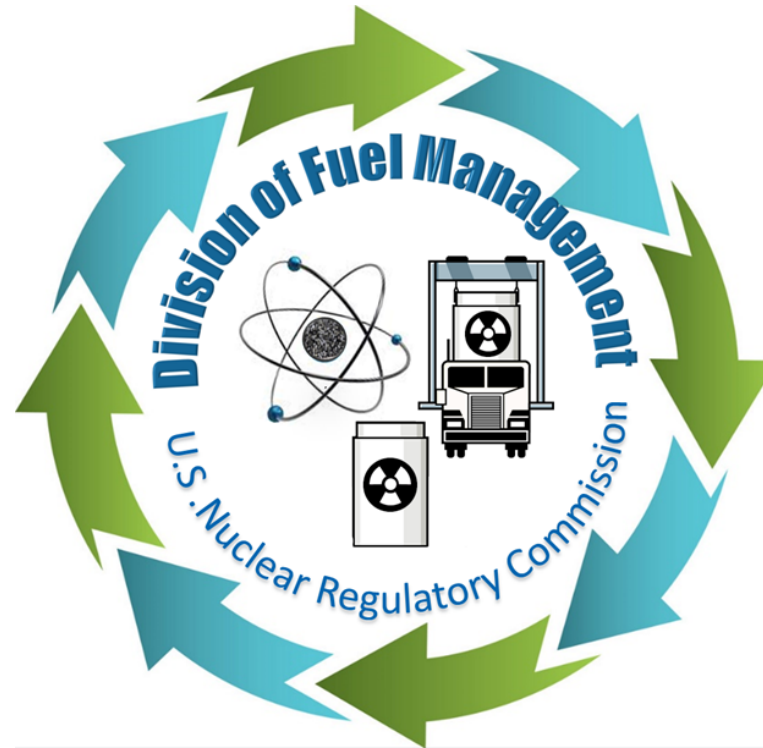
Are Margins consistently understood and applied throughout?

Benefits

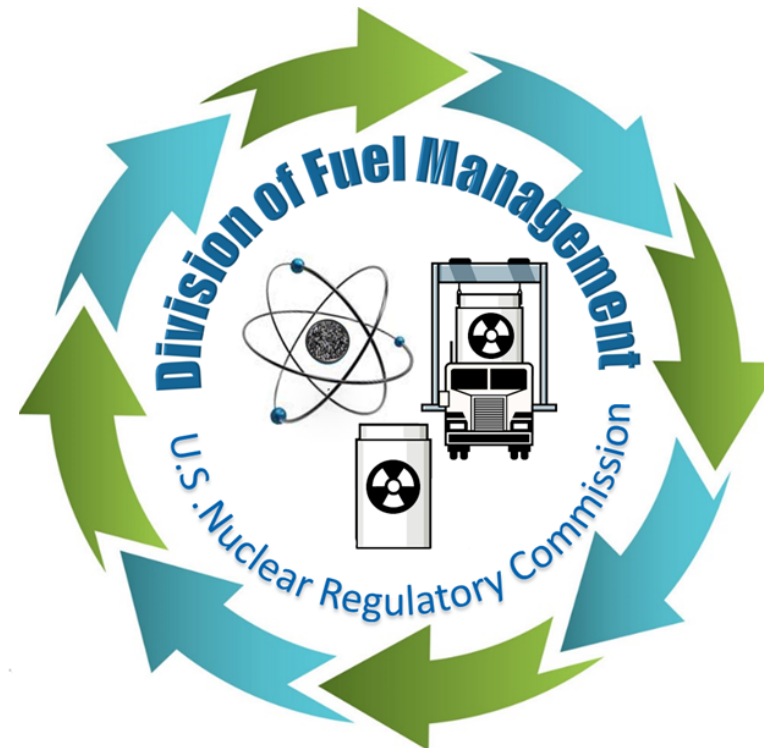
- Reasonable assumptions for dry storage spent fuel parameters lead to more efficient reviews
- Continuity across regulations for spent nuclear fuel results in uniform calculations and a more efficient review process
- Improved licensing practices enable increased focus and resources on issues of safety significance

Questions?

Break



Graded Approach



Norma Garcia-Santos
Storage and Transportation Licensing Branch
April 13, 2021

Background



- **Purpose:** To streamline the format and content of a storage certificates of compliance (CoCs) by focusing mainly on:
 - safety-related items,
 - risk-informed content,
 - reorganize CoC format,
 - remove duplicative items, as appropriate, and
 - relocate non-safety related items to other regulatory documents, as appropriate.
- **Pilot amendment:** Amendment 16, standardized NUHOMS® HSM cask system
- **Applicant:** TN Americas LLC
- **Design changes:** The applicant did not request design changes to the cask system.
- **Amendment Effective:** September 2020
- **NRC endorsement of the graded approach:** January 2020

This streamlined format allows vendors of spent fuel storage systems to be able to make some non-safety-related changes through the existing regulatory process rather than having to request a new or amended certificate, which would require rulemaking.



Background

- Concurrently with the graded approach, activities such as the MOE will also impact the content of certificates of compliance.
- NRC staff held a workshop in December 2020 seeking feedback from industry on their plans for future use of the graded approach.

Industry expressed interest in the graded approach for future amendments, but did not see the need for additional guidance in the immediate future



Next Steps

- Planning to evaluate challenges and successes related to the graded approach pilot.
- Evaluating the following:
 - stakeholder feedback to begin assessing the need and/or timing of guidance updates to incorporate the graded approach
 - ways to further communicate the process for submittals using the graded approach methodology
 - considering ways to facilitate use of the graded approach
 - Looking to see if additional clarity in certain areas of the submittal worksheets would be beneficial (what kind / what areas).
 - How will applications use graded approach criteria?
 - What other actions could facilitate the use of the graded approach?



NUHOMS® Horizontal Storage Module

Denise Elisio, Licensing, Holtec International

Holtec CoC 1014 Reorganization - UPDATE -

NRC/NEI Workshop 4/13/2021



Background

- RIRP-I-16-01 (2017): NEI proposed an outline for improving the storage CoC format and contents on behalf of the industry
- TN Pilot (submitted 2017 – approved 2020): TN submitted a non-technical amendment to a CoC following the guidance in RIRP
- NEI Margin White Paper: Recommendation VI-1: CoC holders should amend their CoCs to follow the precedent
- Holtec CoC 1014 – Amendment 16 (2021 – ongoing): includes technical changes and a proposed reorganization of the CoC and its appendices

Reorganization Process

Step 1:

Compare current CoC statements, sections, tables, etc. to the new proposed outline and identify what should be retained in the reorganized CoC and what should be deleted

Reorganized Outline:

- CoC
 - I. Technology
 - II. Design Features
- Appendix A – Inspections, Tests, and Evaluations
- Appendix B – Technical Specifications
 - 1. Definitions, Use, and Application
 - 2. Approved Contents
 - 3. LCOs and SRs
 - 4. Administrative Controls

Reorganization Process

Step 2:

Risk Insite - Evaluator should think about subsequent changes to a relocated CoC requirement. Specifically, ask the question “what is the likelihood and worst possible consequences of a future change to this requirement in the less conservative direction”?

Will removing this requirement from the CoC/TS result in...

- A significant increase in the probability or consequences of an accident previously evaluated in the cask FSAR?
- The possibility of a new or different kind of accident being created compared to those previously evaluated in the FSAR?
- A significant reduction in the margin of safety for ISFSI or cask operation?

Holtec CoC 1014 – Amendment 16

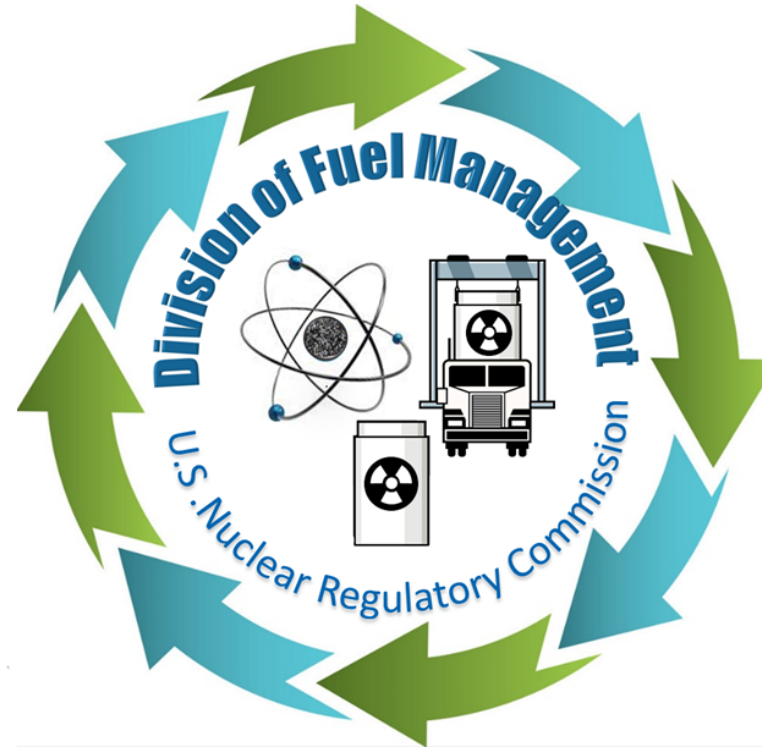
- This LAR contains proposed technical changes to the existing CoC and its Appendices
- It also contains the following documents to support the reorganization:
 - Reorganized CoC and Appendices
 - Reorganization Tables
 - Reorganization Matrix

Holtec Application

- Step 2 was only considered for items that did not fit into the proposed outline
- CoC Section III added
- Code alternative tables retained
- Expanded information included in Appendix A

Overall, the process took less effort than initially estimated.

Shielding MOE



Veronica Wilson
Nuclear Analysis and Risk Assessment Branch
April 13, 2021

Background



- Currently NRC staff approves contents with respect to shielding design via *values* of burnup, enrichment and cooling time to satisfy portions of 72.236(a) that normally appear in the technical specifications
 - Can be in the form of fuel qualification tables (FQT) and/or correlations
- These values are used within shielding demonstration calculations to satisfy 72.236(d) that the *shielding features* are sufficient to meet the requirements in 10 CFR 72.104 and 72.106
 - Within these requirements are an annual dose limit for the controlled area boundary under normal operating conditions and anticipated occurrences and a dose limit under design basis accidents

Background



Need for Improvement:

- CoC applicants have refined their allowable contents for a dry storage system to maximize capacity
 - Some systems allow thousands of possible permutations of fuel parameters that can be used to create a single loading pattern for one cask
 - Each one of these thousands of possible combinations is designed to have roughly similar performance in terms of dose rate
- The problem is that the Tech Specs now include hundreds of pages to specify fuel parameters
- Reviewing and approving systems with complex fuel specifications is difficult and time consuming
 - The staff has not required specifying fuel in this way
 - Staff reviews what is submitted
- To alleviate this issue, the staff is seeking a more efficient way that the systems can demonstrate compliance with regulations while maintaining the same level of safety

NRC Proposal



- NRC is considering acceptance of a *Method of Evaluation* approach (similar to a COLR approach for reactors) to determine specifications for burnup, enrichment, and cooling time to meet the requirements of 10 CFR 72.236(a)
- For example, instead of actual *values* of burnup, enrichment and cooling time, technical specifications could state that a specific NRC approved method will be used to derive and limit these parameters
 - NRC would review and approve the specific method that is referenced in the technical specifications
- This approach builds on lessons learned during the Graded Approach (72-1004 Amd. 16) review

Next Steps

- Holtec has submitted a draft topical report with its approach on the MOE to support a discussion at a pre-application meeting
- The public pre-application meeting was held on 3/10/2021
- The meeting was successful as it helped the staff better understand Holtec's topical report and staff was also able to communicate areas where more information was needed
- Holtec will revise the topical report and submit it to NRC. Date-TBD
- If NRC staff approves the topical report, then a vendor can submit a CoC Amendment using the topical report



Dr. Stefan Anton, VP Engineering, Holtec International

SHIELDING MOE TOPICAL REPORT - UPDATE -

NRC/NEI Workshop 4/13/2021



Background (1)

- NEI white paper on Spent Fuel Performance Margin (Nov. 2019) identified shielding as one of the areas that would benefit from review of margins.
- The corresponding recommendations were placed into Category 3, where changes to NRC guidance was needed. Recommendations in this Category were to be **considered** at a later date.
- However, discussions in early 2020 identified the need to look at this at an earlier date since the potential benefits would be larger than initially expected. Specifically, it became clear that the still unresolved issue of fuel qualification tables/equations in the CoC could be addressed **and** this was where progress would be highly desirable.
- This subject was subsequently and progressively discussed in several workshops throughout 2020.

Background (2)

- The main outcome of the interactions throughout 2020 was that the NRC proposed a slightly different approach to satisfy 10CFR72.236(a) and (d) from what was used in the past. Most importantly, the qualification of fuel would be documented in a report external to the FSAR and CoC, and hence changes to the qualified fuel would not require license amendments. This would have to be based on a Topical Report outlining the methodology used in this external report. Hence the term “MOE Topical Report”.
- The industry welcomed this approach and committed to a pilot to put this into practice.
- After internal industry discussion, it was proposed in the workshop on 11/6/2020 that one topical report would be submitted by Holtec International. The report would be non-proprietary, reflecting its development as a result of the 2019 NEI fuel margin paper.

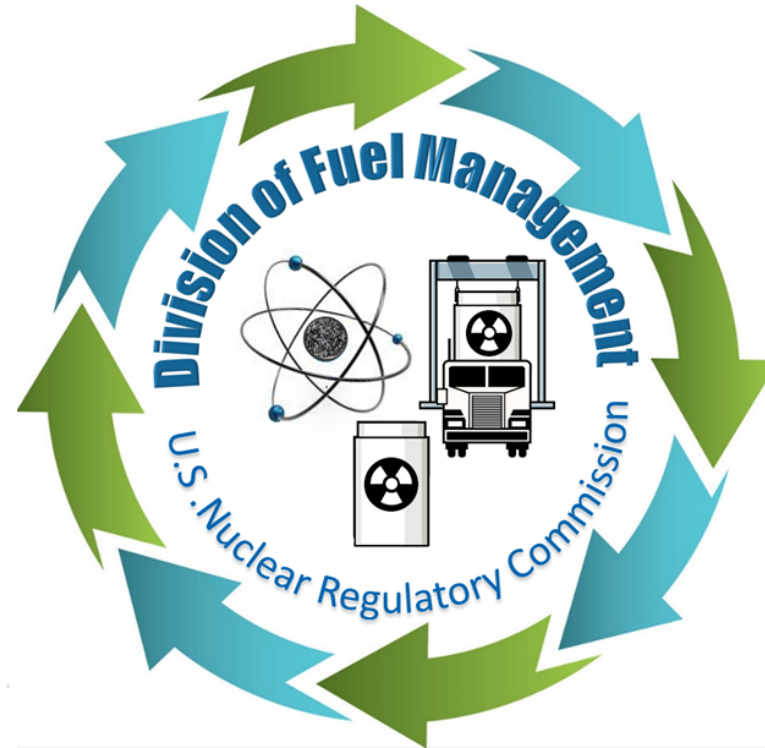
Current Status

- The MOE TR was submitted to NRC as a draft on 1/31/2021.
- A public meeting was held on 3/10/2021 to discuss the draft. This meeting was very beneficial in providing significant clarifications to both the industry and NRC staff.
- The report is currently being revised and the next document will be an updated draft or final version for submittal (still TBD). After review by the NEI team that authored the margin paper, submittal is planned for mid May.

Path Forward

- Review / Approval of the TR
- License Amendment Request(s) for selected storage systems to reference the TR in the CoC as an acceptable way to define approved content
- Qualification report(s) to define acceptable content. These can be generic (covering large range of common fuel, but no unusual types), or site specific (covering everything present at a site, including anything unusual).
 - Qualification reports do not need a license amendment or NRC review and approval

Spent Fuel Storage Job Aid / Risk Tool



Alexis Sotomayor-Rivera
Nuclear Analysis and Risk Assessment Branch
April 13, 2021



Background

Spent Fuel Storage Job Aid for Risk Informing Reviews

- Support the focus of the review (e.g., the depth of the review) based on risk.
- Brings information from the Risk Tool, which includes samples of prior safety evaluations into the licensing process.
- Provide a step-by-step resource for the staff to risk-inform technical reviews.

Background



What it does:

- Risk Tool and Job Aid provides the impetus for culture shift for risk to become part of the daily conversation of a review.
- Job Aid provides for suggested levels of review based on risk.
- A worksheet in the Job Aid provides documentation of risk considerations; this worksheet will be used during the acceptance review and potentially in RAI development.
 - This worksheet facilitates risk discussions amongst the review team.
- The Risk Tool is based on available risk studies, safety margin investigations, selected NRC SERs, and input from NRC Senior Technical Reviewers.
 - Provides an initial raw risk (on a component-by-component basis) for the reviewer to consider.

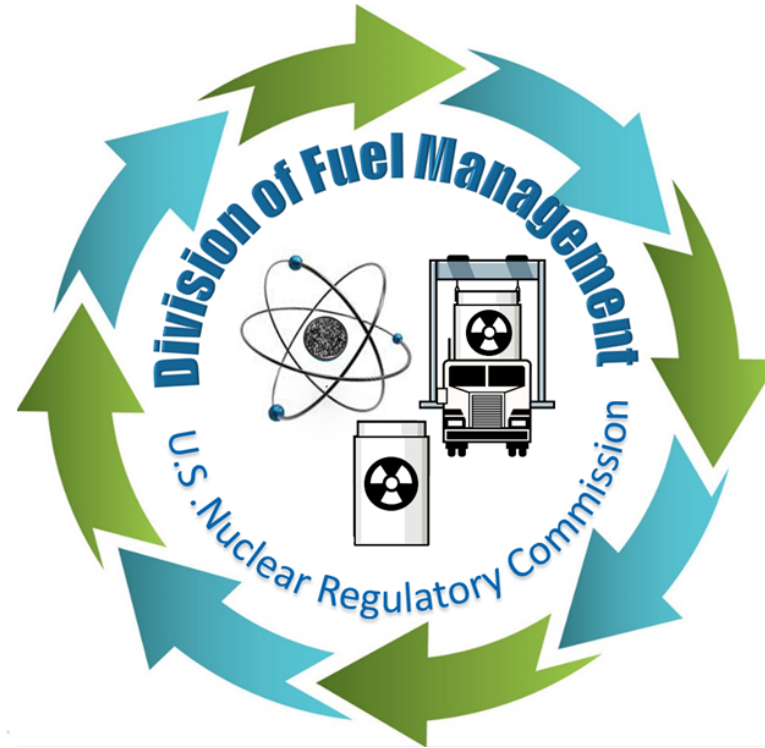
Next Steps



The Risk Tool Working Group will:

- Begin piloting the use of the Risk Tool and Job Aid.
 - On March 8th, the [Job Aid and Risk Tool](#) were issued for pilot use.
 - During the pilot process, NRC staff will hold a conversation with the applicant on the risk tool results and discuss use of the tool within the acceptance review letter.
- Hold a future public meeting after the pilot period to discuss lessons learned and seek feedback from the public on the tool (e.g., 8+ months after the Risk tool pilot period beginning).
- After the pilot period, work to incorporate the Job Aid and Risk Tool into Division Instructions.

Fuel Cladding Gross Rupture



John Wise
Materials and Structural Branch
April 13, 2021

Whitepaper Recommendations



VII-3: Develop a safety-focused **definition of the term “gross rupture”** through a graded or risk-informed approach that maintains reasonable assurance of adequate protection of the public health and safety as required by 10 CFR Part 72.122h. This definition should be clear and have a well-established basis so that it does not evolve over time.

- Actions: Ongoing PIRT activities

IV-4: Replace 400°C “cliff edge” **metric for thermal modeling** of fuel cladding (e.g., one with stepped limits with varying level of rigor in temperature calculations and assumptions review)

- Actions: PIRT after completion of gross rupture definition activities
Review of EPRI topical report

Next Steps



- Continue participation in PIRT exercises
- Review the EPRI topical report. Staff encourages early communication to understand:
 - Approach (e.g., changes to how the role of cladding has traditionally been considered in meeting the regulations, impacts to safety analyses of current licenses)
 - Any research that will be relied on to inform the report
 - Potential need for rulemaking
 - Report schedule and anticipated NRC review timeline
- Review the results of the PIRTs, the EPRI topical report, and research activities to explore how NRC guidance and regulations may be improved to ensure that gross rupture is addressed in a manner that is practical, risk-informed, and safety-focused (this is an ongoing activity)

Gross Rupture PIRT Update

Aladar Csontos, Ph.D
Technical Executive

Keith Waldrop
Principal Technical Leader

April 13, 2021

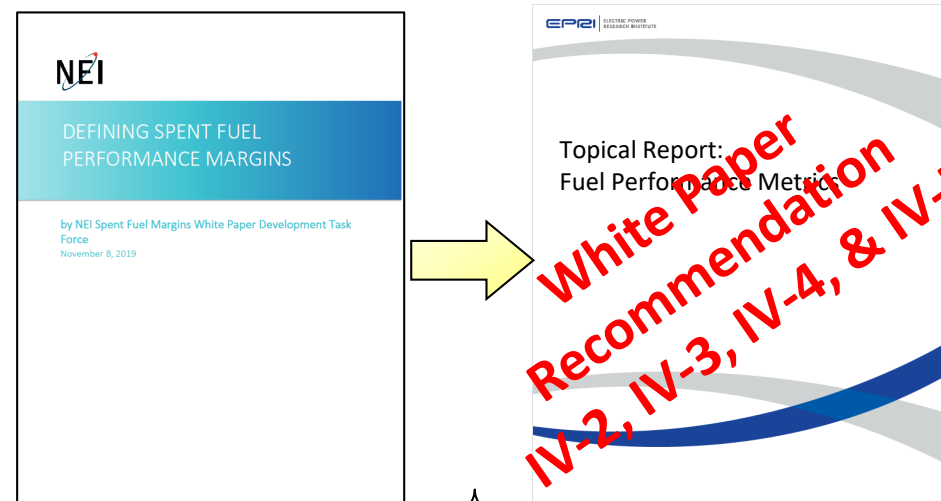
NRC Workshop on Spent Fuel Performance Margins



Thermal Margins Regulatory Issue Resolution Plan

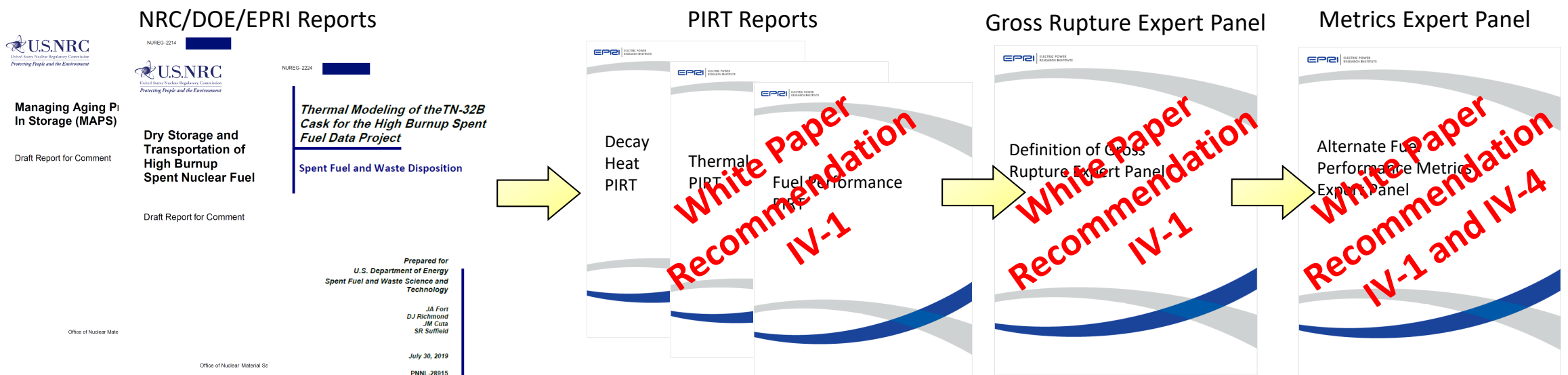
Regulatory Implementation

RIRP Recommendations IV 1-5 Goals: Replace current thermal regulatory limit with a technically defensible alternative to expand margins and operational flexibilities with increased safety and cost savings



Most efficient regulatory implementation vehicle pending further discussions; e.g. EPRI Topical Report and/or NRC Standard Review Plan update

Technical Basis Documents



Gross Rupture PIRT Expert Panel Process

- **Preparation – Steering Committee to:**
 - Define the problem (e.g., licensing, operational, or programmatic)
 - Define the specific objectives
 - Identify SME needs and select expert reviewers to participate on panel(s)
 - Ensures resources are available; defines schedules and oversees progress
- **Pre-elicitation – Experts Review State of Knowledge:**
 - Define the scenario(s) and evaluation criterion
 - Identify, obtain, and review on-line source database
 - Identify plausible phenomena and develop questionnaire to frame future discussions
- **Elicitation – Expert Ranking Process:**
 - Rank importance and provide rationales
 - Assess uncertainty for phenomenon (e.g., define gaps)
- **Documentation – Document PIRT results:**
 - Review by independent experts

Gross Rupture Pre-Elicitation Activities

- Pre-PIRT Meeting #1 (12/16/2020):
 - Address NRC workshop request to provide industry operating experience
 - Example spent fuel characterization procedures and experience
- Pre-PIRT Meeting #2 (01/28/21):
 - Identify scenarios and available information needs for PIRT
 - Historical and current regulatory perspectives
 - NRC proposed gross rupture evaluation criteria
- Pre-PIRT Meeting #3 (03/24/21):
 - Finalize scenarios and figures of merit
 - Industry perspectives on canister unloading and in-core fuel failures
- PIRT Meetings Planned for May

Overall Path Forward

- Gross Rupture PIRT:
 - Pre-PIRT Meetings: Dec 2020-April 2021
 - PIRT Meeting: May 2021
 - Final PIRT Report: September 2021
- Steering Committee Meeting: September 2021
 - Update and Path Forward Discussions
- Alternate Fuel Performance Metrics PIRT (*tentative*):
 - Pre-PIRT Meetings: October 2021
 - PIRT Meetings: December 2021
 - Final PIRT Report: March 2022
- Steering Committee Meeting: December 2021
 - Regulatory Implementation Vehicle Path Forward and Timeline



NRC/NEI/EPRI/Industry: Prior Workshop Discussions

- 01/21/20 Workshop:
 - Thermal/Decay Heat Modeling and Fuel/Cladding Performance PIRT results
 - Recommendation by PIRT expert panel for Gross Rupture PIRT
- 03/25/20 Workshop:
 - DOE/PNNL perspectives on Thermal Modeling of Commercial Spent Fuel
- 04/16/20 Workshop:
 - Technical Interpretation of Gross Rupture – Historical Perspectives
- 06/11/20 Workshop:
 - Roadmaps and NRC perspectives and safety objective of gross ruptures
- 06/23/20 Workshop:
 - Thermal Margins RIRP Crosswalk, Prioritization, and Links to PIRTs
- 07/28/20 Workshop:
 - Path Forward on Implementing the Gross Rupture PIRT Expert Panel

Summary of Recommendations and Action Items

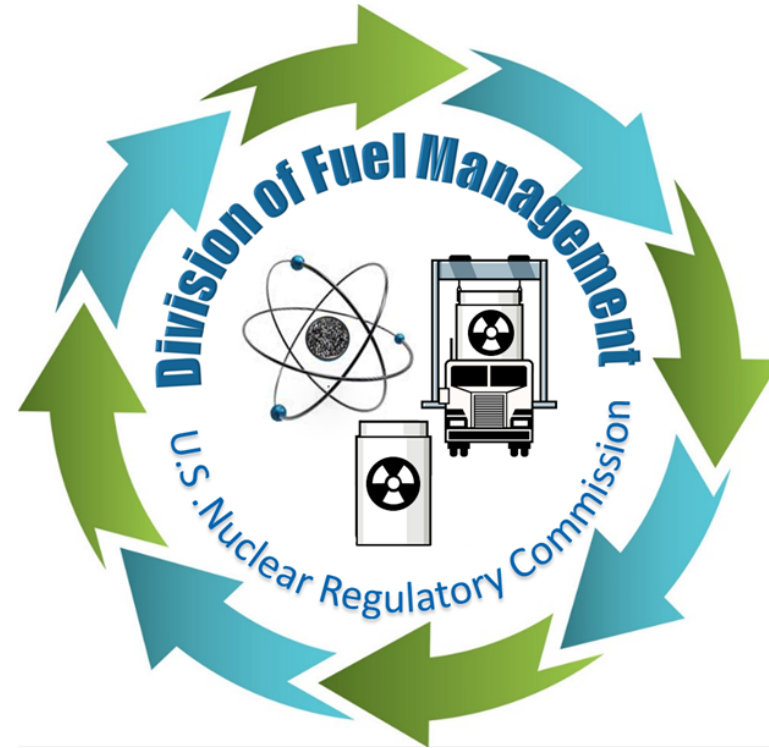


Table with Recommendations, NEI and NRC perspectives

Source: [Open Package \(NRC Response to NEI Letter Dated January 14, 2021, "Implementation of the Recommendations of Industry's November 8, 2019 White Paper"\)](#)

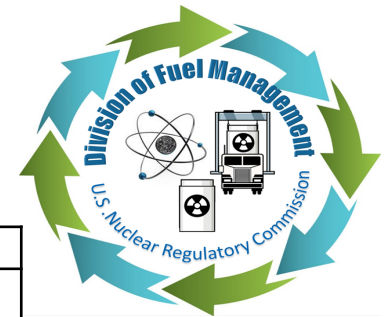


Table 3 - Actions to be addressed through NRC/Industry Dialogue

Rec. #	Summary	Results	Path Forward	NRC Staff Comments	Notes - April 13 Workshop
IV-1	NRC and industry to conduct thermal modeling PIRT	COMPLETE <ul style="list-style-type: none"> Thermal Modeling, Decay Heat Monitoring, and Fuel Performance PIRTs completed 	Industry to apply the results of the PIRTs in future CoC applications and NRC to apply the results of the PIRTs in future licensing reviews.	The NRC agrees with the results. As for path forward, additional discussion may be warranted. We previously communicated in workshops, that a submittal for endorsement may be appropriate for broad applicability, consistency, and transparency (e.g., topical report, industry guidance, etc.)	
IV-4	Replace 400C "cliff edge" metric for thermal modeling	SUBSTANTIAL ACTION TAKEN <ul style="list-style-type: none"> As documented in the 5/13/20 and 6/1/20 letters referenced in Rec. IV-3 above, this will be accomplished by building on the combined results of the three completed PIRTs (IV-1 above) and the ongoing "gross rupture" PIRT (Rec. IV-5 below) 	Industry and NRC to re-evaluate this limit after completion of the "gross rupture" PIRT.	The NRC agrees with the results and path forward. The NRC is currently participating in the EPRI led PIRT on gross rupture.	
IV-5	Develop graded approach to thermal modeling (reinterpret gross rupture)	SUBSTANTIAL ACTION TAKEN <ul style="list-style-type: none"> NRC has agreed (6/1/20 letter) to engage in an ongoing PIRT to address this recommendation. PIRT is ongoing. 	Industry and NRC to engage on the development of this approach after completion of the "gross rupture" PIRT.	The NRC agrees with the results and path forward. The NRC is currently participating in the EPRI led PIRT on gross rupture.	

Table 3 - Actions to be addressed through NRC/Industry Dialogue

V-1	Revise Sect. 6.4 of NUREG-1536 to allow representative vs. bounding dose rates and credit for design analysis	<p>SUBSTANTIAL ACTION TAKEN</p> <ul style="list-style-type: none"> The new review process NRC has developed per III-3 is specific to radiation dose/shielding and will enable this approach 	NRC to reflect new approach in NUREG.	The NRC agrees with the results and generally supports the path forward. In addition to the risk tool referenced, the NRC staff developed a method of evaluation approach to shielding analyses which would result in a more performance-based review and would facilitate the use of representative dose rates. NRC is evaluating how this approach can be applied to other technical areas and will incorporate this approach into NRC guidance.	
V-2	Revise Chapter 6 of NUREG-2215 based on experience	<p>SUBSTANTIAL ACTION TAKEN</p> <ul style="list-style-type: none"> Industry completed NRC requested Operating Experience evaluation and presented results to NRC in 12/16 public meeting Risk tool being developed per II-1 will help enable 	NRC to revise Chapter 6 of the NUREG as appropriate to reflect lessons learned (including experience with application of the risk tool)	The NRC agrees with the results and the path forward. After review of the industry proposed topical report for the implementation of the Method of Evaluation expected in FY 2021, NRC staff will begin planning for updates to NUREG-2215 (Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities).	
VI-2	Align licensing approaches for fuel qualification information	<p>SUBSTANTIAL ACTION TAKEN</p> <ul style="list-style-type: none"> NRC approved graded approach to CoC amendments/applications per V-1 Holtec has committed to submit to NRC a "Shielding Method of Evaluation" topical report that will substantially improve the manner in which fuel qualification information is addressed 	Holtec to submit and NRC to review, under the fee waiver granted for activities related to the White Paper.	The NRC agrees with results and path forward. The NRC will need to evaluate whether the current fee waiver extends to Holtec's future topical report if a fee waiver is submitted.	



Table 3 - Actions to be addressed through NRC/Industry Dialogue

VII-1	Align licensing approaches for criticality safety	NO ACTION IN 2020 • Industry and NRC have agreed to planning dialogue to initiate needed actions	NRC and Industry to engage in further dialogue in 2021.	The NRC agrees with the result and path forward. NRC proposing a planning public workshop in the near- future.	
VII-2	Develop more realistic modeling of fuel configuration	NO ACTION IN 2020 • Industry and NRC have agreed to planning dialogue to initiate needed actions	NRC and Industry to engage in further dialogue in 2021.	The NRC agrees with the result and path forward. NRC proposing a planning public workshop in the near- future.	
VII-3	Redefine “gross rupture”	NRC has agreed (6/1/20 letter) to engage in a PIRT that will begin in October and be complete by January 2021 to directly address this recommendation	NRC and Industry to develop new definition upon completion of the “gross rupture” PIRT.	While no characterization of the results was provided in NEI’s letter, the NRC believes, consistent with Rec. IV-4 and IV-5, that substantial action has been taken through EPRI’s gross rupture PIRT and agrees with the path forward. The current schedule is to complete this work in summer 2021.	



Table 2 – Actions that can be taken by NRC within existing regulations

Rec. #	Summary	Results	Path Forward	NRC Staff Comments	Notes - April 13 Workshop
II-1	Graded Approach Review Process for CoC applications and amendments	COMPLETE SUBJECT TO CLARIFICATION: <ul style="list-style-type: none"> • NRC letter (1/24/20) defined licensing process expectations for more risk informed reviews • NRC developed a risk tool to enable a graded review process (12/17/20 workshop) 	After clarifying how regulatory transparency will be achieved in staff's use of this tool, NRC to implement this tool in its licensing reviews.	The NRC agrees with the results. As for path forward, the NRC developed a risk tool to enhance its safety focus during a CoC application review and will begin piloting this tool in February/March timeframe. The NRC is committed to transparency and has made the tool publicly available (ADAMS Accession Number ML20350B659). The NRC is also evaluating how best to engage with an applicant on the results of the risk tool and agrees this should be a topic for a near term future workshop.	
III-3	Less detailed reviews when conservatism is demonstrated	COMPLETE SUBJECT TO CLARIFICATION <ul style="list-style-type: none"> • The NRC licensing process implementations and risk tool (per Rec. # II-1) effectively addresses this recommendation as well 	After clarifying how regulatory transparency will be achieved in staff's use of this tool, NRC to implement this tool in its licensing reviews.	The NRC agrees with the results and as for path forward is evaluating how best to engage with an applicant on the results of the risk tool and agrees this should be a topic for a near term future workshop.	
IV-3	NRC recognition of PIRT results in licensing reviews	SUBSTANTIAL ACTION TAKEN <ul style="list-style-type: none"> • Industry recommended (7/28/20 workshop) that this be addressed in NRC graded review process per II-1 above • Thermal Modeling, Decay Heat Monitoring, and Fuel Performance PIRTS have been completed and "gross rupture" PIRT is underway 	NRC to consider PIRTS as appropriate in its licensing reviews.	The NRC agrees with the results. As for path forward, additional discussion may be warranted on the use of PIRT reports. We previously communicated in workshops, that a submittal for endorsement may be appropriate for broad applicability, consistency, and transparency (e.g., topical report, industry guidance, etc.)	



Public Comments

