



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
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June 29, 2020

MEMORANDUM TO: Christian Araguas, Acting Deputy Director
Division of Fuel Management
Office of Nuclear Material Safety and Safeguards

FROM: Tilda Liu, Senior Project Manager /RA/
Material Control and Accounting Branch
Division of Fuel Management
Office of Nuclear Material Safety and Safeguards

SUBJECT: SUMMARY OF JUNE 11, 2020, CATEGORY 1 PUBLIC
WORKSHOP ON SPENT FUEL PERFORMANCE MARGINS

On June 11, 2020, the U.S. Nuclear Regulatory Commission (NRC) held a Category 1 remote public workshop with the Nuclear Energy Institute (NEI) and other industry representatives to continue dialogue on recommendations contained in the NEI's white paper on Spent Fuel Performance Margins dated November 8, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19318D971). This workshop built upon previous held meetings and workshops including those conducted on January 22, 2020 (ADAMS Accession No. ML20028F277), March 25-26, 2020 (ADAMS Accession No. ML20106F135), and April 15-16, 2020 (ADAMS Accession No. ML20126G388), respectively.

During the June 11, 2020, meeting, the NRC staff and industry representatives from the NEI and the Electric Power Research Institute (EPRI) reviewed and discussed NRC's safety objective definition for alignment on a gross rupture Phenomenon Identification and Ranking Tables (PIRTs) project plan. In addition, the NRC staff responded to industry questions on NUREG-2152, "Computational Fluid Dynamics Best Practice Guidelines for Dry Cask Applications: Final Report," published in March 2013. More than 50 individuals from industry, vendor groups, public citizens, and NRC staff attended the workshop (some participating in portions only) via Skype and telephone bridge line.

The following presentation materials were used by the NRC staff during the subject workshop:

- Safety of Spent Nuclear Fuel with Gross Ruptures (ADAMS Accession No. ML20162A086)
- Discussion on Uses of NUREG-2152 (ADAMS Accession No. ML20162A084)

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The following presentation material was used by the industry and EPRI during the subject workshop:

- Roadmap for Spent Fuel Performance Margins: Thermal and Fuel Performance Path Forward (ADAMS Accession No. ML20162A082)

The discussions held during this workshop benefited both the NRC staff and industry representatives, as they provided an effective and efficient forum of communication for all parties involved. No NRC staff decision was made during the meeting. During the meeting, the NEI requested a written version of the NRC's oral responses pertaining to its queries on the use of NUREG-2152, the NRC staff agreed that a written version would be provided after the meeting.

The NRC staff acknowledged that the next remote workshop is planned for June 23, 2020 (ADAMS Accession No. ML20160A145) and that it is noticed in the NRC website for public meetings. In the next meeting, the NEI plans to discuss its vision for leveraging recently conducted PIRTs and provide clarity on the connectivity of the recommendations discussed in the previous workshops. The industry and EPRI plan to discuss a revised Thermal Recommendation Issue Resolution Plan reflecting integrated Recommendations IV-1-5 as a function of safety goal and gross rupture definitions. NRC staff plans to discuss its draft approach for conducting graded acceptance reviews (Recommendation II-1) and proposed alternative licensing strategies for shielding reviews.

At the end of the workshop, the NRC staff provided an opportunity for the members of the public to comment or ask questions regarding NRC's regulatory process related to the topics discussed. There were two questions raised, and the questions were relevantly addressed to the respective public members.

Enclosure 1 contains the meeting agenda for the June 11, 2020, workshop as previously noted in the public meeting notice (ADAMS Accession No. ML20143A049). Enclosure 2 provides a list of those who participated in the June 11, 2020, remote public workshop. Enclosure 3 is the detailed meeting summary for the June 11, 2020, workshop. Enclosure 4 contains NRC's response to the industry's queries on the use of NUREG-2152. Enclosure 5 provides a summary table for the June 11, 2020, workshop on spent fuel performance margins.

Enclosures:

1. Meeting Agenda
2. List of Participants
3. Meeting Summary
4. NRC's Response to the Industry's Queries on the Use of NUREG-2152
5. Summary Table: June 11th Workshop on Spent Fuel Performance Margins

SUBJECT: SUMMARY OF JUNE 11, 2020, CATEGORY 1 PUBLIC WORKSHOP
ON SPENT FUEL PERFORMANCE MARGINS

DATED: June 29, 2020

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DATE	6/18/2020	6/29/2020	6/29/2020

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MEETING AGENDA

CATEGORY 1 PUBLIC WORKSHOP ON SPENT FUEL PERFORMANCE MARGINS

June 11, 2020

Time	Topic	Speaker(s)
1:00 pm – 1:15 pm	Introductions and opening remarks	NRC/NEI
1:15 pm – 3:00 pm	Discussion on defining NRC's safety goal and aligning on [EPRI] gross rupture PIRT Project Plan	NRC/NEI/EPRI
3:00 pm – 3:30 pm	Discussion on industry questions on NUREG-2152	NRC
3:30 pm – 4:00 pm	Opportunity for public comment	All
4:00 pm	Meeting adjourn	

LIST OF PARTICIPANTS

CATEGORY 1 PUBLIC WORKSHOP ON SPENT FUEL PERFORMANCE MARGINS

June 11, 2020

Name	Affiliation
Tae Ahn	Nuclear Regulatory Commission (NRC)
Christian Araguas	NRC
Chris Bajwa	NRC
Andrew Barto	NRC
Alana Bell	NRC
Tom Boyce	NRC
Michel Call	NRC
Richard Chang	NRC
Donald Chung	NRC
Jennifer Dalzell	NRC
Yaira Diaz-Sanabria	NRC
Arlette Howard	NRC
JoAnn Ireland	NRC
Paul Kallan	NRC
Andrea Kock	NRC
Tilda Liu	NRC
Timothy McCartin	NRC
John McKirgan	NRC
Jason Piotter	NRC
Christopher Regan	NRC
Jorge Solis	NRC
Alex Sotomayor-Rivera	NRC
Ricardo Torres	NRC
Veronica Wilson	NRC
John Wise	NRC
Aladar Csontos	Electric Power Research Institute (EPRI)
Andrew Orrell	INL
Daniel Ogg	Public
Donna Gilmore	Public
E Supko	Public
George Carver	NAC International
Glenn Schwartz	PSEG Nuclear
Rich Hagler	Public
Andrea Jennetta	Platts
Jeremy Renshaw	EPRI
Hundal Jung	NWTRB
Kalene Walker	Public
Keith Waldrop	EPRI
Kevin Braico	Public
K Manzione	Public
Yoonjo Lee	Public
Mark Richter	Nuclear Energy Institute

Name	Affiliation
Nigel Mote	Public
Paul Plante	The Yankee Companies
Robert Quinn	Westinghouse
Shannon Chu	Public
Stefan Anton	Holtec International
Tom Tramm	Centrec
Venkata Venigalla	Public
Zita Martin	Tennessee Valley Authority
Sven Bader	Public
Hatice Akkurt	EPRI

MEETING SUMMARY

CATEGORY 1 PUBLIC WORKSHOP ON SPENT FUEL PERFORMANCE MARGINS

June 11, 2020

On June 11, 2020, the U.S. Nuclear Regulatory Commission (NRC) held a Category 1 public workshop with the Nuclear Energy Institute (NEI) and other industry representatives to discuss NEI's white paper on Spent Fuel Performance Margins (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19318D971). The June 11, 2020, workshop built upon discussions held during the January 22, 2020 (ADAMS Accession No. ML20028F277), March 25-26, 2020 (ADAMS Accession No. ML20106F135), and April 15-16, 2020 (ADAMS Accession No. ML20126G388) workshops.

The June 11, 2020, workshop focused on safety of spent nuclear fuel with consideration of assessing and developing an actionable definition of gross rupture, during which the NRC staff and industry representatives from the NEI and the Electric Power Research Institute (EPRI) reviewed and discussed NRC's safety objective definition for alignment on a gross rupture Phenomenon Identification and Ranking Tables (PIRTs) project plan. The industry stated that its objective was preventing gross rupture and preserving fuel integrity, versus managing or mitigating a gross rupture. The workshop participants aligned on the detailed problem statements for the associated recommendations, planned regulatory products, and next steps. In addition, the NRC staff responded to industry questions on NUREG-2152, "Computational Fluid Dynamics Best Practice Guidelines for Dry Cask Applications: Final Report," published in March 2013.

The NRC staff made opening remarks for the workshop and discussed the safety objective of spent nuclear fuel with gross ruptures. The discussion specifically included relevant regulatory background, preliminary qualitative assessment, proposed next steps and associated timelines for planning purpose. During the workshop, the NRC staff acknowledged that the current guidance on gross ruptures has led to difficulties in fuel selection and appropriate loading in transportation packages and dry storage systems. In addition, the NRC staff sought additional stakeholder's input on significance of design and operational impacts of gross ruptures, and other potential operational and practical benefits for addressing the problem.

The industry then made a presentation on "Roadmap for Spent Fuel Performance Margins: Thermal and Fuel Performance Path Forward." In particular, EPRI discussed the industry's objective in developing a technically defensible consensus regulatory implementation vehicle to establish up-to-date fuel performance metrics, and proposed the relevant path forward including incorporation of technical basis reports from PIRTs and expert panels, an accelerated implementation strategy via topical report submittal, and adoption via approved topical report reference into vendor applications and/or amendments or other wide-scale implementation vehicle.

The NRC staff responded to industry questions on NUREG-2152, "Computational Fluid Dynamics Best Practice Guidelines for Dry Cask Applications: Final Report," published in March 2013. These questions were posed by the industry to the NRC during the April 15-16, 2020, workshop. At the end of the meeting, the NRC staff provided an opportunity for the members of the public to provide any comments or questions. There were two questions from the members of the public which were addressed at the meeting.

More than 50 individuals from industry, vendor groups, public citizens, and NRC staff attended the workshop (some participating in portions only) via Skype and telephone bridge line. The NRC staff is planning future workshops to continue efforts on the white paper recommendations; and the next workshop is scheduled for June 23, 2020.

NRC'S RESPONSE TO THE INDUSTRY'S QUERIES ON THE USE OF NUREG-2152:

Clarification on the use and applicability of NUREG-2152, "Computational Fluid Dynamic Best Practices Guidelines for Dry Cask Applications," in licensing reviews provided at the June 11, 2020, Public Meeting between NRC and NEI

Background

On March 25, 2020, the NRC staff held a public meeting to discuss the recommendations provided in NEI's White Paper, "Defining Spent Fuel Performance Margins." During the discussion of Recommendation IV-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-practice guide), NEI questioned NRC's use and applicability of NUREG-2152, "Computational Fluid Dynamic Best Practices Guidelines for Dry Cask Applications" during licensing reviews of dry storage casks. During a subsequent public meeting on April 15, 2020, the staff asked NEI additional clarifications. The following are NRC respective responses to the NEI questions as provided during the June 11, 2020 public meeting.

NEI Questions/Comment (in bold)

- 1. How do reviewers apply NUREG-2152 and is it being considered as de facto regulation (i.e., the only way of reaching compliance)? Is it being considered a regulatory guide or a regulation?**

NRC Response:

NUREG-2152, "Computational Fluid Dynamic Best Practices Guidelines for Dry Cask Applications," is a guidance that the staff uses for reviewing applications of Computational Fluid Dynamics (CFD) methods. NUREG-2152 is not *de facto* regulation because it provides one possible approach for the applicants/licensees in demonstrating safety or meeting the regulations. Specifically, CFD is one way to demonstrate compliance with 10 CFR 71.71, 10 CFR 71.73, and 10 CFR 72.236, with respect to thermal performance of a spent fuel transportation package or a spent fuel storage cask. Other methods, such as finite element analysis, have been used by the applicants/licensees and approved by the NRC staff to demonstrate compliance with the regulations. Applicants/licensees are not required to follow the guidelines described in NUREG-2152. Whatever modeling approach is selected, the applicant/ licensee should demonstrate, for example, how errors in the analysis are minimized and calculation options are justified (e.g., demonstrating the results are grid independent).

- 2. If industry deviates from what is written in the guidance (even if justified), it's often rejected by staff.**

NRC Response:

An applicant may choose to explicitly reference in its Final Safety Analysis Report the guidance in NUREG-2152. If an applicant chooses to use the NUREG, it is the staff's responsibility to make sure that the guidance is applied appropriately. Staff performs this review to ensure that the modeling results are predictable and within acceptable limits, thereby enabling staff to determine whether a design will perform its safety functions. Deviations from the guidance (NUREG) or any alternate approach used in an application is acceptable if the applicant provides an appropriate technical justification. The assertion that

the staff has often rejected other approaches that deviated from the guidance is inaccurate. The staff issues RAIs when an applicant/licensee expresses consistency with NUREG-2152 but does not apply the CFD method as stated. For example, if an applicant selects a calculation option that is not justified in a specific design or makes an error in the process of creating the analytical model. Similarly, picking and choosing elements of the CFD method may not provide reliable results. If an applicant chooses to use NUREG-2152, it should follow those best practice guidelines, and any departures should be technically justified.

3. Did NUREG-2152 go through a public review process?

NRC Response:

Yes, a notice was published in the Federal Register on October 23, 2012, requesting public comment on draft NUREG-2152 and the public comment period remained open through December 24, 2012 (77 FR 64834). Two comments were received. Additionally, the staff presented the content of NUREG-2152 during public meetings, national technical conferences, and specialized meetings (such as EPRI Extended Storage Collaboration Program) to cask vendors and utilities.

4. If NUREG-2152 is being implemented as “one way of reaching compliance with regulation,” why is it not a regulatory guide?

NRC Response:

In accordance with the NRC Directive Handbook 3.7 content appropriate for publication in a NUREG includes but is not limited to: support for regulatory and licensing decisions; action plans and guidance for meeting NRC requirements; and guidance and instructions for employees. As the content of NUREG-2152 meets this scope it was published as a NUREG. The information could have alternatively been published as a regulatory guide. In either event, both documents only contain guidance.

5. Is the level of effort described in NUREG-2152 commensurate with the safety significance?

NRC Response:

Yes, the level of effort involved in understanding CFD applications in a design is proportional to the complexity of the heat transfer phenomenon and the amount of design margin with respect to the safety margin.

The guidance provided in NUREG-2152 describes the steps that are typically followed by any CFD analyst. Since temperatures calculated from thermal analyses are used as proxies for shielding, criticality, and confinement or containment performance, the safety significance is determined based on how the selected heat load of the system compares with the selected acceptance criteria for specific materials present in the design. Alternatively, in cases where the thermal performance of the system is well known (for example an amendment adding additional heat loading configurations), the level of effort may not need as much rigor.