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January 14, 2021

Ms. Andrea Kock, Director  
Division of Fuel Management  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**Subject: Implementation of the Recommendations of Industry's November 8, 2019 White Paper, "Defining Spent Fuel Performance Margins"**

**Project Number: 689**

Dear Ms. Kock:

The Nuclear Energy Institute (NEI)<sup>1</sup>, on behalf of its members, would like to thank NRC for the substantial level of effort and engagement that staff has conducted in response to the White Paper, *Defining Spent Fuel Performance Margins*, that we submitted just over a year ago. The purpose of this White Paper – to develop improvements in regulatory efficiency based on what has been learned about dry storage safety margin through the deployment of more than 3,000 storage systems over the past 33 years – has been largely satisfied. The purpose of this letter is to seek NRC's perspectives on what we have accomplished and request NRC's engagement in assessing our effectiveness going forward with the implementation of these improvements.

Full implementation of the actions taken as a result of the NRC-Industry dialogue on the White Paper, along with the completion of identified follow on activities, will have a transformative effect on the continued dry storage of spent fuel in the following ways.

- Safety will be enhanced by the refocusing of NRC and industry resources to the most safety significant areas.
- Efficiencies gained will enable suppliers to bring innovative new designs to market more quickly to address the increasing diversity of spent fuel discharges (including accident tolerant fuels).

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<sup>1</sup> The Nuclear Energy Institute (NEI) is responsible for establishing unified policy on behalf of its members relating to matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect and engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations involved in the nuclear energy industry.

- Reactor operators will have greater flexibility in dry storage loading choices and there will be less risk of regulatory issues delaying dry storage loading campaigns.
- Decommissioning plants will be able to off-load their spent fuel pools earlier, which will support the growing trend toward accelerating the completion of decommissioning, which has become a key stakeholder interest.

Specifically, the White Paper made 16 recommendations based on an examination of margin in 5 areas, based on what is now understood about performance margin in each of these areas:

- I) Source Terms
- II) Thermal Parameters
- III) Radiological Parameters
- IV) Fuel Qualification
- V) Criticality

These recommendations fall into the following three categories:

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

Throughout 2020, NRC and industry interacted extensively on 14 of these 16 recommendations. In some cases, actions were taken directly as recommended. In other cases, actions taken in response to one recommendation achieved the purposes of another. In still other cases activities already underway prior to the submittal of the paper were completed in ways that achieved the purposes of a given recommendation. In total, this dialogue resulted in the development of methods, tools, or approaches that – if implemented as intended – will reshape both industry and NRC licensing practices and result in significant efficiency improvements.

Industry had previously sought to improve the efficiency of dry storage licensing by petitioning for a rulemaking (PRM 72-7, dated October 3, 2012). In February 2020, industry determined that NRC's endorsement of the Graded Approach criteria (per Recommendation VI-1 of the White Paper) and progress being made on the other recommendations of our White Paper were sufficient to satisfy the central purpose of PRM 72-7. With that central purpose addressed, industry requested withdrawal of PRM 72-7. NRC formally announced the withdrawal of PRM in October 2020, hence obviating the need to devote resources to a time-consuming rulemaking.

Tables 1 through 3 below summarize what was accomplished, by category, on each recommendation as well as identifying the path forward to assure that the value of these achievements is fully realized going forward.

The roman numerals in the recommendation number link each recommendation to the functional area being addressed (listed above, as identified in the White Paper).

Table 1 – Actions that can be taken by industry within existing regulations

| Rec. # | Summary   | Results  | Path Forward   |
|--------|---|--|--|
| III-1  | Utilize more realistic source terms                                 | COMPLETE <ul style="list-style-type: none"> <li>NRC endorsement of NEI 12-04 (9/22/20) provides industry with improved flexibility</li> <li>Action completed per Table 2 will provide additional flexibility</li> </ul>  | Industry to build more realistic source terms into analyses as appropriate.  |
| III-2  | Do not apply uncertainty penalty on top of conservative source term | COMPLETE <ul style="list-style-type: none"> <li>NRC endorsement of NEI 12-04 (9/22/20) provides improved flexibility</li> <li>Actions completed per Table 2 will provide additional flexibility</li> </ul>   | Industry to reduce reliance on uncertainty penalties as appropriate.   |
| IV-3   | Develop and document industry consensus thermal modeling practices  | COMPLETE <ul style="list-style-type: none"> <li>Thermal Modeling, Decay Heat Monitoring, and Fuel Performance PIRTS have been completed</li> <li>Industry proposed new safety objective (5/13/20), NRC letter (6/1/20) agreed with approach, "gross rupture" PIRT process underway to define new safety objective that includes realistic and actionable fuel integrity metrics</li> </ul> | Industry to apply, in future license and Certificate of Compliance (CoC) applications, the insights documented in the PIRTS and letters. |
| VI-1   | Adopt and extend graded approach CoC precedent (Per RIRP I-16-01)   | COMPLETE <ul style="list-style-type: none"> <li>NRC approved Orano pilot graded approach CoC (9/14/20)</li> <li>NRC and industry aligned on future use of the graded approach (12/17/20 workshop)</li> </ul>   | Industry to use the graded approach in future license and CoC applications.  |

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

| Rec. # | Summary  | Result   | Path Forward   |
|--------|--|--|--|
| II-1   | Graded Approach Review Process for CoC applications and amendments | COMPLETE SUBJECT TO CLARIFICATION: <ul style="list-style-type: none"> <li>NRC letter (1/24/20) defined licensing process expectations for</li> </ul> | After clarifying how regulatory transparency will be achieved in staff's use of this tool, NRC to implement this tool in its |

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|       |   | more risk informed reviews <ul style="list-style-type: none"> <li>• NRC developed a risk tool to enable a graded review process (12/17/20 workshop)</li> </ul>  | licensing reviews.  |
| III-3 | Less detailed reviews when conservatism is demonstrated | COMPLETE SUBJECT TO CLARIFICATION <ul style="list-style-type: none"> <li>• The NRC licensing process implementations and risk tool (per Rec. # II-1) effectively addresses this recommendation as well</li> </ul>   | After clarifying how regulatory transparency will be achieved in staff's use of this tool, NRC to implement this tool in its licensing reviews. |
| IV-3  | NRC recognition of PIRT results in licensing reviews    | SUBSTANTIAL ACTION TAKEN <ul style="list-style-type: none"> <li>• Industry recommended (7/28/20 workshop) that this be addressed in NRC graded review process per II-1 above</li> <li>• Thermal Modeling, Decay Heat Monitoring, and Fuel Performance PIRTS have been completed and "gross rupture" PIRT is underway</li> </ul> | NRC to consider PIRTS as appropriate in its licensing reviews.  |

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

| Rec. # | Summary   | Result   | Path Forward   |
|--------|---|--|--|
| IV-1   | NRC and industry to conduct thermal modeling PIRT                       | COMPLETE <ul style="list-style-type: none"> <li>• Thermal Modeling, Decay Heat Monitoring, and Fuel Performance PIRTS completed</li> </ul>   | 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. |
| IV-4   | Replace 400C "cliff edge" metric for thermal modeling                   | SUBSTANTIAL ACTION TAKEN <ul style="list-style-type: none"> <li>• 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)</li> </ul> | Industry and NRC to re-evaluate this limit after completion of the "gross rupture" PIRT.   |
| IV-5   | Develop graded approach to thermal modeling (reinterpret gross rupture) | SUBSTANTIAL ACTION TAKEN <ul style="list-style-type: none"> <li>• NRC has agreed (6/1/20 letter) to engage in an ongoing PIRT to address this recommendation. PIRT is ongoing.</li> </ul>  | Industry and NRC to engage on the development of this approach after completion of the "gross rupture" PIRT.                                 |

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| 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"> <li>The new review process NRC has developed per III-3 is specific to radiation dose/shielding and will enable this approach</li> </ul>   | NRC to reflect new approach in NUREG.   |
| V-2   | Revise Chapter 6 of NUREG-2215 based on experience  | <p>SUBSTANTIAL ACTION TAKEN</p> <ul style="list-style-type: none"> <li>Industry completed NRC requested Operating Experience evaluation and presented results to NRC in 12/16 public meeting</li> <li>Risk tool being developed per II-1 will help enable</li> </ul>   | NRC to revise Chapter 6 of the NUREG as appropriate to reflect lessons learned (including experience with application of the risk tool) |
| VI-2  | Align licensing approaches for fuel qualification information   | <p>SUBSTANTIAL ACTION TAKEN</p> <ul style="list-style-type: none"> <li>NRC approved graded approach to CoC amendments/applications per V-1</li> <li>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</li> </ul> | Holtec to submit and NRC to review, under the fee waiver granted for activities related to the White Paper.                             |
| VII-1 | Align licensing approaches for criticality safety   | <p>NO ACTION IN 2020</p> <ul style="list-style-type: none"> <li>Industry and NRC have agreed to planning dialogue to initiate needed actions</li> </ul>  | NRC and Industry to engage in further dialogue in 2021.   |
| VII-2 | Develop more realistic modeling of fuel configuration   | <p>NO ACTION IN 2020</p> <ul style="list-style-type: none"> <li>Industry and NRC have agreed to planning dialogue to initiate needed actions</li> </ul>  | NRC and Industry to engage in further dialogue in 2021.   |
| VII-3 | Redefine "gross rupture"  | <ul style="list-style-type: none"> <li>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</li> </ul>  | NRC and Industry to develop new definition upon completion of the "gross rupture" PIRT.   |

It should be noted that industry considers the clarification requested in Table 2 with respect to NRC's risk tool (Recommendations II-1 and III-3) to be of the utmost importance. This tool has the potential to be among the most valuable products of this effort, however, for this value to be realized, the tool must be transparently

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applied and its use visible to industry. It was not clear in our December 17 public meeting specifically how this would be achieved. We request that NRC schedule a public meeting at your earliest convenience so that we may further discuss.

Overall, NRC is to be commended for its hard work and dedication towards achieving needed improvements in dry storage licensing efficiency. This effort has become a notable example of the type of change that is needed if NRC is to truly complete its ongoing transformation to become a modern risk-informed regulator. Nuclear Materials Safety and Safeguards (NMSS) staff have clearly embraced the objective of former NMSS Office Director Mark Dapas' January 15, 2019 memorandum which identified "the need for systematic and expanded use of risk and safety insights in decision-making, including the need to appropriately scale the scope of staff review and the level of detail needed from an applicant for licensing decisions."

Industry looks forward to continuing to work with NRC on the implementation of the methods, tools, and approaches that we have developed. Going forward, it is important that we openly discuss and document the specific efficiency improvements which result, and address lessons learned to further refine our efforts. To this end, we recommend that, beginning in July 2021, NRC and Industry convene quarterly progress review and reinforcement meetings.

We are very interested in hearing NRC's perspective on what has been accomplished through this effort. We request that you reply to this letter with your assessment of the results identified in Tables 1-3 above and an indication of your willingness to engage on the recommended path forward. An initial response would be appreciated by February 22, 2021. Please contact me or Mark Richter of my staff ([mar@nei.org](mailto:mar@nei.org)) with any comments or questions on the content of this letter.

Sincerely,



Rod McCullum

Enclosure: Industry White Paper – *Defining Spent Fuel Performance Margins*

c: Mr. John Lubinski, NRC/NMSS  
Mr. Christopher Regan, NRC/NMSS/DFM  
Mr. James Rubenstone, NRC/NMSS/DFM