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May 1, 2015

Ms. Cindy Bladey  
Office of Administration, OWFN-12-H08  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**Subject:** Industry Comments on NRC draft NUREG-2174, "Impact of Variation in Environmental Conditions on the Thermal Performance of Dry Cask Storage" (Docket ID NRC-2014-0273).

**Project Number: 689**

Dear Ms. Bladey:

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI)<sup>1</sup> appreciates the opportunity to provide comments on the draft NUREG-2174, "Impact of Variation in Environmental Conditions on the Thermal Performance of Dry Storage Casks," that was published in the *Federal Register* on March 5, 2015 (80 FR 12042). The industry supports the advancement of understanding the impact of environmental conditions on the thermal analysis of dry cask storage systems.

The work contained in the draft NUREG provides helpful insights on the significance of various environmental conditions, such as ambient temperature, solar heating, humidity, elevation and wind. However, those insights need to be considered in the appropriate context. In this regard, we have four significant issues that should be addressed in the NUREG prior to final issuance:

- 1) There are statements in the draft NUREG that appear to inappropriately state new requirements. Industry's position on these statements is detailed in the attachment to this letter. If the NRC intends to incorporate the technical information from the draft NUREG into the CoC application review process, then it would be more appropriate for this information to be directly incorporated into NUREG-1536, in a manner consistent with the objectives of NUREG-1536.
- 2) There are a number of considerations regarding conservatisms in the analysis in the draft NUREG and licensing basis thermal calculations that should be factored into the determination that a given cask system will satisfy the peak cladding temperature limits with reasonable assurance that are not

<sup>1</sup> NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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fully recognized in the results presented in Section 4. These considerations are explained in the attachment to this letter.

- 3) In most cases the analysis performed in the draft NUREG was based on steady state conditions (i.e., long-term environmental conditions) and did not consider the effect of nearby buildings, other casks, or topography. Industry believes that this approach is overly conservative. Our position in this regard is discussed in the attachment to this letter.
- 4) The report includes a statement about the significance and impact of the results presented in the draft NUREG that is not substantiated with experimental data or operational experience. Our specific concerns with this statement is discussed in the attachment to this letter.

The industry believes that the results presented in the draft NUREG provide conformation of the capability of the dry cask storage systems, regardless of the significant differences of the designs, to adequately discharge the heat associated with used nuclear fuel. Despite performing a very conservative analysis, the impact on the peak cladding temperature shown in the NUREG is not significant (i.e., less than 10%). While, this analysis provides some insights into the nature and magnitude of such effects, we believe that the results of the effort, when viewed in an appropriate context, do not provide sufficient value to warrant the commitment of additional resources to this topic. Therefore, in considering our comments, NRC should also consider whether or not finalization of the NUREG is even necessary.

If you have any questions or require additional information, the industry would look forward to discussing this issue further.

Sincerely,



Kristopher W. Cummings

Attachment

c: Ms. Catherine Haney, NMSS, NRC  
Mr. Mark Lombard, NMSS/DSFM, NRC  
Mr. Anthony Hsia, NMSS/DSFM, NRC  
Mr. Christian Araguas, NMSS/DSFM/CSTB, NRC  
Mr. Jorge Solis, NMSS/DSFM/CSTB, NRC

## Additional Detail Supporting the Comments on Draft NUREG-2174, "Impact of Variation in Environmental Conditions on the Thermal Performance of Dry Cask Storage"

- 1) Four statements in the draft NUREG are identified and repeated below, that are presented as recommendations to NRC staff to implement when reviewing Certificate of Compliance (CoC) applications:

### **Four Applicable Statements from Specific Sections of Draft NUREG-2174 (i.e., underlined and in italics)**

#### ABSTRACT

*The NRC staff should consider the analysis results in this report when performing technical reviews, applicants should consider them when applying for cask certification, and the technical reviewer should consider them for applicability to a specific design. The results can also be used as additional guidance when considering the thermal impact of the environmental factors in the thermal performance of spent fuel dry storage systems.*

#### CONCLUSIONS

##### Bullet 1

Wind magnitude mainly affects the underground cask design included in this study. As wind speed increases, predicted peak cladding temperature (PCT) increases for a range of wind speeds of 0 to 2.235 meters per second (m/s) [0 to 5 miles per hour (mph)], as compared to quiescent conditions. At a wind speed of about 2.235 m/s (5 mph), the PCT reached the maximum predicted value. At higher wind speeds, the PCT starts to decrease. Therefore, low wind speed should be considered in the thermal evaluation as a normal environmental variable. This specific analysis examined the effect on this type of underground design and determined that a wind speed of 2.235 m/s (5 mph) will result in the maximum predicted cladding temperature. *A thermal evaluation should be performed for other underground designs to determine how wind affects the cask's thermal performance, as part of the thermal evaluation for normal storage conditions.*

##### Bullet 10

Based on a transient analysis, about 95 percent of PCT change is reached in 10 days when the wind direction is normal (perpendicular) to the back of the advanced NUHOMS cask with a magnitude of 10 mph. *For this design, the applicant should include the effect of back wind when there is no sufficient margin.*

##### Bullet 12

Based on a transient analysis, about 95 percent of the PCT change between the 300 and 322 K (80 and 120°F) steady-state cases is reached after 7 days. *Measured temperatures suggest that, to bound all sites, the SAR thermal evaluation should consider seasonal variations.*

From a logistical perspective, the draft NUREG provides little to no guidance on how, and to what extent these recommendations, and associated technical information, should be implemented in the overall review process. This ambiguity would lead to non-standard interpretations and applications of the technical information. As such, these recommendations are inconsistent with the NRC's Principles of Good Regulation:

*"Regulatory actions should always be fully consistent with written regulations and should be promptly, fairly, and decisively administered so as to lend stability to the nuclear operational and planning processes."*

From a regulatory process perspective, the recommendations presented in the draft NUREG are outside the scope, and inconsistent with the objectives of NUREG-1536, Revision 1, "Standard Review Plan for Spent Fuel Dry Storage Systems at a General License Facility," (i.e., the primary regulatory vehicle that NRC Staff would use to review applications for a CoC of a dry storage system (DSS) for use at a general license facility). That is:

- provide a basis that promotes a consistent regulatory review of an application for a DSS;
- promote quality and uniformity of these reviews across each technical discipline;
- present a basis for the review scope;
- identify acceptable approaches to meeting regulatory requirements; and
- develop an approach for review of each review procedure section of each chapter to assist the staff in prioritization of its review.

Therefore, the inclusion of these four statements in the draft NUREG is inappropriate. At a minimum, if the NRC intends to incorporate the technical information from the draft NUREG in the CoC application review process, then this information should be directly incorporated into NUREG-1536, in a manner consistent with the objectives of NUREG-1536.

- 2) For the majority of the results presented in Tables 4-8 through 4-25, the impact of any given environmental variable is less than 10% of the peak cladding temperature limit (in terms of the absolute temperature in Kelvin). Given the conservative nature of the licensing basis thermal calculations, it is expected that there is sufficient conservatism to accommodate the uncertainties associated with wind speed and direction. Additionally, the decay heat load of any individual cask must be below the licensed decay heat limit, which is specified in the Certificate of Compliance for the individual cask systems. In reality, spent fuel storage casks currently in service have typically been loaded with much lower heat loads than allowed by the license or CoC.

The only significant impact reported in Section 4 is associated with the impact of wind speed and direction on the peak clad temperature in a hypothetical vertical cask with only two vents. As recognized on page 34 the report,

"It should be mentioned that this analysis corresponds to an extreme case, because the NRC has not certified a cask design with only two vents."

At a minimum, this stipulation should be more clearly articulated in both the Abstract and the Conclusion section of the report to ensure that the results are not misconstrued or applied inappropriately in the future. Alternatively, the two-vent vertical cask analysis could be removed in its entirety without any loss of value to the report, given that this cask system is not a realistic representation of any actual cask and likely would not be postulated given the limited ability of a two-vent cask to disperse heat through passive cooling.

- 3) Certain environmental variables, such as temperature and humidity could be credibly considered to exist for several weeks depending on the specific geographic location of a dry storage cask in the United States. However, wind speed and direction will vary with time over several days, such that the wind speed and direction analysis contained in the NUREG is highly conservative. The analysis also does not appear to consider the effect of nearby buildings, other casks, or topography that would create more realistic wind scenario resulting in varying wind speed and direction with time. Additional stipulations recognizing the conservative nature of these analyses need to be added to the report to ensure that the results are not applied inappropriately in the future.
- 4) In the Introduction, it is stated,

"...these adverse ambient conditions could result in peak cladding temperatures (PCTs) being higher than the SRP-recommended limits, which could create thermal conditions such that spent fuel could degrade and lead to gross rupture."

This statement is speculative into the impact of exceeding the limits established in ISG-11, Revision 3 and on the ability of the cladding to be protected against degradation that leads to gross ruptures. This sentence should be removed from the document and allow the results of the thermal analysis results to stand-alone in the context of impact on peak-cladding temperature. Given the ongoing research and experiments into cladding integrity, by DOE, EPRI, NRC and the industry, conclusions in this area should be reserved for the future.