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February 16, 2022

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

Subject: Request for Review and Endorsement of NEI 22-02 – Guidelines for Weather-Related Administrative Controls for Short Duration Outdoor Dry Cask Storage Operations

Project Number: 689

Dear Ms. Helton:

The Nuclear Energy Institute (NEI)¹, on behalf of its members, is submitting NEI 22-02, "Guidelines for Weather-Related Administrative Controls for Short Duration Outdoor Dry Cask Storage Operations," for NRC review and endorsement. This guidance has been developed as follow up to discussions held in a November 9, 2021, public meeting between industry and NRC on approaches to addressing tornado hazards during short-duration dry cask outdoor operations. During this meeting, and in interactions between NRC inspectors and industry representatives at various plants, it has become apparent that greater clarity may be needed regarding the administrative controls that industry employs to assure that certain short-term dry cask operations are not conducted outdoors during times that severe weather is forecast.

NEI believes that clarity on this subject can be provided through NRC review and approval of guidance that will describe acceptable industry methods for relying on weather forecasting to assure that short-duration dry cask outdoor loading operations are not started when severe weather is expected and that such operations can be restored to an analyzed configuration in the event that weather forecasts subsequently change. This is important for two reasons:

- Operators need flexibility to tailor, and update as necessary, their site-specific administrative controls to address site-specific configurations and conditions that may change over time.

¹ 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.

- Given the wide range of operating practices applied during DCS operations across the US nuclear fleet, NRC review and approval of specific administrative controls or operating practices would create a significant increase in both NRC and licensee workload with no commensurate safety benefit.

Since NRC questions about this issue have arisen in the context of recent inspections conducted with respect to 10 CFR 72.48, "Changes, Tests, and Experiments," industry considers NEI 22-02 to be a complimentary resource to NRC endorsed industry guidance document NEI 12-04, Revision 2,² "Guidance for Implementation of 10 CFR 72.48, 'Changes, Tests, and Experiments.'" It is our expectation that NRC endorsement of NEI 22-02 would provide a vehicle to achieve a documented resolution to NRC inspector questions raised about protection of Dry Storage Systems (DSS) from natural phenomena during transient outdoor operations.

NEI 12-04 was reviewed and endorsed by NRC under a fee waiver, granted pursuant to 10 CFR 170.11(a)(1)(ii). We are requesting that this urgently needed addition to industry's 10 CFR 72.48 guidance can be similarly reviewed. NEI is therefore requesting that the NRC's review of this proposed companion document to NEI 12-04, Revision 2 be granted a fee waiver pursuant to 10 CFR 170.11(a)(1)(ii), consistent with the NRC's waiver granted for NEI 12-04 Revision 2. We will submit a formal request for a fee waiver to the Office of the Chief Financial Officer.

NEI believes that NRC endorsement of NEI 22-02 can further advance ongoing efforts to improve the efficiency of the dry storage regulatory process, consistent with the efforts to more effectively implement the Commission's principles of good regulation as well as the regulatory review vision articulated by Marc Dapas in his January 15, 2019, memorandum to the NRC staff, "Key Principles for Nuclear Material Safety and Safeguards Reviews."³

We look forward to discussing this draft guidance with NRC staff in a public meeting now scheduled for February 17, 2022. Please contact me or Mark Richter of my staff (mar@nei.org) with any comments or questions on the content of this letter.

Sincerely,



Rod McCullum

c: Mr. John Lubinski, NRC/NMSS
Mr. Geoff Miller, NRC/NMSS/DFM
Ms. Jennifer Weil, NRC/NMSS/DFM

² NEI 12-04 Revision 2 was endorsed by NRC in Regulatory Guide 3.72 in September 2020

³ Key Principles for Nuclear Material Safety and Safeguards Reviews, Marc Dapas, January 15, 2019, ML19015A290

GUIDELINES FOR WEATHER-RELATED ADMINISTRATIVE CONTROLS FOR SHORT DURATION OUTDOOR DRY CASK STORAGE OPERATIONS

Prepared by the Nuclear Energy Institute
February 2022

Revision Table

Revision	Description of Changes	Date Modified	Responsible Person

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Foreword

This document provides guidance for licensees of Independent Spent Fuel Storage Installations (ISFSIs) to use for developing weather-related administrative controls applicable to short duration, outdoor dry cask storage (DCS) operations. This guidance does not apply to normal storage operations at the ISFSI. The purpose of the administrative controls to which this guidance applies is to provide reasonable assurance that severe weather is unlikely to occur during such operations. This document also provides guidance for administrative controls to address actions to be taken in response to changes in weather forecasts that may occur during short duration outdoor DCS operations.

This guidance provides a shared understanding of the principles guiding the implementation of appropriate measures that can be implemented by licensees to address the potential for severe weather during a DCS campaign. The document also provides resources and implementation guidance to help licensees develop the details of appropriate site-specific administrative controls that cannot be generically specified due to site-specific configurations or conditions.

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1 INTRODUCTION

This document was prepared in response to an application of the Very Low Safety Significance Issue Resolution Process (VLSSIR) that addressed issues pertaining to spent nuclear fuel (SNF) dry storage system (DSS) and related auxiliary equipment designs for natural phenomena events involving severe weather. Of particular interest is the potential occurrence of a tornado during dry cask storage (DCS) operations occurring outdoors between the time the loaded SNF cask¹ is exposed to outdoor conditions and before it is in its storage location at the Independent Spent Fuel Storage Installation (ISFSI).

The activities of interest are short-duration operations that are necessary to transfer the SNF to the ISFSI and are performed outdoors, where the protection of a building structure is not available and for which formal tornado wind/missile analyses are not conducted. The types and durations of these activities, and the equipment involved, are defined by the combination of the DSS design and site-specific facility configuration and procedures. Section 2.1 defines and provides examples of short duration outdoor DCS operations. Section 3 provides implementation guidance.

DSS designs and operations are determined to be safe by NRC review and approval of the specific ISFSI license or DSS Certificate of Compliance (CoC) as described in the supporting NRC Safety Evaluation Report (SER). Safe storage of the SNF also depends on licensees using the DSS as described in the approved licensing basis and implementing site-specific administrative controls, as appropriate.

The topic of severe weather during short duration outdoor DCS operations is typically not addressed in the ISFSI or DSS FSAR, or the NRC's SER. Instead, licensees rely on administrative controls to assure that these operations do not occur during times that severe weather is forecast. The multitude of equipment types and configurations that could be possible across the dozens of ISFSI sites in the United States make it infeasible to address every conceivable circumstance at every site.

This document will benefit ISFSI licensees and the NRC by aligning the expectations for severe weather-related administrative controls governing short duration outdoor DCS operations. This guidance provides the principles underpinning the site-specific measures that should be implemented by licensees to address the potential for severe weather during a DCS campaign. The guidance also provides resources and implementation guidance to help licensees develop appropriate and consistent site-specific administrative controls that cannot be generically specified (i.e., because they depend on site-specific factors such as specific weather forecasting resources that may vary by geographic location, details of the loading campaign that vary by design of the system used, etc.). The topics of interest include:

- The types of severe weather to be considered,
- Severe weather forecast resources that should be consulted prior to initiating short duration outdoor DCS operations and during such operations, and
- Severe weather forecast conditions under which short duration outdoor DCS operations should not be conducted.

¹ As used in this document. "cask" means a fuel-loaded bare fuel cask, canister inside a transfer cask, or canister inside a storage cask.

This guidance provides a common set of practices acceptable to industry and the NRC for developing the appropriate site-specific procedures or instructions to be implemented at each site. This guidance does not supersede any requirements in an ISFSI specific license, a DSS CoC, or the associated FSARs. The licensing basis as described in those documents always governs.

Administrative controls also play a role in guiding licensee actions with respect to DSS operations, particularly with respect to natural phenomena. This guidance provides a shared understanding of the principles guiding the implementation of appropriate administrative control measures that can be implemented by licensees to address the potential for severe weather during a DCS campaign. The document also provides resources and implementation guidance to help licensees develop the details of appropriate site-specific administrative controls that cannot be generically specified due to site-specific configurations or conditions.

2 SCOPE OF THE GUIDANCE

This section summarizes what is meant by “short duration outdoor DCS activities” and the use of administrative controls by ISFSI licensees during those activities.

2.1 Short Duration Outdoor DCS Activities

This guidance is limited in its applicability to short-duration DCS operations conducted outdoors that are necessary at many sites to accomplish moving SNF from wet to dry storage. These activities occur between when the cask loaded with SNF leaves the protection provided by the indoor facility plant and when it is in its storage location at the ISFSI. In these locations and at several interim locations between the two, the DSS either is in an analyzed configuration for tornado missiles or can be placed in such a configuration without delay, but in controlled, deliberate manner, if necessary.

The specific types of these activities and ancillary equipment involved vary by DSS design and site facility infrastructure. For these reasons, neither a complete list of all activities and equipment nor a single bounding duration for these activities can be defined. Each licensee must individually determine what, if any, short duration outdoor DCS activities are conducted at its site and the time frames involved.

The overall goal of licensees conducting DCS operations is to move the cask to the ISFSI as expeditiously as possible considering safety, personnel dose, and time in an appropriate balance. Short duration outdoor DCS activities are performed continuously. That is, they continue until completed, i.e., have reached the point where the cask is at the ISFSI in its storage location in its analyzed storage configuration. During these activities, there are also periods where the DSS is in an analyzed condition temporarily (e.g., cask resting on the ground) to allow for shift changes, equipment adjustments, and other operational needs. Importantly, short duration outdoor DCS activities are used to transition from one analyzed configuration to another, and are performed pursuant to utilities’ written procedures or instructions. These activities are conducted under the active control of DCS personnel from start to finish by the work crew and its supervision.

Because short duration outdoor DCS activities require coordination with other plant activities and personnel, there is site-wide awareness, including main control room and shift management personnel. Furthermore, as part of their normal duties, shift management personnel are aware of changes to the weather forecast and are trained to respond based on the circumstances of the forecast change and the activities ongoing at the time. The response includes making appropriate notifications and

announcements to site personnel and ensuring appropriate actions for any ongoing outdoor activity, including DCS activities, are implemented.

Some examples of common short-duration outdoor activities are listed below. Others may exist that are unique to a particular site.

- Movement of cask with a motorized crawler, truck and trailer, air pads, rail carts, self-propelled modular transporter, or similar conveyance,
- Use of an outdoor facility to perform the transfer of the canister from the transfer cask to the storage cask,
- Removal of the transfer cask lid, insertion of the canister into the horizontal storage module (HSM), retraction of the transfer trailer with the HSM door uninstalled, and installation of the HSM door,
- Installation of a vertical storage cask lid after the canister has been downloaded from the transfer cask into the storage cask, and
- Use of a crane or other lifting device to lift or move the cask outside the plant facility or to support transfer of the canister from the transfer cask to the vertical storage cask or HSM.

ISFSI licensees responsible for the safety of the SNF have an obligation to determine if additional controls beyond the licensing basis may be prudent for their particular sites. In doing so, ISFSI licensees use the best available and appropriate methods to provide reasonable assurance of adequate protection of public health and safety. This includes the use of administrative controls.

2.2 Licensing Basis and Administrative Controls

Dry storage systems (vertical and horizontal) and transfer casks are designed and analyzed for the severe weather events in accordance with 10 CFR 72.122(b). The DSS designer determines the design criteria for the design and supporting analyses, including maximum wind speed and tornado missile size and mass using applicable regulatory guidance. Importantly, the DSSs and transfer casks are assumed to be fully configured for the related safety analyses. That is, lid installed and fully bolted in place. The location of the cask (on ground or situated on a transfer vehicle) may also be specified in the FSAR.

Certain short duration outdoor DCS operations and the ancillary equipment involved often are either not addressed in ISFSI or DSS FSAR at all, or are addressed at a high level to allow the operational flexibility individual licensee's need. That is, the licensing basis in the FSAR often does not define in detail all scenarios where an SSC may be subject to severe weather events. Portable lifting devices such as boom cranes and cask transport vehicles (whether classified as important to safety or not) may not be designed or analyzed for high winds and/or tornado missiles because they are used intermittently and for short periods of time to lift and move the loaded cask and these devices are not operated during times when severe weather is forecast².

² In cases where the lifting device is designed in accordance with ASME NOG-1, Section 4134(c) specifically states that the crane "will not be operational, but be secured" during tornado winds. This implies the ability to predict tornado winds.

Present day weather forecasting capability and technology in the United States is sufficiently sophisticated and accurate. Accurate weather forecasting enables ISFSI licensees to reliably determine with high confidence whether severe weather will occur in the windows of time required to conduct the various required short duration outdoor DCS activities at their sites. A forecast that predicts no severe weather for that window provides the basis for the licensee to consider tornadoes as non-credible events during that time. Thus, use of the administrative controls and commitment to not move casks to the ISFSI pad during inclement weather give the utility reasonable assurance of adequate protection without having conducted tornado missile analyses during these short term windows.

ISFSI licensees also recognize that routine DCS operations conducted outdoors sometimes involve DSS components in an unanalyzed configuration for short time segments. These operations do not require detailed tornado missile analysis due to the low-risk associated with them, the extremely low probability of them being disrupted by severe weather during these short time periods, and the further risk reduction provided by administrative controls. This also provides needed operational flexibility and avoids the significant burden that analyzing each and every operational configuration would impose. Thus, for short duration outdoor DCS activities and component configurations where the licensing basis is silent, it is prudent for ISFSI licensees to have appropriate site-specific administrative controls in place to address the potential for severe weather.

3 GUIDANCE

This section describes the resources and principles for licensees to review existing administrative controls and developing or revising DCS-related severe weather administrative controls, as necessary to address this guidance. There are both proactive and reactive elements to such administrative controls involving:

- Actively checking for severe weather alerts before and during short term outdoor DCS operations, and
- Reacting to severe weather alerts received outside of the active checks (e.g., notification from the control room of a severe weather alert for the site).

3.1 Resources

In the United States, the National Weather Service (NWS) is an agency under the National Oceanic and Atmospheric Administration (NOAA), within the Department of Commerce. The NWS manages a hazardous weather outlook program and severe weather alert system that should be used as the resource for addressing severe weather before and during short duration outdoor DCS operations. Licensees should use the NWS's hazardous weather outlook information unless another resource for the site is already used or can be justified as providing equivalent information in terms of timeliness and accuracy.

NWS weather forecasting is highly accurate and reliable in the near-term windows of time associated with planning short duration outdoor DCS activities. The NWS's hazardous weather outlook program includes three classifications of severe weather alerts: watch, warning, and advisory; although advisories

are used less broadly than watches and warnings. The NWS defines over 40 weather watches, warnings, and advisories.³ Those that apply to this guidance are listed in Section 3.3.

From the NWS web page, a link is available for active alerts (www.weather.gov/alerts). On that page, the user will find several useful links to determine if a severe weather alert is in effect for the site or if severe weather is forecast for the upcoming time periods of interest, including:

- Warnings by State
- Latest Warnings
- Thunderstorm/Tornado Outlook
- Hurricanes

Licensees can also use one of several mobile phone and internet-based applications (e.g., the Weather Channel) to receive severe weather notifications in real time for the area of interest. However, mobile phone applications should be considered defense-in-depth and not a replacement for written procedures or instructions.

3.2 Use of Severe Weather Alerts to Guide Decision-making

The overarching principle for this guidance is: short duration outdoor DCS activities are to be avoided if certain watches, warnings, or advisories are in effect or expected for the geographic area that includes the site. Severe weather advisories should be considered as reasons to avoid certain DCS operations by ISFSI licensees case-specifically, based on the particular circumstances of the advisory, as discussed further below.

“Avoiding” short duration outdoor DCS operations means not conducting these activities until the severe weather alert is no longer in effect for the site and for the expected duration of the activities. Whether a severe weather alert is in effect before or during short duration outdoor DCS activities, the intent of ISFSI licensee response actions is fundamentally the same – to ensure the cask is placed in an analyzed configuration. Such actions should reflect the specific circumstances and timing of the potential change to the weather forecast as well as the current status of the short duration outdoor DCS operation. Response actions may involve any of the following, depending on the severity and timing of the pending weather situation:

- Keeping the cask in a suitable structure,
- Returning the cask to a suitable structure,
- Completing the placement of the fully-configured cask in its storage location at the ISFSI,
- Placing the cask in an analyzed configuration at or near its then-current location, or
- Other action deemed appropriate by the licensee.

³ [Watch/Warning/Advisory Definitions \(weather.gov\)](http://www.weather.gov/alerts)

3.3 Implementation

The following NWS alerts are within the scope of this guidance, requiring administrative controls for short duration outdoor DCS operations if the site location is within the alert area:

- Severe thunderstorm watch or warning
- Tornado watch or warning
- Winter storm, blizzard, or ice storm watch or warning
- High wind watch or warning
- Extreme wind warning
- Flood watch or warning (if expected to impact the site location)
- Tropical storm watch or warning
- Hurricane watch or warning

Licensees should create administrative controls to implement this guidance in the form of new or revised DCS procedures or instructions if existing procedures do not sufficiently address applicable aspects of this guidance. Such procedures or instructions should be consistent with plant protocols and input from the DSS designer, as necessary, for contingency plans. Furthermore, existing protocols for plant-wide actions required in the event a severe weather alert is declared should be reviewed and revised, if necessary, to appropriately consider DCS activities in progress at the time. This provides a “two-way” set of administrative controls for the affected activities.

The procedures or instructions should require a check for active severe weather alerts before outdoor DCS activities commence. Such activities should be prohibited if one of the alerts listed above is in effect at any time over the expected duration of the outdoor activity. The responsible personnel should also decide if a severe weather advisory (as opposed to one of the watches or warnings listed above) or other contemporaneous weather forecast information (e.g., temperature, wind, etc.) should prohibit such operations based on the particular circumstances of that advisory or other forecast information. In doing this, responsible personnel should also include a recognition of the opportunities that exist to move the DCS to an analyzed configuration and the timeframes needed to accomplish this.

Depending on the expected duration of the DCS activity, the procedures or instructions should include additional checks of the forecast one or more times during the activity. Licensees should decide if, and how frequently, additional forecast checks should be performed and include that frequency in procedures or instructions. These formal forecast checks should be recorded and maintained with the documentation for the DCS campaign. Licensees may also wish to consider having designated DCS personnel download an application to a mobile device that will provide immediate notification of severe weather affecting the site in real time as a defense-in-depth measure.

Lastly, the procedures or instructions should include guidance at a level of detail sufficient for specific actions to be taken if the weather forecast changes. Such information could come from a planned check of the forecast, notification from the plant control room, an alert from a mobile device application, or

other source. Information not verified to have come from the NWS or other site-approved source should be validated. Licensees should place the DSS in an analyzed configuration awaiting such validation.

4 REFERENCES

- 1) Title 10, *Code of Federal Regulations* (10 CFR), Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste," U.S. Nuclear Regulatory Commission.
- 2) NUREG-2215, "Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities," U.S. Nuclear Regulatory Commission.
- 3) NRC Regulatory Guide 1.76, "Design Basis Tornado and Tornado Missiles for Nuclear Power Plants," Revision 1, U.S. Nuclear Regulatory Commission.