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E-59819

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Subject: Application for Amendment 3 to NUHOMS® EOS Certificate of Compliance No. 1042, Revision 3a (Docket 72-1042, CAC No. 001028, EPID: L-2021-LLA-0055) – Amendment Scope Change

The purpose of this submittal is to inform the NRC of a requested additional scope item for CoC 1042 Amendment 3, which is currently under NRC review. The reason for this additional scope item is to add technical specifications (TS) requirements associated with transfer cask lifting heights and consideration of severe weather.

The reason for this change is that in complying with ASME NOG-1 requirements for single-failure-proof cranes of the type used with the CoC 1042 NUHOMS® EOS System, severe weather conditions prohibit operation and must be considered. This change adds TS requirements to account for those severe weather conditions, including severe weather warnings and watches.

Enclosure 1 provides the changed TS pages associated with this scope change. Enclosure 2 provides the changed updated final safety analysis report (UFSAR) pages associated with this scope change. New TS and UFSAR changes are shaded gray.

Should the NRC staff require additional information to support review of this application, please do not hesitate to contact Mr. Glenn Mathues at 410-910-6538, or by email at Glenn.Mathues@orano.group.

Sincerely,

A. Prakash

Prakash Narayanan
Chief Technical Officer

cc: Chris Jacobs (NRC), Senior Project Manager, Storage and Transportation Licensing Branch Division of Fuel Management

Enclosures:

1. Changed Technical Specifications Pages
2. Changed Updated Safety Analysis Report Pages

Enclosure 1 to E-59819

Changed Technical Specifications Pages

1.1 Definitions (continued)

HORIZONTAL STORAGE MODULE (HSM)	An HSM is a reinforced concrete structure for storage of a loaded DSC at a spent fuel storage installation. Where the term "HSM" is used without distinction, this term shall apply to both the EOS-HSM and HSM-MX. The term EOS-HSM refers to the base unit for storage of a single DSC as a single piece (EOS-HSM) or as a split base (EOS-HSMS). The term MATRIX (HSM-MX) refers to the two-tiered staggered structure for storage of the DSCs.
INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)	The facility within a perimeter fence licensed for storage of spent fuel within HSMs.
INTACT FUEL	Fuel assembly with no known or suspected cladding defects in excess of pinhole leaks or hairline cracks, and with no missing rods.
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on a DSC in a TC while it is being loaded with fuel assemblies. LOADING OPERATIONS begin when the first fuel assembly is placed in the DSC and end when the TC is ready for TRANSFER OPERATIONS (i.e., when the cask is in a horizontal position on the transfer trailer.) LOADING OPERATIONS do not include DSC transfer between the TC and the HSM.
LOW-ENRICHED OUTLIER FUEL (LEOF)	LOW-ENRICHED OUTLIER FUEL is PWR and BWR fuel with enrichments below the minimum enrichment specified in Table 7A and Table 18, respectively.
RECONSTITUTED FUEL ASSEMBLY	A RECONSTITUTED FUEL ASSEMBLY is a fuel assembly where one or more fuel rods are replaced by low enriched uranium or natural uranium fuel rods or non-fuel rods.
SAFE CONDITION AND FORECAST	*A SAFE CONDITION AND FORECAST is considered to be the absence of: Tornado and Severe Thunderstorm Watches, Tornado and Severe Thunderstorm Warnings, and Hazardous Weather Outlook indicating a moderate or high risk of severe thunderstorms for the current date (Day One at the NOAA website).*

(continued)

All Indicated Changes are in support of an additional scope item for Lifting Controls.

5.0 ADMINISTRATIVE CONTROLS (continued)

iv. If measurements or other evidence indicate that the HSM-MX concrete temperatures have exceeded the concrete accident temperature limit of 500 °F for more than 32 hours, the user shall perform an analysis and/or tests of the concrete in accordance with TS 5.3. The user shall demonstrate that the structural strength of the HSM-MX has an adequate margin of safety and take appropriate actions to return the HSM-MX to normal operating conditions.

v. If measurements or other evidence indicate that off-normal or accident temperature limits for fuel cladding have been exceeded, verify that canister confinement is maintained and assess analytically the condition of the fuel. Additionally, within 30 days, take appropriate actions to restore the spent fuel to a safe configuration.

5.2 Lifting Controls

5.2.1 TC/DSC Lifting Height and Temperature Limits

The requirements of 10 CFR 72 apply to TC/DSC lifting/handling height limits outside the FUEL BUILDING. The requirements of 10 CFR Part 50 apply to TC/DSC lifting/handling height limits inside the FUEL BUILDING. Confirm the surface temperature of the TC before TRANSFER OPERATIONS of the loaded TC/DSC.

The lifting height of a loaded TC/ DSC is limited as a function of low temperature, the type of lifting/handling device, *and weather,* as follows:

- No lifts or handling of the TC/DSC at any height are permissible at TC surface temperatures below 0 °F
- The maximum lift height of the TC/DSC shall be 65 inches for the EOS-DSCs or 80 inches for the 61BTH Type 2 DSC if the surface temperature of the TC is above 0 °F and a non-single-failure-proof lifting/handling device is used.
- No lift height restriction is imposed on the TC/DSC if the TC surface temperature is higher than 0 °F, a single-failure-proof lifting/handling system is used*, and (for lifting/handling outside the FUEL BUILDING) a SAFE CONDITION AND FORECAST is verified.*

The requirements of 10 CFR Part 72 apply when the TC/DSC is in a horizontal orientation on the transfer trailer. The requirements of 10 CFR Part 50 apply when the TC/DSC is being lifted/handled using the cask handling crane/hoist. (This distinction is valid only with respect to lifting/handling height limits.)

5.2.2 Cask Drop

<u>Inspection Requirement</u>

The TC will be inspected for damage and the DSC will be evaluated after any TC with a loaded DSC side drop of 15 inches or greater.

(continued)

All Indicated Changes are in support of an additional scope item for Lifting Controls.

Enclosure 2 to E-59819

Changed Updated Safety Analysis Report Pages

A.1.2.2 TRANSFER EQUIPMENT

Transfer Trailer:

The EOS DSC will be transferred to the HSM-MX using the same transfer trailer and ram as the transfer equipment transferring the EOS DSC to the EOS-HSM. Thus, there is no change from Section 1.2.2.

Cask Support Skid:

A universal support skid will be used for the transfer of the NUHOMS® EOS DSC to the HSM-MX and is shown in Figure A.1-9. The key design features from the EOS cask support skid are the same as those described in Section 1.2.2; however, in addition, the universal support skid also allows for a NUHOMS® MATRIX loading crane (MX-LC) to capture the skid with a grappling mechanism to raise and lower the TC/DSC for insertion into the HSM-MX.

Ram:

The EOS DSC will be transferred to the HSM-MX using the same ram as the transfer equipment transferring the EOS DSC to the EOS-HSM. Thus, there is no change from Section 1.2.2.

NUHOMS® MATRIX Loading Crane:

The MX-LC is the device used as part of the NUHOMS® transfer equipment, designed and built to assist in loading the DSC into the HSM-MX. The MX-LC is a Part 72 [A.1-1] important-to-safety (ITS) piece of transfer equipment. The MX-LC is designed, fabricated, installed, tested, inspected, and qualified in accordance with *the applicable portions of* ASME NOG-1 [A.1-4], as a Type 1 gantry crane. In addition, the MX-LC is engineered to be "single-failure-proof" per NUREG-0612 [A.1-5]. The MX-LC is considered ITS as it supports the loaded TC/DSC during the DSC's insertion and extraction both into and out of the HSM-MX, respectively, thus providing both a structural and retrieval function. 72.48

NUHOMS® MATRIX Retractable Roller Tray:

The NUHOMS® MATRIX retractable roller tray (MX-RRT) is part of the NUHOMS® transfer equipment and is a device used to support the DSC during transfer operations. There are two MX-RRT beams inserted into opposing channels below the DSC opening on the HSM-MX. Each of the MX-RRT beams are removed upon completion of the loading operation.

All Indicated Changes are in support of an additional scope item for Lifting Controls.

A.2.1.4.2 Other Transfer Equipment

The NUHOMS® EOS HSM-MX transfer equipment (i.e., ram, skid, transfer trailer, MATRIX loading crane (MX-LC), MATRIX retractable rolling tray (MX-RRT) and MX-RRT handling device (RHD)) are necessary for the successful loading of the DSCs into the HSM-MX.

MX-LC

The NUHOMS® MX-LC is the device used as part of the NUHOMS® transfer equipment, designed and built to assist in loading the DSC into the HSM-MX. The MX-LC is a Part 72 [A.2-6] ITS piece of transfer equipment. The MX-LC is designed, fabricated, installed, tested, inspected, and qualified in accordance with *the applicable portions of* ASME NOG-1 [A.2-7], as a Type I gantry crane. In addition, the MX-LC is engineered as "single-failure-proof" per NUREG-0612 [A.2-9]. The MX-LC is considered ITS since it supports the loaded TC/DSC during the DSC's insertion and extraction both into and out of the HSM-MX, respectively, thus providing both a structural and retrieval function. 72.48

MX-RRT

The MX-RRT is part of the NUHOMS® transfer equipment and is a device used to support the DSC, during transfer operations. There are two MX-RRT beams inserted into opposing channels below the DSC opening on the HSM-MX. Each of the MX-RRT beams are removed upon completion of the loading operation and replaced with the HSM-MX shield door shielding blocks. The MX-RRT is designed in accordance with ASME B30.1 [A.2-15] as a combination power-operated jack with industrial rollers. Structural acceptance criteria of the MX-RRT is in accordance with ASME NOG-1 [A.2-7]. In addition, the MX-RRT is engineered as "single-failure-proof" per NUREG-0612 [A.2-9]. The MX-RRT function is twofold, one to accept the DSC during its insertion and second, to lower the DSC onto its permanent pillow blocks within the HSM-MX. The MX-RRT is a Part 72 ITS-related piece of transfer equipment. The MX-RRT is considered ITS as it supports the DSC during its insertion and extraction both into and out of the HSM-MX, respectively, thus providing both a structural and retrieval function.

MX-RRT Handling Device

The MX-RRT handling device is part of the NUHOMS® Transfer Equipment and is a device used to allow insertion and extraction of the MX-RRT and the HSM-MX shield door shielding blocks. This is a NITS piece of equipment since it does not provide a safety function feature for the HSM-MX.

A.2.1.5 Auxiliary Equipment

No change to Section 2.1.5.

All Indicated Changes are in support of an additional scope item for Lifting Controls.

A.2.3 Design Criteria for Environmental Conditions and Natural Phenomena

The HSM-MX ITS SSCs described in Section A.2.1 are designed consistent with the 10 CFR Part 72 [A.2-6] §122(b) requirement for protection against environmental conditions and natural phenomena. The criterion used in the design of the NUHOMS® EOS System ensures that exposure to credible site hazards does not impair their safety functions.

A.2.3.1 Tornado Wind and Tornado Missiles for HSM-MX

The HSM-MX *is* designed to safely withstand 10 CFR 72.122 (b)(2) tornado missiles. The tornado characteristics, as specified in NRC Regulatory Guide (RG) 1.76, Revision 1 [A.2-8], are used to qualify the HSM-MX. The missiles spectrum of NUREG-0800, Revision 3, Section 3.5.1.4 [A.2-10] with missile velocity for Region I is used to qualify the HSM-MX.

Extreme wind effects are much less severe than the specified design basis tornado (DBT) wind forces. The design basis extreme wind for the HSM-MX is calculated per [A.2-10].

The MX-LC is specified per ASME NOG-1 [A.2-7]*, which prohibits the use of a Type I gantry crane under extreme weather conditions (i.e., tornado wind and missile conditions) and imposes administrative controls to place the crane in a secured position in advance of impending extreme weather conditions. Therefore, the MX-LC need only be designed for the operating wind speed of 44 mph. This is consistent with Technical Specification 5.2.1, which requires that a SAFE CONDITION AND FORECAST be verified for the lift height restrictions of a loaded TC/DSC.*

A.2.3.1.1 Tornado Wind Design Parameters

No change to Section 2.3.1.1.

A.2.3.1.2 Determination of Forces on Structures

No change to Section 2.3.1.2.

A.2.3.1.3 Tornado Missiles

No change to Section 2.3.1.3.

A.2.3.2 Tornado Wind and Tornado Missiles for EOS-TC

No change to Section 2.3.2.

A.2.3.2.1 Tornado Wind Design Parameters

No change to Section 2.3.2.1.

All Indicated Changes are in support of an additional scope item for Lifting Controls.

A.2.4.2.4 MX-LC Design Criteria

The MX-LC is designed in accordance with the applicable portions of ASME NOG-1 [A.2-7], as a Type 1 gantry style crane. The MX-LC is engineered to provide *H*igh *I*ntegrity *H*andling (HIH) of the load, defined as a lifting/handling operation, wherein the risk of an uncontrolled lowering of the heavy load is considered non-credible. Demonstration of HIH of the MX-LC occurs when designed for "single-failure-proof" lifting operations per NUREG-0612 [A.2-9], maintaining the supported loads in a safe configuration during design basis events (e.g., seismic). Therefore, design requirements from ASME NOG-1 for Type 1 loading equipment are specified with an additional single failure proof handling capability. MX-LC single-failure-proof handling capability is achieved by ensuring that the applicable design factor is 200% of that required by ASME NOG-1 (i.e., NUREG-0612 application). Alternatively, other load carrying members may be designed with redundant devices to meet the single failure proof handling capability. Therefore, MX-LC HIH may be achieved by having either MX-LC subcomponent SSCs that comply with ASME NOG-1 stress limits plus the 200% NUREG-0612 design factor or with other MX-LC subcomponent SSCs having redundant safety basis protection features. 72.48

ASME NOG-1 prohibits the use of a Type I gantry crane under extreme weather conditions (i.e., tornado wind and missile conditions), and imposes administrative controls to place the crane in a secured position in advance of impending extreme weather conditions. This is consistent with Technical Specification 5.2.1, which requires that a SAFE CONDITION AND FORECAST be verified for the unrestricted lift height of a loaded TC/DSC.

Use of such administrative controls is justified based on the time frame for completing the tasks necessary to lift the loaded TC with the MX-LC, dock the TC to the HSM-MX, and insert the DSC into the HSM-MX, where the total duration is conservatively estimated at eight hours. A SAFE CONDITION AND FORECAST, which is defined in Technical Specification 1.1, is considered to be the absence of: Tornado and Severe Thunderstorm Watches, Tornado and Severe Thunderstorm Warnings, and Hazardous Weather Outlook indicating a moderate to high risk of severe thunderstorms for the current date (Day One at the National Oceanic and Atmospheric Administration (NOAA) website). Weather forecasts will be accessed from the nearest NOAA Weather Forecast Office proximate to the site prior to each loading/unloading evolution. Administrative controls triggered by the presence of such severe weather forecasts ensure avoidance of atmospheric conditions that are favorable for the development of severe thunderstorms capable of producing tornados within the specified period of time. Therefore, the risk of an unexpected tornado within eight hours of the time that no severe weather is predicted is extremely remote.

All Indicated Changes are in support of an additional scope item for Lifting Controls.

A.9.1 Procedures for Loading the DSC and Transfer to the HSM-MX

The following steps describe the recommended operating procedures for HSM-MX system. A pictorial representation of key phases of this process is provided in Figure A.9-1.

A.9.1.1 TC and DSC Preparation

No change. See Section 9.1.1.

A.9.1.2 DSC Fuel Loading

No change. See Section 9.1.2.

A.9.1.3 DSC Drying and Backfilling

No change. See Section 9.1.3.

A.9.1.4 DSC Sealing Operations

No change. See Section 9.1.4.

A.9.1.5 TC Downending and Transfer to ISFSI

No change. See Section 9.1.5.

A.9.1.6 DSC Transfer to the HSM-MX

CAUTION: The insides of empty compartments have the potential for high dose rates due to adjacent loaded compartments. Proper as low as reasonably achievable (ALARA) practices should be followed for operations inside these compartments and in the areas outside these compartments whenever the door from the empty compartment has been removed.

1. MX-LC Rails are installed, aligned and verified on the pad for the loading campaign. Alignment is verified to the specifically designated features on the face of HSM-MX.

CAUTION: Prior to using the MX-LC to lift the loaded TC above the applicable lift height restriction of Technical Specification (TS) 5.2.1, verify the requirements of TS 5.2.1 are satisfied regarding local weather for a SAFE CONDITION AND FORECAST. If, during operations with the MX-LC, the requirements of TS 5.2.1 are either not satisfied or may be at risk of not being satisfied, place the MX-LC in a secured position with the loaded TC at a height not to exceed the applicable lift height restriction of TS 5.2.1.

2. Prior to transporting the TC to the ISFSI, remove the HSM-MX door, inspect the compartment of the HSM-MX, removing any debris and ready the HSM-MX to receive a DSC. The doors on adjacent compartments should remain in place.

A.9.2 Procedures for Unloading the DSC

The following section outlines the procedures for retrieving the DSC from the HSM-MX. The procedures for removing the FAs from the DSC are the same as described in Section 9.2.

A.9.2.1 DSC Retrieval from the HSM-MX

1. Ready the TC, transfer trailer, loading crane, and skid for service. Fill the TC liquid neutron shield and remove the top cover plate from the TC. Transport the trailer into the ISFSI.

CAUTION: Confirm a functional test of the air circulation system, including the blowers, generators, and power cords, etc. was satisfactorily performed within 7 days prior to commencing Transfer Operations, if required per Section 3.1.3 of the Technical Specifications [A.9-5]. 72.48

Note: Verify that a TC spacer of appropriate height is placed inside the TC to provide the correct airflow and interface at the top of the TC during cutting and unloading operations for DSCs that are shorter than the TC cavity length.

2. MATRIX MX-LC rails are installed, aligned and verified on the pad for the unloading campaign. Alignment is verified to the specifically designated features on the face of HSM-MX.

CAUTION: Prior to using the MX-LC to lift the loaded TC above the applicable lift height restriction of TS 5.2.1, verify that the requirements of TS 5.2.1 are satisfied regarding local weather for a SAFE CONDITION AND FORECAST. If, during operations with the MX-LC, the requirements of TS 5.2.1 are either not satisfied or may be at risk of not being satisfied, place the MX-LC in a secured position with the loaded TC at a height not to exceed the applicable lift height restriction of TS 5.2.1.

3. Move the transfer trailer inside the MX-LC "home" position between the skid and the MX-LC grappling mechanism.

4. Use the MX-LC grappling mechanism to capture the skid along with TC, disengage the skid positioning system, move the skid up vertically to clear it from the transfer trailer, then move the transfer trailer from the MX-LC.

5. Install the ram cylinder assembly.

CAUTION: The insides of *loaded* compartments have the potential for high dose rates. Proper ALARA practices should be followed for operations in the areas outside these compartments whenever the MX-RRT operations are being performed. 72.48

All Indicated Changes are in support of an additional scope item for Lifting Controls.

Once the EOS-TC is loaded onto the transfer skid/trailer and secured, it is pulled to the HSM-MX site by a tractor vehicle. A predetermined route is chosen to minimize the potential hazards that could occur during transfer. This movement is performed at very low speeds. System operating procedures and technical specification limits defining the safeguards to be provided ensure that the system design margins are not compromised. As a result, it is highly unlikely that any plausible incidents leading to an EOS-TC drop accident could occur. At the ISFSI site, the transfer skid/trailer is used in conjunction with the MATRIX loading crane (MX-LC). The MX-LC is used to assist in loading the DSC into the HSM. The MX-LC is designed, fabricated, installed, tested, inspected and qualified in accordance with *the applicable portions of* ASME NOG-1, as a Type I gantry type of crane, as per the guidance provided in NUREG-0612 [A.12-4]. *ASME NOG-1 [A.12-9] prohibits the use of a Type I gantry crane under extreme weather conditions (i.e., tornado wind and missile conditions), and imposes administrative controls to place the crane in a secured position in advance of impending extreme weather conditions. This is consistent with Technical Specification 5.2.1, which requires that a SAFE CONDITION AND FORECAST be verified for the lift height restrictions of a loaded TC/DSC.*

The transfer skid/trailer is backed up to, and aligned with, the HSM-MX using transfer equipment. The EOS-TC/MX-LC is docked with, and secured to, the HSM-MX access opening. The MX-RRT rollers are extended into HSM-MX through front wall slots for the MX-RRT and secured. The loaded DSC is transferred to or from the HSM-MX using a transfer equipment. The MX-RRT is then lowered to place the DSC on the front and rear DSC supports in the HSM-MX. As a result, for a loaded EOS-TC drop accident to occur during these operations is considered non credible.

Lifts of the EOS-TC loaded with the dry storage canister are made within the existing heavy loads requirements and procedures of the licensed nuclear power plant. The EOS-TC design meets requirements of NUREG-0612 [A.12-4] and American National Standards Institute (ANSI) N14.6 [A.12-4].

The EOS-TC is transferred to the ISFSI in a horizontal configuration. Therefore, the only drop accident evaluated during storage or transfer operations is a side drop or a corner drop.

The EOS-TC and DSC are evaluated for a postulated side and corner drops to demonstrate structural integrity during transfer and plant handling.

Accident Analysis

No change to accident analysis in Section 12.3.1.

Accident Dose Calculation

No change to the accident dose calculation described in Section 12.3.1.

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A.12.4 References

A.12-1 Title 10, Code of Federal Regulations, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste."

A.12-2 ANSI/ANS-57.9-1984, "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Storage Type)," American National Standards Institute, American Nuclear Society.

A.12-3 Title 10, Code of Federal Regulations, Part 50, "Domestic Licensing of Production and Utilization Facilities."

A.12-4 NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," U.S. Nuclear Regulatory Commission, July 1980.

A.12-5 ANSI N14.6-1993, "American National Standards for Special Lifting Device for Shipping Containers Weighing 10,000 lbs. or More for Nuclear Materials," American National Standards Institute.

A.12-6 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," U.S. Atomic Energy Commission, Revision 1, December 1973.

A.12-7 ANSYS Computer Code and User's Manual, Release 14.0 and 17.1.

A.12-8 LS-DYNA Version 7.0.0, Rev. 79055, Livermore Software Technology Corporation (LSTC)

A.12-9 ASME NOG-1-2015, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," The American Society of Mechanical Engineers, New York, New York, 2015.

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