UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 6, 2019

Mr. Jeffrey D. Isakson
Chief Executive Officer/President
Interim Storage Partners LLC
P.O. Box 1129
Andrews, TX 79714

SUBJECT: INTERIM STORAGE PARTNERS LLC's LICENSE APPLICATION TO CONSTRUCT AND OPERATE THE WASTE CONTROL SPECIALISTS CONSOLIDATED INTERIM STORAGE FACILITY, ANDREWS COUNTY, TEXAS, DOCKET NO. 72-1050 – FIRST REQUEST FOR ADDITIONAL INFORMATION, PART 2

Dear Mr. Isakson:

By letter dated July 19, 2018 (NRC Agencywide Documents Access and Management System (ADAMS) Accession No. ML18206A595), Interim Storage Partners LLC (ISP), a joint venture of Waste Control Specialists LLC (WCS) and Orano CIS LLC (a subsidiary of Orano USA), requested that the U.S. Nuclear Regulatory Commission (NRC) resume all safety and environmental review activities associated with the proposed WCS Consolidated Interim Storage Facility (WCS CISF) license application. ISP requested authorization to store up to 5,000 metric tons of uranium for a period of 40 years in the WCS CISF.

The NRC staff is conducting a detailed technical review of your application and has determined that additional information is necessary to complete its review. The information needed by the NRC staff is discussed in the enclosed request for additional information (RAI). Consistent with our August 21, 2018, letter notifying you of our decision to resume the WCS CISF technical review, the NRC staff expects to issue its first round RAIs in several parts (ADAMS Accession No. ML18225A281).

We request that you provide responses within 60 days from the date of this letter. If you are unable to meet this deadline, please notify NRC staff in writing, within two weeks of receipt of this letter, of your new submittal date and the reasons for the delay.

Upon removal of Enclosure 2, this document is uncontrolled.

Please reference Docket No. 72-1050 and CAC/EPID 001028/L-2017-NEW-0002 in future correspondence related to the technical review for this licensing action. If you have any questions, please contact me at (301) 415-0262.

Sincerely,

/RA/

John-Chau Nguyen, Senior Project Manager
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-1050
CAC No. 001028
EPID L-2017-NEW-0002

Enclosures:
1. 1st Round safety RAIs – Part 2 (Non-Proprietary)
2. 1st Round safety RAIs – Part 2 (Proprietary)

SUBJECT: INTERIM STORAGE PARTNERS LLC's LICENSE APPLICATION TO CONSTRUCT AND OPERATE THE WASTE CONTROL SPECIALIST CONSOLIDATED INTERIM STORAGE FACILITY, ANDREWS COUNTY, TEXAS, DOCKET NO. 72-1050 – FIRST REQUEST FOR ADDITIONAL INFORMATION, PART 2, DOCUMENT DATE: March 6, 2019

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ADAMS Accession No.: ML19065A018 LTR: ML19065A019 ENCL: ML19065A020

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First Request for Additional Information, Part 2 (non-proprietary)
Docket No. 72-1050

WCS Consolidated Interim Storage Facility in Andrews County, Texas

By letter dated July 19, 2018 (NRC Agencywide Documents Access and Management System (ADAMS) Accession No. ML18206A595), Interim Storage Partners LLC (ISP), a joint venture of Waste Control Specialists LLC (WCS) and Orano CIS LLC (a subsidiary of Orano USA), requested that the U.S. Nuclear Regulatory Commission (NRC) resume all safety and environmental review activities associated with the proposed WCS Consolidated Interim Storage Facility (WCS CISF) license application. ISP requested authorization to store up to 5,000 metric tons of uranium for a license term of 40 years in the WCS CISF application.

This request for additional information (RAI) identifies additional information needed by the NRC staff to complete its safety review of the WCS CISF license application. The requested information is sorted by the specific part of the license application, technical specifications, proposed license conditions, the specific chapter or section number in the safety analysis report (SAR), or their respective supporting analyses. The NRC staff used the guidance in NUREG-1567, “Standard Review Plan for Spent Fuel Dry Storage Facilities.”

License Application, Attachment A, “Proposed License Conditions”

RAI PLC-1: Provide a description of onsite and offsite insurance coverage, as described in the License Application, Attachment A, “Proposed License Conditions,” proposed license condition No. 19, which states:

> “The Licensee shall obtain onsite and offsite insurance coverage in the amounts committed to by ISP in the ISP license application.”

The NRC staff could not find a description of onsite and offsite insurance coverage in the license application

RAI PLC-2: Clarify the terms, “to the extent practicable,” and, “by this test,” contained in Proposed License Condition 22 which states, “Prior to removing the shipping cask closure lid, the gas inside the shipping cask shall be sampled to verify that the canister confinement boundary is intact *to the extent reasonably practicable by this test*.”

As written, the license condition is vague and does not identify a specific procedure, test, or acceptance criteria.

This information is needed to determine compliance with 10 CFR 72.24(b), (c), (d), (e) and (l) and 72.120(a).

License Application, Appendix A, "Proposed Technical Specifications"

RAI TS-1: Specify the total design basis heat load for each of the storage cask designs to be used at the WCS CISF. Ensure the design basis values are included in the appropriate section of the Technical Specifications.

WCS CISF SAR Section 8.1.1, "Criteria," states, "Thermal assessments documented in this Chapter and associated Appendices verify that the WCS CISF characteristics and environmental conditions are bounded by the cask thermal analyses." However, the total design basis heat load for each type of canister received at the site is not provided in the Technical Specifications or anywhere else in the application. The NRC staff needs to evaluate whether thermal analyses of the storage cask systems proposed for use at the WCS CISF are bounding.

This information is needed to determine compliance with 10 CFR 72.44(c).

RAI TS-2: Clarify why the Technical Specifications are not consistent among the different storage systems to be used at WCS CISF. Ensure the Technical Specifications include any appropriate additional requirements for all storage systems.

Sections 3.2 through 3.4 of WCS CISF Technical Specifications provide Limiting Conditions for Operation (LCOs) and Surveillance Requirements (SRs) for all NAC storage systems, but equivalent LCOs and SRs are not provided for TN America's dry storage systems. The applicant should ensure the Technical Specifications include appropriate additional requirements for the TN America's storage systems or provide adequate justification why this information is not needed. The NRC staff needs this information to determine that adequate protection is provided during storage to preclude any important to safety materials from exceeding safety limits.

This information is needed to determine compliance with 10 CFR 72.122 and 72.44(c).

RAI TS-3: Ensure the Technical Specifications (TS) include the appropriate information regarding the minimum center-to-center spacing between two canisters for vertical systems such as NAC-MPC, NAC-UMS, and MAGNASTOR.

The minimum center-to-center spacing between two canisters for vertical systems is not provided in the Proposed Technical Specifications. Section 4.3, "Storage Area Design Features," of the proposed TS state that the Vertical Concrete Casks for NAC-MPC, NAC-UMS, and MAGNASTOR Systems shall meet the minimum center-to-center spacing requirements presented in the WCS CISF SAR. The minimum spacing values should be included in the TS because these values are used to perform the thermal evaluations for normal, off-normal, and accident-level conditions of storage.

This information is needed to determine compliance with 10 CFR 72.44(c).

RAI TS-4: Ensure that appropriate details of the Horizontal Storage Module (HSM) Thermal Monitoring Program that is used to monitor the thermal performance of each HSM is included in the Technical Specifications (TS).

Section 5.1.3, "HSM Thermal Monitoring Program," of the Proposed Technical Specifications states that the intent of the program is to prevent conditions that could lead to exceeding the concrete and fuel clad temperature criteria. Section 5.1.3 also states that each user must implement either TS 5.1.3(a) OR 5.1.3(b). As the cask user, the applicant is required to implement one of the above TSs; however, it is not clear which TS would be implemented to monitor the thermal performance of each HSM at the site. The applicant should provide details of the program, per either TS 5.1.3(a) or TS 5.1.3(b). For example, if TS 5.1.3(a) is implemented, the user shall develop and implement procedures to perform visual inspection of HSM inlets and outlets on a daily basis. The NRC staff needs this information to make sure adequate protection is implemented to avoid conditions that could lead to safety-related components exceeding applicable safety limits.

This information is needed to determine compliance with 10 CFR 72.44.

RAI TS-5: Ensure that the Proposed Technical Specifications include adequate administrative controls such as limiting the amount of flammable material (including diesel fuel) to the equivalent of 50 gallons of diesel fuel.

Table 3-1 in Appendices A-D of the application for the Rancho Seco/MP187/NUHOMS® Systems list the WCS CISF design criteria as 300 gallons of diesel fuel. Table 3-1 in Appendices E-G of the application for the NAC systems list the WCS CISF design criteria as 50 gallons of diesel fuel.

WCS CISF SAR Section 3.3.6 states: "The CTS and the VCT are quantity limited (< 50 gallons) and are described in Section 12.2.1. The transfer vehicle for the NUHOMS® System is also quantity limited (< 60 gallons) and will not be in the Cask Handling Building (CHB) during handling of the vertical systems. As the NUHOMS® System is evaluated for fire with 300 gallons of diesel fuel, the quantity of fuel in the transfer vehicle is bounded for NUHOMS® Systems operations." On the other hand, Section SAR 7.5.3.8, "On-Site Accidents" states, "During operations, the amount of flammable liquids that are in the CHB will be administratively controlled to ensure the amount of flammable liquids is maintained below the fire load limits for the respective systems (e.g., 300 gallons of diesel fuel for NUHOMS® Systems). In combination with fuel limitations and a fire suppression system, the fire hazard for the building is adequately mitigated (see WCS CISF SAR Section 3.3.6)."

The information provided in WCS CISF SAR Table 3-1 of Appendices A-G, and WCS CISF SAR Section 3.3.6, and Section 7.5.3.8 appears to be inconsistent with regards to the WCS CISF design criteria for fire/explosions protection; therefore, administrative controls should be included in the Proposed Technical Specifications to limit the amount of combustible material to the equivalent of 50 gallons of diesel fuel to make sure WCS CISF is bounded. Also, inconsistencies in the application should be fixed or clarified. The NRC staff needs this information to determine that adequate protection is provided to preclude any important to safety material from exceeding safety limits.

This information is needed to determine compliance with 10 CFR 72.44, 72.122(b), and 72.122(c).

RAI TS-6: Clarify which version of ACI-349 is called out in Operating Procedures - Administrative and Management Control Section 5.1.3.b.iv of the Proposed Technical Specifications.

Based on the context of the information provided in the Proposed Technical Specifications, Administrative Controls Section 5.1.3.b.iv, it appears that the information referenced is an outdated version of ACI-349 (1985 version with the 1990 Revisions). The ACI-349 standard has been revised in 2006 and again in 2013. Note that starting in the 2006 revision, the thermal considerations were moved to Appendix E.

This information is needed to determine compliance with 10 CFR 72.24(c)(4).

RAI TS-7: Ensure that Proposed Technical Specifications Section 5.1.3.b.v clearly explains what measurements or other evidence will be used to determine that, "off-normal or accident temperature limits for fuel cladding have been exceeded," and what procedures or tests will be used to "verify that the canister confinement is maintained."

The Proposed Technical Specifications, Operating Procedures - Administrative and Management Control Section 5.1.3.b.v, include these statements but there is no specific procedure or SAR section referenced.

This information is needed to determine compliance with 10 CFR 72.24(b) and (l), 72.120(a) and 72.122(h)(1).

RAI TS-8: Ensure the application provides the appropriate inspection requirements and acceptance criteria in Proposed Technical Specifications Section 5.2.2, "Cask Drop," Inspection Requirement, which states, "The NUHOMS® CANISTER will be inspected for damage after any STC with CANISTER side drop of 15 inches or greater."

This information is needed to determine compliance with 10 CFR 72.24(c)(4) and 72.120(a).

Safety Analysis Report (SAR), Chapter 3, "Principal Design Criteria"

RAI 3-1: Clarify the application of ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," to the design of the canister transfer system (CTS).

The design criteria specified for the canister transfer system is inconsistent. WCS CISF SAR Section 3.2.3.5 states the 1989 edition of ASME NOG-1 [Ref. 3-26] was used for the static design load combinations, while WCS CISF SAR Section 3.2.8.3 indicates that the important-to-safety canister transfer system load combinations were in accordance with the 2010 edition of ASME NOG-1 [Ref. 3-34].

This information is needed to determine compliance with the 10 CFR 72.24(c)(4).

RAI 3-2: Provide the quality assurance classification and justification for the MP187 and the MP197HB transportation/transfer casks that will be used at the WCS CISF.

WCS CISF SAR Appendices A.3.1.4 and B.3.1.4 identify the MP187 as being qualified for transfer operations and SAR Appendices C.3.1.4 and D.3.1.4 identify the MP197HB as being qualified for transfer operations. WCS CISF SAR Table 7-1: WCS CISF Structures and QA Classification identify the transfer casks as important to safety, but the quality assurance classification of these Structures, Systems, and Components are not included in WCS CISF SAR Table 3-5, "Quality Assurance Classification of Structures, Systems, and Components as Utilized at the WCS CISF."

This information is needed to determine compliance with 10 CFR 72.24(c) and (d).

RAI 3-3: Provide the safety classification and quality assurance classification of the NAC Transfer casks for the transfer of Transportable Storage Canisters (TSCs) for the NAC-MAGNASTOR, NAC-UMS and the NAC-MPC systems.

The WCS CISF SAR Appendices E-G identify NAC Transfer casks for the transfer of TSCs for the NAC-MAGNASTOR, NAC-UMS and the NAC-MPC systems. The safety classification of SSCs for these systems is referenced to the respective UFSARs for these systems in WCS CISF Appendices E-G Section 3.1.2.1, however the transfer cask is not classified as either important to safety or not important to safety in the WCS CISF SAR and the quality assurance classification of these SSCs is not included in WCS CISF SAR Table 3-5, "Quality Assurance Classification of Structures, Systems, and Components as Utilized at the WCS CISF."

This information is needed to determine compliance with 10 CFR 72.24(c) and (d).

RAI 3-4: Clarify the information provided in WCS CISF SAR Section 3.3.7.1, "Spent Fuel or High-Level Radioactive Waste Handling and Storage," which states:

> *A recovery method for the unlikely loss of confinement event is independent of any bare fuel handling facilities.*

Provide specific information on the recovery method(s) that will be used for the systems incorporated by reference.

This information is needed to determine compliance with 10 CFR 72.120(a).

RAI 3-5: Provide the basis to classify the Cask Handling Building (CHB) as an important to safety (ITS) Category C structure in WCS CISF SAR Section 3.4.1, "Cask Handling Building Quality Classification."

NUREG/CR-6407, “Classification of Transportation Packaging and Dry Spent Fuel Storage System Components Accordance to Importance to Safety,” defines ITS Category C as structures, systems and components (SSCs) whose failure or malfunction would not significantly reduce the effectiveness of storage system components and would not be likely to create a situation adversely affecting public health and safety. Category B items are defined as SSCs whose failure or malfunction could indirectly result in a condition adversely affecting public health and safety. Furthermore, the failure of a Category B item, in conjunction with the failure of an additional item, could result in an unsafe condition.

Based on the above definitions, justify the classification of the CHB as an ITS Category C SSC when collapse of the CHB structural members, failure of other structural members such as the overhead cranes, or dropping of other heavy objects under wind and seismic events, could create conditions leading to damage of canisters during transfer operations within the CHB.

This information is needed to determine compliance with 10 CFR 72.122(b)(2)(ii).

RAI 3-6: Revise the discussion in WCS CISF SAR Section 3.2.3.5 to clarify whether the same soil property data presented in WCS CISF SAR Table 7-38 are also being used for WCS CISF SAR Section 7.6.4, “Soil Structure Interaction of NUHOMS NITS Storage Pad.”

The present SAR discussion covers only the soil property data used for the NAC system storage pad. The SAR Section 3.2.3.5 discussion on the soil properties data should be revised to also cover the NUHOMS NITS Storage Pad.

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b).

RAI 3-7: Clarify the basis or scope supporting classification of the Canister Transfer System (CTS) and Vertical Cask Transporter (VCT) as important to safety (ITS) Category B systems in WCS CISF SAR Table 3-5, “Quality Assurance Classification of Structures, Systems, and Components as Utilized at the WCS CISF.”

NUREG/CR-6407, “Classification of Transportation Packaging and Dry Spent Fuel Storage System Components Accordance to Importance to Safety,” defines ITS Category B as structures, systems and components (SSCs) whose failure or malfunction could indirectly result in a condition adversely affecting public health and safety. Thus, the failure of a Category B item, in conjunction with the failure of an additional item, could result in an unsafe condition. NUREG/CR-6407 defines ITS Category A as SSCs whose failure or malfunction could directly result in a condition adversely affecting public health and safety. Thus, the failure of a single item could cause loss of primary containment leading to release of radioactive material, loss of shielding, or unsafe geometry compromising criticality control.

The CTS and VCT handling systems each contain components, such as certain structural members and special lifting devices, whose failure could cause canisters loaded with fuel to drop under conditions (i.e., drop heights and overpack configurations) that have not been evaluated to show that primary containment and a safe geometry would be maintained. Therefore, to clarify the classification and scope, either provide an evaluation showing a single component failure within the CTS or VCT handling systems would not directly result in a condition adversely affecting public health and safety to justify classification of the overall systems as ITS Category B or designate portions of the CTS and VCT handling systems as ITS Category A.

This information is needed to determine compliance with 10 CFR 72.122(a).

SAR Chapter 4, "Facility Design"

RAI 4-1: Provide additional information to support the differences between the required tests and maintenance activities described in WCS CISF SAR Section 4.5.1, "Transportation Cask Repair and Maintenance Activities," and specific repair and maintenance activities provided in the SARs for each of the systems incorporated by reference. Alternatively, revise WCS CISF SAR Section 4.5.1 and state all maintenance activities for the transportation casks will follow requirements outlined in Chapter 8 of the SARs for the systems incorporated by reference. The NRC staff notes the following potential inconsistencies between WCS CISF SAR Section 4.5.1 and SARs of the transportation systems incorporated by reference:

- The NAC STC and NAC-UMST both have quick-disconnect fittings (e.g., vent, drain, inner lid interseal test and interlid ports) for which there are required inspections for proper function during each cask loading and unloading operation. See Table 8.2-1 of each SAR. (Section 8.2.4 of the NAC STC and the NAC-UMST SAR). These connectors shall be replaced, as required, and at a minimum of every 2 years. Neither the required inspections nor the periodic replacement are described in the WCS CISF SAR.

- MP197HB has a structural test in its SAR Section A.8.2.1 and dimensional testing of the trunnions. Neither are described in the WCS CISF SAR.

- Some transportation systems such as the MP187 and the MP197HB require periodic fastener replacement with frequencies that are based on either time or number of uses. The periodic replacement of these fasteners is not described in the WCS CISF SAR.

- The reference to nondestructive examination in the paragraph under Trunnion Inspections in WCS CISF SAR Section 4.5.1 is not descriptive. Clarify whether this is something other than visual testing (VT) and/or beyond the requirements identified in the Chapter 8 of the transportation SARs for the systems incorporated by reference. The NRC staff notes that the NAC-UMS requires periodic penetrant testing (PT) of trunnions (see NAC-UMST SAR Section 8.2.1).

This information is needed to determine compliance with 10 CFR 72.120(a).

RAI 4-2: Describe, or provide a reference to, the testing procedure and the acceptance criteria for Impact Limiter weight tests to detect the absorption of moisture for the NAC-STC and the TN MP197HB. WCS CISF SAR Section 4.5.1 states:

> *In addition, the impact limiters are inspected to verify that a significant amount of water has not been absorbed and that degradation of the energy absorbing material has not occurred. These inspections are performed by weighing the impact limiter and visual examination of the impact limiters and welds.*

Weight testing of impact limiters appears to be used only in the NAC-UMST (NAC-UMST SAR Section 8.2.3) and the MP187 (ADAMS Accession No. ML063520505), which include acceptance criteria. The acceptance tests and maintenance chapters of the SARs for the NAC-STC and the MP197HB do not include testing procedures and acceptance criteria for evaluating the possibility of moisture absorption of the impact limiters. However, the MP197HB does require leak testing of the impact limiters to identify evidence of cracking in the welds (MP197HB SAR Section A.8.2.3.2).

This information is needed to determine compliance with 10 CFR 72.120(a).

RAI 4-3: Describe the administrative controls that will be used to ensure the lift height of the NUHOMS transportation cask is maintained at or below 80 inches with respect to the following areas identified in Section 5.1.1 of NUREG-0612:

- Definition of safe load paths (How will the operator determine load height?)
- Procedures (What level of oversight will be provided and what actions will be taken if load exceeds height limit?)
- Operator training (How will the crane operator and any supervisors be qualified?)
- Crane inspection, testing, and maintenance (How will proper performance of crane controls be verified?)

The NRC staff found that the specified administrative controls do not provide sufficient information to fully demonstrate conformance with the guidance contained in Section 5.1.1 of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," because the administrative controls used to maintain that load height were not specified other than by specifying the load height limit in the applicable procedure descriptions in the FSAR. WCS CISF SAR Section 4.7.2 states that the two 130-ton overhead bridge cranes would be provided for transferring loaded NUHOMS fuel canisters within transportation casks from a rail car to the transfer trailer. This section of the WCS CISF SAR also states that the cranes would be administratively controlled to maintain the NUHOMS cask at or below the analyzed 80-inch drop height, and that, as indicated in Section 7.5.3.1 of the WCS CISF SAR, lifts performed by the overhead bridge crane would be governed by the guidance of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," to minimize the potential for release of radioactive material from a spent fuel cask.

This information is needed to determine compliance with 10 CFR 72.24(h).

RAI 4-4: Describe the important-to-safety movement of a NAC fuel canister in its transportation cask from a railcar to the canister transfer system (CTS) and provide drawings of the major structures, systems, and components intended for this function.

The described movement of the NAC canisters from the railcar to the CTS using the vertical cask transporter (VCT) appears inconsistent with provided drawings of the cask handling building (CHB) and VCT. WCS CISF SAR Section 4.7.4, "NAC Cask Transfer System," describes that the VCT is used to unload the NAC transportation casks from the railcar in the following manner:

> …After the transportation cask has been received, including removal of the impact limiters, the VCT is driven over, essentially straddling the railcar, and is positioned to engage the transportation cask upper trunnions. The VCT then raises and moves towards the rear of the cask to raise and lift the transportation cask from the railcar. The VCT then lowers the transportation cask to 3-6" off the ground. The railcar is removed from the unloading area and the VCT moves the cask to the CTS. The VCT is shown in Figure 4-4.

WCS CISF SAR Section 7.5.2, "Vertical Cask Transporter (VCT)," describes that the VCT lift removing the transportation cask for vertical storage cask systems from the railcar within the CHB is considered important to safety. However, WCS CISF SAR Figure 4-4 [Proprietary] depicts a mobile, hydraulic gantry hoist with less than a 5-foot hoist range, which is insufficient to upright a transportation cask that is over 15-feet in height from a horizontal position. Furthermore, Figure 1-7, "Cask Handling Building Plan," and Figure 1-8, "Cask Handling Building Section View," depict train rails traversing the entire CHB with the rails approximately at the finish grade of the CHB floor, which appears to preclude positioning the U-shaped VCT frame depicted in Figure 4-4 such that it can move over the railcar "towards the rear of the cask."

This information is needed to determine compliance with the 10 CFR 72.24(d).

RAI 4-5: Revise WCS CISF SAR Section 4.4.1, "Equipment Decontamination" to: 1) define the term "weeping," and 2) address decontamination of the interior of transportation packages and transfer casks.

WCS CISF SAR Section 4.4.1 states "the only radioactive wastes are solid wastes generated from residual quantities of radioactive contamination that may be encountered on the surfaces of the transportation casks due to weeping." It is not clear what the applicant means by the term "weeping." Additionally, WCS CISF SAR Section 4.4.1 discusses decontamination of the exterior of incoming transportation packages, but does not discuss decontamination of the interior surfaces of transportation packages or transfer casks after removing spent fuel canisters. These decontamination activities could be a significant contributor to solid decontamination waste, and should be discussed in this section.

This information is needed to determine compliance with 10 CFR 72.126.

RAI 4-6: Revise WCS CISF SAR Section 4.5, "Transportation Casks and Associated Components," discussion regarding the transportation casks design for protecting the canisters from the effects of environmental conditions, natural phenomena, and accidents.

The spent fuel transportation casks, which are designed in accordance with the 10 CFR Part 71 requirements, do not specifically address the effects of environmental conditions, natural phenomena, and accidents associated with 10 CFR 72.122(b) provisions. As such, the basis for citing the transportation cask evaluation results to address broadly the canister storage operation at WCS ICSF is unclear.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

SAR Chapter 5, "Operational Systems & Procedures"

RAI 5-1: Describe how the air-powered chain hoist used as part of the Canister Transfer System (CTS) satisfies the single-failure-proof criteria of NUREG-0612. The response should specify the degree of conformance with ASME NUM-1, "Rules for Construction of Cranes, Monorails, and Hoists (with Bridge or Trolley or Hoist of the Underhung Type)," criteria for Type IA or IB hoists, and, if compared to the Type IB criteria, justify the lack of redundant torque transfer mechanisms between the braking device and the chain considering the effects of fatigue and wear over the course of the facility's operations.

WCS CISF SAR Section 5.2.1.3.2, Safety Features, states:

> The CTS fully meets the single-failure-proof criteria of NUREG-0612 [5-4], providing a combination of fail-safe features and redundant design factors, as well as structures designed to the criteria of ASME NOG-1 for compliance with NUREG-0554 for single-failure-proof critical load handling. Additionally, failure modes and effect analyses (FMEA) have been performed to further demonstrate the design adequacy.

As described in WCS CISF SAR Section 7.5.1, "Canister Transfer System," the CTS includes an air-powered chain hoist for transfer of NAC fuel canisters from the transportation to the storage casks. The chain hoist is described as having a single disc brake of 200% design capacity and inherent air-motor braking acting through the gear train, but the NUREG-0612 criteria specify redundant holding brakes acting via redundant gear trains. Therefore, the described design does not appear to fully satisfy the single-failure-proof criteria of NUREG-0612.

This information is needed in order to confirm compliance with 10 CFR 72.24(c)(4).

SAR Chapter 7, "Installation Design and Structural Evaluation"

RAI 7-1: Specify how the cask handling building (CHB) overhead crane design combines seismic loadings with normal loadings (e.g., CMAA #70, "Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Travelling Cranes," with discussion of how seismic loading is incorporated or an appropriate alternative standard such as the design criteria for a Type II crane as defined in ASME NOG-1), and justify the "not-important-to-safety" (NITS) classification of the crane structure exclusive of the seismic clips and runway beams.

The design measures necessary to ensure the crane structure itself can withstand design seismic loading must be specified to verify the crane structure would not fall and damage important-to-safety (ITS) equipment per 10 CFR 72.122(b). WCS CISF SAR Section 7.5.3.1 states the following regarding seismic design of the overhead bridge cranes:

> The overhead bridge cranes are classified as [NITS] and are designed in accordance with ANSI B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)." The overhead bridge cranes rails are attached to the CHB structure in a manner that provides adequate assurance that the rails will remain attached to the CHB structure during the above-described seismic event. Seismic clips are provided on the overhead crane bridge trucks and trolley to limit uplift during a seismic event, thereby eliminating the potential for the bridge or trolley to fall onto loaded casks inside the CHB.

Also, WCS CISF SAR Section 3.4.1 states:

> The 130-ton overhead crane and associated NUHOMS® MP197HB and MP187 Casks Lift Beam Assembly are NITS because the NUHOMS® cask and canister are not lifted above the Technical Specifications [3-1] height limits. The building structure (structural steel and column foundations) is classified as ITS, Category C to meet the requirements of 10 CFR 72.122(b)(2)(ii) [3-23] and to prevent massive building collapse onto cask systems and related ITS SSCs. The overhead crane bridge trucks and trolley seismic clips are ITS.

WCS CISF SAR Section 7.5.3.7, "Structural Analysis and Design," describes how the loadings on the crane runway beams were established, but not the loadings on the crane structure itself.

This information is needed to determine compliance with 10 CFR 72.122(b)(2)(ii).

RAI 7-2: Describe the inspection and maintenance programs associated with the Canister Transfer System (CTS), including the air-powered chain hoist and the hydraulic jacking tower components.

WCS CISF SAR Section 7.5.1.13, “Maintenance,” addresses maintenance and inspection of CTS components. However, the guidance in NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants,” specifies inspection, testing, and maintenance to a specific consensus standard for overhead cranes, and the specified actions do not fully correspond with those included in the applicable consensus standards for hydraulic gantries and chain hoists in the ASME B30 series, “Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings.”

This information is needed to determine compliance with 10 CFR 72.24(n).

RAI 7-3: Make appropriate adjustments to the SASSI model to account for concrete cracking to ensure consistency with the GTSTRUDL model. Report these findings in WCS CISF SAR Section 7.6.1.5 and/or other appropriate sections of the WCS CISF SAR.

In the GTSTRUDL model used to evaluate all of the load combinations, the concrete pad flexural stiffness is reduced by 50% to account for concrete cracking. However, in the SASSI soil structure interaction (SSI) model the concrete pad is considered to be uncracked and the flexural stiffness is not reduced (ENERCON CALC NO. NAC004-CALC-04, Rev. 1, "Soil Structure Interaction Analysis of ISFSI Concrete Pad at Andrews, TX," Page 34). In the load combinations, safe shutdown earthquake (SSE) occurs with Dealload (D) and Liveload (L). If the concrete pad is cracked under D and L, then it must be cracked under SSE. The GTSTRUDL and SASSI models must be consistent in their assumptions regarding concrete cracking. In the SSI analysis it is conservative to consider the concrete cracked. Had the concrete been considered cracked, it is estimated that the acceleration at the center of gravity of the cask would be higher by approximately 10%. (Reference: G. Bjorkman, "Influence of ISFSI Design Parameters on the Seismic Response of Dry Storage Casks," PATRAM 2010, London.)

This information is needed to determine compliance with 10 CFR 72.24 (d)(2).

RAI 7-4: Ensure the soil springs in the GTSTRUDL model reflect the behavior of the storage pad under applied loads. Make any changes to WCS CISF SAR Section 7.6.1.5 and/or other appropriate sections of the WCS CISF SAR.

In WCS CISF SAR Section 7.6.1.5, subheading "Nonlinear Soil Springs" it states:

> Nonlinear (compression only) springs are included at each storage pad node using the GTSTRUDL function.... The GTSTRUDL command uses the user input soil stiffness... combined with the tributary area from each node's connecting element(s) to compute a spring stiffness in force per unit length.

The resulting soil springs are uncoupled and are commonly referred to as a "Winkler" foundation (M. Hetenyi, "Beams on Elastic Foundation," University of Michigan Press, 1946; and J. Bowles, "Foundation Analysis and Design," McGraw-Hill, Fourth Edition, 1988). Because of the way the soil spring stiffness is calculated, a uniformly distributed load applied to the storage pad will produce a uniform downward displacement everywhere. By contrast, if the storage pad were placed on an elastic half-space and a uniform load were applied, the displacement would not be uniform but concave downward, which is in agreement with measured test results (Bowles, 1988). One way to account for this using a Winkler foundation is to double the stiffness of the soil springs at and near the edges of the pad (Bowles, 1988).

This information is needed to determine compliance with 10 CFR 72.24 (d)(2).

RAI 7-5: In WCS CISF SAR Sections 7.6.1.4 and 7.6.5.3, clarify whether differential settlement was included with dead load in certain load combinations.

ACI 349 requires that differential settlement be included with dead load in certain load combinations. Specify in which of the load combinations listed on pages 7-48 and 7-91 of the WCS CISF SAR was differential settlement included with dead load.

This information is needed to determine compliance with 10 CFR 72.24(c)(3).

RAI 7-6: Provide a full description of the cask model and how it is connected to the pad to supplement the discussion in SAR Section 7.6.1.5.

With respect to the GTSTRUDL model discussed on page 7-49 of the WCS CISF SAR, it states that "Rigid members are used to locate the cask center of gravity in the model." Additional information is needed to describe the cask model and how it is connected to the pad.

This information is needed to determine compliance with 10 CFR 72.24(c)(3).

RAI 7-7: In WCS CISF SAR Sections 7.6.4.2 and 7.6.5.1, explain whether the concrete pad is assumed to be cracked or uncracked in the structural and SSI analyses.

Based on the value of Young's modulus used in the structural analysis and the SSI analysis, it appears that the concrete pad is considered to be uncracked. If this is correct, please explain the basis for this assumption.

This information is needed to determine compliance with and 72.24 (c) (d).

RAI 7-8: With respect to WCS CISF SAR Section 7.6.5.4, provide the proprietary settlement calculations for the NUHOMS storage pad for staff review.

Without reviewing the storage pad settlement calculations, the staff is unable to make a safety finding.

This information is needed to determine compliance with 10 CFR 72.24(d)(2).

RAI 7-9: Provide the basis for the assumption in WCS CISF SAR Section 7.5.3.2 that an administrative control will be adequate to prevent failures of structural members and potential collapse of overhead cranes onto canisters during receipt, transfer, storage, and retrieval operations for the spent nuclear fuel and GTCC waste within the CHB.

The NRC staff needs additional information to determine the effectiveness of the administrative control to prevent failures leading to a reduction of storage cask system effectiveness. The evaluation of the effectiveness of this administrative control should consider factors such as time available to take mitigative actions because of an inclement weather watch/warning or other notification; estimated time to complete activities to place systems in a safe configuration; estimates of the tornado strike probabilities and maximum wind speeds for the site; and the capability of SNF transportation, transfer, and storage cask systems to withstand tornado missile impacts.

This information is needed to determine compliance with 10 CFR 72.122(b)(2)(i) and (ii).

RAI 7-10: Pertaining to the seismic loads information in WCS CISF SAR Section 7.5.3.2, "Design Analysis:" (1) Provide the basis to use IBC/ASCE 7 default response spectra for the seismic loads of the CHB rather than the site-specific response spectra developed from the Probabilistic Seismic Hazard Evaluation described in WCS CISF SAR Chapter 2; and (2) Provide a comparison of the IBC/ASCE 7 default spectrum with the site-specific uniform hazard spectrum at 2% probability of exceedance in 50 years. Define the soil classification used for the soil amplification factor coefficients in order to reach the conclusion that the site could be classified as Seismic Design Category C.

The NRC staff needs additional justification on the applicability of the International Building Code (IBC) as the seismic design criteria for the CHB. Standards such as the ASCE 4 establish criteria for nuclear facilities and provide facilities such as the CHB with design methods that result in a lower probability of unacceptable seismic performance than conventional facilities.

This information is needed to determine compliance with 10 CFR 72.122(b)(2)(i) and (ii).

RAI 7-11: Provide the basis for the use of the IBC load combinations and ACI 318 in WCS CISF SAR, Section 7.5.3.2.1, "Reinforced Concrete Load Combinations" for the design of reinforced concrete members of the CHB, which is an ITS structure.

NUREG-1567 Section 5.4.4, "Other SSCs Important to Safety," references ANSI 57.9 standards. The standards referenced on load combinations and design limits are in line with those for nuclear facilities such as ACI 349. Further justification is needed on the applicability of the IBC and ACI 318 for the design of reinforced concrete members of the CHB.

This is needed to determine compliance with 10 CFR 72.122(b)(2)(i) and (ii).

RAI 7-12: Provide a report for the design of the CHB that, at a minimum, includes the following: (1) the dimensions of all sections that have a structural role including locations, sizes, configuration, and spacing, (2) structural materials with defining standards or specifications, (3) location and specifications for assembly, and (4) fabrication codes and standards.

WCS CISF SAR Section 7.5.3.7, "Structural Analysis and Design," states that the CHB will be designed using static analysis methods for the determination of forces and moments on structural steel members from service loading conditions and dynamic methods for loading conditions involving seismic loads. The application, however, provides no additional information that would allow the staff to review the design of the CHB consistent with the guidance in Section 5.5.4 of NUREG-1567.

The report provided should include descriptions of the design method used, computer models used, and information on the application of the structural analysis methods used to determine the capacity of the CHB for service and natural phenomena loads. In addition, clarify if the modal response spectrum analysis will be the dynamic method used for the evaluation of seismic loads of the CHB.

This information is needed to determine compliance with 10 CFR 72.122(b)(2)(ii).

RAI 7-13: Revise WCS CISF SAR Section 7, "Installation Design and Structural Evaluation," to add Concrete Casks (e.g., CC1 through CC4) to the item 2 description for the NAC MAGNASTOR storage cask system on WCS CISF SAR page 7-1. Alternately, provide an appropriate SAR note for generic use of the terminology, "Vertical Concrete Cask (VCC)," to also cover the MAGNASTOR overpacks, CC1 through CC4.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI 7-14: Revise the WCS CISF SAR page 7-3 statement, "No new analyses are required for the NAC storage system," to recognize that a seismic reconciliation soil-structure interaction analysis is performed in SAR Section 7.6.3, "Soil Structure Interaction of the VCC Storage Pad," to demonstrate seismic stability of the VCCs using the site-specific design basis earthquake motions.

This information is necessary to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b).

RAI 7-15: Provide the basis for the use of the International Building Code (IBC) as stated in WCS CISF SAR Section 7.5.3.2, "Design Analysis" to determine the design earthquake loads for the Cask Handling Building, which is an important to safety structure.

NUREG-1567, Section 5.4.4, "Other SSCs Important to Safety," references ANSI 57.9 standards. The standards on earthquake loading follow references that are in line with those for nuclear facilities. The use of codes and standards such as the IBC appear in NUREG-1567, Section 5.4.5, "Other SSCs," which invokes commercial building codes for the design of Non-ITS SSCs, including load combinations.

The NRC staff needs additional justification on the applicability of the IBC as the seismic design criteria for the CHB. Standards such as ASCE 4 establish criteria for nuclear facilities. This code also provides analysis methods for facilities such as the CHB with design methods that result in a lower probability of unacceptable seismic performance than conventional facilities.

This information is needed to determine compliance with 10 CFR 72.122(b)(2)(i) and (ii).

SAR Chapter 8, "Thermal Evaluation"

RAI 8-1: Provide bounding site specific ambient temperatures which account for seasonal variations.

Seasonal variations must be accounted for as ambient temperatures may persist for periods of time sufficient for the cask systems to reach steady state conditions, which may differ from the use of an annual average, as analyzed in the respective FSARs.

The applicant has not clearly defined an ambient temperature which considers seasonal variations. According to the monthly averaged values provided, Table 1-2 of the license application seems to provide a value that bounds seasonal variations. The applicant needs to clearly state how a bounding site-specific ambient temperature which considers seasonal variations is obtained.

This information is needed to determine compliance with 10 CFR 72.122 and 72.128.

RAI 8-2: Provide thermal evaluation, analysis, and results to demonstrate that all cask systems meet the WCS CISF site specific environmental conditions.

WCS CISF SAR Appendices A.8, B.8, C.8, and D.8 of the application provide a normal ambient temperature design criteria for the NUHOMS®-MP187, Standardized Advanced NUHOMS®, Standardized NUHOMS®-61BT, and Standardized NUHOMS®-61BTH Type 1 cask systems, respectively. Appendices E.8, F.8, and G.8 of the application state that for the NAC-MPC, NAC-UMS, and MAGNASTOR, the maximum average yearly temperatures allowed are 75°F, 76°F, and 76°F, respectively. A definition of normal ambient temperature for the site is not clear in the application but according to the monthly averaged values provided (mean monthly temperature of 81.5°F [considering seasonal variations] on SAR Table 2-2, "Summary of Maximum and Minimum Temperatures for Andrews, TX, Period of Record: 1962 to 2010"), SAR Table 1-2 would provide a value that seems to bound seasonal variations and the value seems to bound storage systems described in Appendices A-D of the application; however, Table 1-2 is not bounded by the systems described in Appendices E.8, F.8, and G.8. Therefore, a thermal evaluation is needed for these systems based on the normal ambient temperature presented in Table 1-2.

The NRC staff needs this information to verify that no thermal limits are exceeded for any of the cask systems stored at WCS CISF.

This information is needed to determine compliance with 10 CFR 72.122 and 72.128.

SAR Chapter 9, "Radiation Protection"

RAI 9-1: Ensure that the shielding analysis in the WCS CISF SAR Section 9.4, "Estimated On-Site Collective Dose Assessment," includes the appropriate information specifying the neutron and gamma cross section libraries used to determine off site dose rates.

Both NAC Analysis 30039-5001, Rev. 0, and Areva Calculation WCS01-0503, Rev. 0, specify which version of MCNP is used for each part of the dose rate analysis, but do not specify which neutron and gamma cross section libraries are used. The WCS CISF SAR should include this information.

This information is needed to determine compliance with 10 CFR 72.104 and 72.106, and 10 CFR 20.1201 and 20.1301.

RAI 9-2: Ensure that the WCS CISF SAR includes the appropriate written policy that states management's commitment to maintain exposures to workers and the public As Low As Is Reasonably Achievable (ALARA) levels and addresses both facility design and operations. Consistent with 10 CFR 20.1101, the policy should include the following provisions as set forth in NUREG-1567, section 11.4.1.1.:

- No practice involving radiation exposure will be undertaken unless evaluation of the practice demonstrates that its use will produce a net benefit to society.
- All exposures will be kept ALARA, with technological, economic, and social factors considered.
- Individual dose limits will be established that are appropriate for practices involving radiation exposure, and exposures to individuals will not exceed these limits.
- Supervisors will integrate appropriate radiation protection controls into all work activities.
- Workers will be appropriately instructed in the objectives and implementation of the ALARA program, with this information included in training modules.
- There will be strict compliance with all regulatory requirements and license conditions regarding procedures, radiation exposures, and releases of radioactive materials.
- A comprehensive program will be maintained, and periodically evaluated, to ensure that both individual and collective doses meet ALARA objectives and do not exceed acceptable levels.

This information is needed to determine compliance with 10 CFR 20.1101.

RAI 9-3: Ensure that WCS CISF SAR Section 9.6.2.4, "Environmental Monitoring," includes appropriate details on the facility Radiological Environmental Monitoring Program (REMP).

WCS CISF SAR Section 9.6.2.4 provides minimal details about the REMP for the WCS facility. The NRC staff needs to evaluate details, including: 1) number of samples; 2) sample locations; 3) collection frequency; 4) sample analysis to be performed; and 5) sample analysis frequency. The SAR should also include a map of suitable scale that identifies the sampling locations to show distance and direction of monitoring stations, with release points and relevant boundaries (e.g., controlled area boundary, site boundary) also indicated on the map. Additionally, the WCS CISF SAR description of the REMP should include the approach for determining background levels and the contribution of the facility's incremental releases to background levels. The WCS CISF SAR should include the results of the background level determination.

This information is needed to determine compliance with 10 CFR 72.104.

RAI 9-4: Ensure the WCS CISF SAR Section 9.6.2.4 includes information clearly stating how neutron doses will be determined at the Owner Controlled Area (OCA) boundary dosimeter locations.

WCS CISF SAR Section 9.6.2.4 states that the Landauer Inlight® Environmental X9 (beta/photon) dosimeter will be used for the perimeter environmental monitoring program. As neutrons will represent some fraction of OCA boundary dose, and the referenced dosimeter does not detect neutrons, it is not clear how the neutron component of the dose will be determined.

This information is needed to determine compliance with 10 CFR 72.104.

RAI 9-5: Ensure that WCS CISF SAR Section 9.5.2 includes appropriate information on radiation detection equipment and instrumentation to be used at the WCS CISF.

WCS CISF SAR Section 9.5.2 provides information on the radiation protection facilities at WCS, but only limited information on the radiation detection equipment and instrumentation to be used. The SAR should include information regarding the operational sensitivity and range, and frequency and methods of calibration for all of the equipment and instrumentation identified in the SAR.

This information is needed to determine compliance with 10 CFR 20.1501(c).

RAI 9-6: Ensure that WCS CISF SAR Section 9 includes appropriate information about the facility health physics program.

Table 10A-2 of Draft NUREG-2215, "Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities," contains a list of program elements expected to be included as part of a facility health physics program. Many of these elements are included in various sections of the SAR. However, several elements are missing, including:

- Requirements for initial and refresher radiation protection training, contents (topics), and health physics-related qualification of workers;
- Provisions to inform female workers of fetal protection requirements, to monitor fetal dose, and to provide alternatives to minimize fetal dose;
- Requirements and procedures for calibration, maintenance, and care of radiation detection, monitoring, and dosimetry instruments and records; and
- Preparing of reports and records for health physics program contents and audits, surveys, calibrations, and personnel monitoring results.

The description of the health physics program in the SAR should be revised to include these elements or justification should be provided for the alternative proposed.

This information is needed to determine compliance with 10 CFR 20.1208, 20.1501(b), 20.1501(c) and (d), 20.2103, and 10 CFR Part 20 Subparts L and M.

RAI 9-7: Ensure that WCS CISF SAR Section 9.1.2 clearly provides what is meant by, "remote inspection of storage overpack vents for blockage."

This statement appears on WCS CISF SAR Page 9-5 as part of a discussion of measures to minimize dose to WCS personnel by avoiding the need to perform daily walkdowns near the storage casks. It is not clear how remote vent inspection would be accomplished, and such inspections are not discussed further in the SAR. The SAR should be revised to clarify remote inspections, this verbiage should be removed from Section 9.1.2, or justification should be provided for the proposed alternative approach.

This information is needed to determine compliance with 10 CFR 20.1101(b).

RAI 9-8: Address an apparent typographical error in WCS CISF SAR Section 9.3.2.1, "Controlled Area."

The third paragraph of WCS CISF SAR Section 9.3.2.1 starts with the sentence: "ISP will establish access controls to ensure that unauthorized access inside the OCA and the PA." This sentence is incomplete and should be clarified.

RAI 9-9: Ensure that all the collective dose estimates from transportation and storage cask operations in the WCS CISF SAR Appendices are provided so that all operating procedure steps that could expose personnel are included.

It is not clear that all operating procedure steps that could expose personnel to radiation are captured in the collective dose estimates in WCS CISF SAR Sections A.9, B.9, C.9, D.9, E.9, F.9, and G.9. For example, inspection of Table B.9-2 indicates that step 11 for installing the cask shear key plug assembly, and steps 13 and 14 for sampling and leak testing the transportation package, are not reflected in the dose estimate. Similarly, Table B.9-3 does not include steps for removing the AHSM door, ensuring vents are clear of debris, and lubrication of support rails. All of these steps involve personnel close to a loaded transportation package or storage overpack, and should be reflected in the collective dose assessment. The applicant should ensure that all of the collective dose assessments from the cited Appendixes accurately reflect the operating procedures for the various cask systems.

This information is needed to determine compliance with 10 CFR 20.1101(b).

RAI 9-10: Ensure that the collective dose estimates from transportation and storage cask operations in the WCS CISF SAR Appendices are provided so that all the cited distances and dose rates are appropriate for the specific operating step, and that the total dose calculations are correct.

It is not clear that all cited distances and dose rates for each operating step, and total dose calculations, are correct for the collective dose assessments in WCS CISF SAR Sections A.9, B.9, C.9, D.9, E.9, F.9, and G.9 of the WCS CISF SAR. For example, inspection of Table G.9-1 indicates the following inconsistencies:

- For the process step "Perform radiation and contamination survey of MAGNATRAN Cask," the table indicates a worker distance of greater than two meters. It is not clear how personnel would be able to decontaminate the transportation package from that distance.

- For process steps "Inspect top impact limiter security seal and verify it is intact and correct ID," and "Remove Personnel Barrier and complete surveys," it appears that the dose calculations are incorrect. For the first step, one person working for 15 minutes in a dose field of 20 millirem per hour should be five millirem total, instead of the table reading of one. For the second step, two people working for 30 minutes in a 20 millirem per hour dose field should equate to 20 millirem total, instead of the table reading of 32.

- For the process step "[Using VCT, move empty MAGNASTOR VCC to transfer position in CTF and set down adjacent to MAGNATRAN cask. Set up appropriate work platforms/man lifts for access to top of VCC and MAGNATRAN]," the table indicates a distance of greater than two meters, and an associated dose rate of zero millirem per hour. Personnel will need to be closer than two meters to the MAGNATRAN package to set up work platforms around it, and other activities in the table list non-zero values for estimated dose for similar distances.

- The process steps "[Remove vent port cover and connect pressure test system to vent port to check for excessive pressure. If pressure is high, take sample and check. If clean vent to HEPA filter]," and "[Remove 48 MAGNATRAN lid bolts, install alignment pins and lid lifting hoist rings/slings and remove inner lid and store. Remove alignment pins]," both cite worker distances of half a meter. However, the table cites different dose fields for the same distance (50 millirem per hour for the first step, and 30 millirem per hour for the second).

These inconsistencies, and any others in the collective dose estimates of WCS CISF SAR Sections A.9, B.9, C.9, D.9, E.9, F.9, and G.9 of the WCS CISF SAR, should be revised or justified.

This information is needed to determine compliance with 10 CFR 20.1101(b).

SAR Chapter 11 "Confinement Evaluation"

RAI 11-1: Provide information on corrective actions that would be taken if leak testing does not meet acceptance criteria for the post transportation leakage testing performed at the WCS CISF.

In response to RSI P-9-1, "Description of actions that will be taken if a leakage rate test does not meet the acceptance criterion in a post transport package evaluation," the applicant stated: "Although the procedure does not specify what actions will be taken should testing fail to satisfy an acceptance criterion, the Quality Assurance program implementing procedure on Test Control dictates that test failure will be managed through the corrective program. This will be defined within operational test procedures prior to implementation."

To enable the NRC staff to assess the corrective actions taken at the WCS CISF, the applicant should describe in detail the corrective actions taken for each type of cask system to ensure that the confinement safety is maintained..

This information is needed to determine compliance with 10 CFR 72.24(e) and (l).

RAI 11-2: Provide (a) a limit for the release of radioactive gas (volume) for the gas sampling performed for each of the canister types to be received at the WCS CISF and (b) guidance to prevent/minimize risks caused by the release of radioactive gas during gas sampling, taking into account ALARA concerns.

In its response to RSI 9.4, the applicant stated that the likelihood of releasing radioactive gases during post-transport sampling is small because canisters are seal welded and tested to assure compliance with the leaktight standard of ANSI N14.5 or equivalent. The exceptions to this are FO-, FC- and FF-DSCs that were leak-tested to a leakage rate of 10^{-5} ref-cm^3/sec.

Even though the likelihood of the release of radioactive gases is small, the applicant should provide the limit on the volume of radioactive gas to be released for each of the canister types received at the WCS CISF and guidance to prevent/minimize risk caused by the releasing radioactive gases during gas sampling, taking into account ALARA concerns.

This information is needed to determine compliance with10 CFR 72.24(e).

RAI 11-3: Explain the gas sampling process in sufficient detail to demonstrate that gas sampling would be appropriately performed during post-transportation verification of canisters received at the WCS CISF.

The applicant proposed License Condition No. 22, which would provide that "Prior to removing the shipping cask closure lid, the gas inside the shipping cask shall be sampled to verify that the canister confinement boundary is intact to the extent reasonably practicable by this test."

However, a description of the gas sampling process is not provided in the application (e.g., QP-10.02) and the applicant did not describe:

(a) Whether gas sampling would be performed for each canister or just a certain number of the "bounding" canisters from each site of origin. The applicant should clarify whether the canister selection basis for post-transportation verification described in Section 5.2 of QP-10.02 is applicable to gas sampling;

(b) What rationale is used for not performing sampling for all canisters received at the WCS CISF;

(c) The acceptance criteria (e.g., gas volume/concentration) for gas sampling performed on the canisters received at the WCS CISF.

This information is needed to determine compliance with10 CFR 72.24(e) and 72.44(c)(1)(i).

RAI 11-4: Provide a deadline by which to return a canister to the place of origin, or other facility licensed to perform fuel loading procedures, in License Application, Appendix A, "Proposed Technical Specifications.", if the canister does not pass the gas sampling testing and the post-transportation leakage testing acceptance criterion and therefore cannot be stored at the WCS CISF. If a deadline is not specified, the application should discuss how storage of such canisters is considered and accounted for in the site's safety analyses (e.g. normal and accident doses due to confinement and shielding, thermal time limits) and operating procedures.

The applicant needs to provide the information for each type of canister or each type of cask system used at the WCS CISF.

This information is needed to determine compliance with 10 CFR 72.24(g) and 72.44(c)(1).

SAR Chapter 12, "Accident Analysis"

RAI 12-1: Provide a conclusion for the fire and explosion analysis in WCS CISF SAR Appendix A.12.2.5.

State whether the analysis in the Rancho Seco SAR Section 8.2.5, "Fire" is the same or bounding for the WCS site.

This information is needed to determine compliance with 10 CFR 72.122 (c).

RAI 12-2: Provide accident analysis for the GTCC systems that address drop accidents, floods, lightning, tornado and wind missiles, and tip over for the NAC GTCC systems.

WCS CISF SAR Appendix H.8 addresses earthquakes and fire/explosion, but none of the other accidents listed are analyzed for the GTCC systems.

This information is needed to determine compliance with 10 CFR 72.122(b).

RAI 12-3: Provide a technical basis for the offsite explosion analysis and explain why the 1,660 feet criteria is applicable for the operations at the quarry.

The analysis in WCS CISF SAR Section 12.2.2, "Offsite Accident Analysis," appears to utilize the analysis for a truck transport on a highway using the guidance from Regulatory Guide 1.91. Provide additional information to support that the material limit of 50,000 lbs used in the accident analysis is applicable to the quarry operation located northwest of the facility. In addition, provide information to support the assessment for potential future quarry operations in the area.

This information is needed to determine compliance with 10 CFR 72.122(b), (c) and (e).

RAI 12-4: Provide the following information for the gasoline, diesel, and propane tanks located on the Waste Control Specialists commercial waste disposal facility identified in WCS CISF SAR Section 12.2.2:

1. The distance between the proposed WCS CISF and the propane tanks and provide an analysis to support the conclusion that an accident involving these storage tanks would not impact the proposed WCS CISF. WCS CISF SAR Section 12.2.2 states that there are a number of gasoline, diesel and propane tanks located on the Waste Control Specialists commercial waste disposal facility. The location of each gasoline and diesel tank is provided and all gasoline and diesel tanks are greater than 1,660 feet from the proposed ISFSI and none of the locations have quantities that would create overpressures in excess of 1 psi at the CISF. The location of the propane storage tanks with respect to the CISF are not provided.

2. Indicate whether the analysis of the offsite accidents of the propane, gasoline and diesel storage tanks includes an assessment of the combined explosion overpressures of multiple storage tanks that are collocated at the Waste Control Specialists commercial waste disposal facility. WCS CISF SAR Section 12.2.2 states that there are a number of gasoline, diesel and propane tanks located on the Waste Control Specialists commercial waste disposal facility. The location of each gasoline and diesel tank is provided and all gasoline and diesel tanks are greater than 1660 feet from the proposed ISFSI and none of the locations have quantities that would create overpressures in excess of 1 psi at the CISF. However, it is not clear from the SAR whether the analysis considers the overpressure from a single tank explosion or the possible combined explosions of collocated tanks such as the 5,000 gallon gasoline tank and the 8,000 gallon diesel tank located 4,732 feet from the proposed CISF.

This information is needed to determine compliance with 10 CFR 72.122(b), (c) and (e).

SAR Chapter 13, "Conduct of Operations"

RAI 13-1: SAR Section 13.2 provides a general high-level description of the program covering preoperational testing prior to the on-site receipt of SNF and the types of tests that will be performed and that the system for preparing, reviewing, approving, and implementing testing procedures and instructions for WCS CISF operations will be in accordance with written procedures. However, additional information is needed.

Provide specific test information, including type of test, expected response, acceptable margins of difference, method of validation, and corrective actions for unexpected or unacceptable results, or provide the Pre-operational Test Plan for operations, transfer operations, and overpack loading and retrieval. Refer to SRP Section 10.4.2.1 for guidance on the information needed.

This information is needed to determine compliance with 10 CFR 72.24(p)

RAI 13-2: Provide an operating startup plan that identifies those specific operations involving the initial handling of radioactive material to be placed into storage.

WCS CISF SAR does not appear to include an operating startup plan. NUREG-1567 provides guidance on the elements that should be included in an operating startup plan. The operating startup plan should identify those specific operations involving the initial handling of radioactive material to be placed into storage. Although procedures to be used for normal operations or during steady-state conditions would not necessarily be included in the operating startup plan, the evaluation of the effectiveness of those procedures should be elements of the operating startup plan. For As Low As Reasonably Achievable (ALARA) considerations, as many of the operating startup actions as feasible should be performed during preoperational testing (i.e., before sources of exposure are present).

The operating startup plan should include the following elements:

- tests and confirmation of procedures and exposure times involving actual radioactive sources (e.g., radiation monitoring, in-pool operations);
- direct radiation monitoring of casks and shielding for radiation dose rates, streaming, and surface hot-spots;
- verification of effectiveness of heat removal features; and
- Documentation of results of tests and evaluations.

This information is needed to determine compliance with 10 CFR 72.24(p).

RAI 13-3: Provide TRN-1.1.

WCS CISF SAR Section 13.3 provides general descriptions of training and qualification of personnel. ISP stated WCS CISF personnel shall be trained and qualified in accordance with existing WCS Training Program and that ISP will expand ISP joint venture member Waste Control Specialists existing Training

Plan, TRN-1.1, to encompass training for the WCS CISF. In accordance with 10 CFR 72.192, the training program must be submitted to the Commission for approval with the license application.

This information is needed to determine compliance with 10 CFR 72.28(c) and 10 CFR Part 72, Subpart I.

SAR Appendix A, "NUHOMS-MP187 Cask System,"

RAI A-1: Provide the confinement calculations (e.g., Excel Spreadsheet), documented in WCS CISF SAR Section A.11, in order for the NRC staff to verify that the radionuclide inventory in WCS CISF SAR Table A.11.1, "SNF Assembly Activities," an analysis with 24 spent nuclear fuel assemblies per canister, and an analysis with 21 canisters, is bounding for all fuel and GTCC waste in FO-, FC-, and FF- DSCs.

The applicant provided a new confinement evaluation documented in Section A.11 of the WCS CISF SAR to include all of the isotopes required to meet current standards. The radioactive inventory was determined using the same design basis fuel assemblies that were demonstrated to be bounding in the Rancho Seco ISFSI FSAR, except that updated methods were used to calculate the radionuclide inventories.

The bounding assembly burnup and initial enrichment combinations used for the original analysis remain bounding for the radionuclide inventories regardless of the updated methods used to generate the source term. Therefore, assuming that all 21 canisters containing fuel under the SNM-2510 license are loaded with 24 fuel assemblies, each with the maximum radionuclide inventory for each assembly, the results bound the 21 canisters that are actually loaded.

The applicant should provide the confinement calculations (e.g., Excel Spreadsheet) for purposes of the staff's verification on the applicant's confinement evaluation.

This information is needed to determine compliance with 10 CFR 72.104(a) and 72.106(b).

RAI A-2: Clarify whether the computed air leakage rates shown in WCS CISF SAR Section A.11.3.3, Appendix A, represent the allowable air leakage rate (cm^3/sec) or the reference leakage rate (ref-cm^3/sec)?

The applicant used the method described in ANSI N14.5 and assumed a leakage hole length to be the size of the weld length (3/16 inches) to compute a hole diameter of 4.7611×10^{-4} cm for a leakage rate of 1.0×10^{-5} std-cm^3/sec, as shown in SAR Section A.11.3.3. The computed air leakage rates, based on ANSI N14.5, are 4.4914×10^{-6}, 7.5892×10^{-6}, and 2.5413×10^{-5} cm^3/sec, respectively, under normal, off-normal, and accident conditions.

The applicant should either revise the unit of the leakage rate from "cm^3/sec" to "ref-cm^3/sec" or convert the allowable leakage rate to the reference leakage rate for clarification. The applicant should use the reference air leakage rate (medium: air; cavity pressure: 1 atm abs; ambient pressure: 0.01 atm abs; temperature 25°C) as the acceptance criterion for testing as recommended by ANSI N14.5.

This information is needed to determine compliance with 72.24(e).

RAI A-3: Provide a rationale for the statement in WCS CISF SAR Appendix A.7, “Structural Evaluation,” p. A.7-1, that the canister confinement boundaries are evaluated for Normal Conditions of Transport (NCT) for the WCS CISF. On the basis of the rationale, also revise, as appropriate, the last paragraph of page A.7-3 on the need for performing a bounding evaluation in WCS CISF SAR Section A.7.7, “Structural Evaluation of Canister Confinement Boundary under Normal conditions of Transport,“ to demonstrate that the canister confinement boundaries are not adversely impacted by transport to the WCS CISF.

The FO-, FC-, FF- Dry Shielded Canisters (DSCs) should all have been certified for transport as part of the Model NUHOMS MP-187 transportation package (Docket 71-9255) by meeting the 10 CFR Part 71.71 requirements for Normal Conditions of Transport. It is unclear why the canister confinement boundaries need to be re-evaluated for the so-called “Normal Conditions of Transport” for transport of spent nuclear fuel to the WCS CISF site. However, If the Normal Conditions of Transport are considered to address certain handling and transfer operations upon canister receipt at the site, specifics to these operations must be provided and justified in the SAR for their applicability.

(Note: This request applies similarly to the evaluations proposed in Appendix B, Section B.7.9, “Structural Evaluation of 24PT1-DSC Confinement boundary under Normal Conditions of Transport,” Section C.7.8, “Structural Evaluation of 61BT DSC Confinement Boundary under Normal Conditions of Transport, and Section D.7.8, “Structural Evaluation of 61BTH Type 1 DSC Confinement Boundary under Normal Conditions of Transport)

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(1).

RAI A-4: Provide evaluations, as appropriate, to substantiate statements in SAR Section A.7.1, “Discussion”. At the bottom of page A.7-2, the SAR states:

> “The evaluation of the MP187 cask as a transfer cask is based on Revision 13 of Drawing NUH-05-4001 (Cask Main Assembly) and Revision 8 of NUH-05-4003 (Cask On-Site Transfer Arrangement), as shown in Volume IV of [A.7-4]. The current revision of NUH-05-4001 is Revision 15 as shown in Section 1.3.2 of [A.7-7]. There are no significant design differences in the cask main assembly configuration between these two revisions.”

The broadbase statement of the above, “[T]here are no significant differences in the cask main assembly configuration between these two revisions,” lacks clarity for the details through the process of incorporation by reference (IBR). The details addressed in individual revisions, including the design criteria on loads and load combinations and resulting changes in structural performance margins, should be properly summarized in the SAR for the NRC staff to evaluate the design differences as a basis for making a safety finding.

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(1).

SAR Appendix B, "Standardized Advanced NUHOMS® System"

RAI B-1: Revise the following statement in WCS CISF SAR Section B.3.3.3, "Seismic Design":

> "This system was designed for very high seismic regions, such as the west coast, and as such the design basis earthquake shown in Figures 2.2-1 and 2.2-2 of reference [B.3-1] for the AHSM easily envelops the enveloping acceleration response spectra at the concrete pad base and HSM center of gravity obtained by the WCS CISF soil-structure interaction (SSI) analysis at all frequencies as demonstrated in Sections B.7.5 and B.7.8. Due to the very low accelerations, the ties between the individual modules and the shear keys used to transfer vertical motions are not required at the WCS CISF."

The NRC staff notes that the AHSM arrays evaluated in WCS CISF SAR Section 7.6.4 are markedly different from those evaluated in the AHSM FSAR. For the previously approved AHSM, the analysis is performed for an assembly of three AHSM modules. For the analyzed assembly, the adjacent modules are tied to each other with module-to-module ties to prevent out-of-phase tipping and module-to-module separation. The analysis indicates that, for the high seismic region, the AHSM row assembly will need 10 feet of space around all sides to accommodate sliding and to facilitate retrievability of the 24PT1-DSC. For the AHSMs at the WCS CISF, where ties between the individual modules and shear keys are removed, the FSAR approved AHSMs (Docket No. 72-1029) are reconfigured. As such, the seismic stability description for the AHSM must be revised considering the site-specific analysis results presented in SAR Section 7.6.4, "Soil Structural Interaction of the NUHOMS NIT Storage Pad."

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(1)(i).

RAI B-2: Revise the following statement on WCS CISF SAR page B.7-3, Section B.7.1, "Discussion" and make conforming changes to WCS CISF SAR Section B.7.8

> "The cask stability evaluations in [B.7-4] use the hypothetical case of the cask as a storage component, and hence in the vertical configuration, as bounding the horizontal configuration in the transfer mode."

The MP-187 in the transfer mode remains horizontal in the transfer trailer. As such, the cask stability and missile penetration evaluation of Section B.7.8 evaluation is the only evaluation that needs to be performed for the MP-187 transfer operation. The word, "alternate," of the section title, which also appears throughout, should be removed from Section B.7.8, "Alternate Cask Stability and Missile Penetration Evaluation of the MP187 Cask On-Site Transfer Configuration."

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(1).

RAI B-3: Provide additional information for the WCS CISF SAR Section B.7.4, “Structural Analysis of AHSM with a Canister,” seismic reconciliation analysis of the AHSM configured for WCS CISF. As a further clarification, also revise the last paragraph on page B.7-7, which states: “[T]he stress qualification for AHSM ties and concrete keys is provided in Table 3.3-21 of [B.7-1]”

The IBR evaluation of the AHSM uses the component design basis stress analysis results in UFSAR, Revision 6. The 1.5 g horizontal and 1.0 g vertical peak ground accelerations used are significantly higher than those of SAR Section 7.6.4, “Soil Structural Interaction of the NUHOMS NTS Storage Pad,” which considers the design changes of removing the module-to-module ties and shear keys from the analyzed AHSM configuration. As such, the IBR stress results must clearly be delineated to address both the loading conditions and corresponding structural margins of safety for the AHSM storage system components.

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(2)(i).

SAR Appendix C, “Standardized NUHOMS®-61BT System”

RAI C-1: Replace the acronym “PWR” to read “BWR” in WCS CISF SAR Section C.3.4.2, by noting that the NUHOMS-61BT1 storage system is designed for storing the BWR FAs.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI C-2: Confirm that the IBR citation, “Section K.2.3.2,” is accurately identified in WCS CISF SAR Section C.3.4.2, “Structural,” for presenting the principal design criteria for evaluating the DSC confinement structural performance. If it is not the correct citation, please provide appropriate IBR citation(s) to facilitate the staff review of the principal design criteria.

Section K.2.3.2 of the Standardized NUHOMS FSAR appears to address the confinement barrier leak testing only and there is no discussion regarding the confinement boundary structural design criteria.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI C-3: With respect to the WCS CISF SAR Section C.7.7.3.1, Incorporated By Reference (IBR) use of the two FSARs (Rancho Seco, Revision 4 and TN Document NUH-003, Revision 14) to evaluate the MP197HB drop accident, provide an IBR list of the SAR sections, subsections, and paragraphs for identifying the specific analysis attributes and results to facilitate the staff safety review. In addition to Section C.7.7.3.1, “Loads,” the list should also cover, as appropriate, other subject areas, including Section C.7.7.3.2, "Finite Element Analysis Models," Section C.7.7.3.3, "Boundary Conditions," and Section C.7.7.3.4, "Stress Analysis Methodology."

The proposed use of the two previously approved SARs covers multiple transfer cask models, including MP 187, OS187, OS197, OS197L, and OS197H. It is unclear how the DSC 61BT was evaluated against the previously approved transfer cask model(s). A detailed IBR list of information is needed to facilitate the staff review of the MP 197HB for transfer operation drop accidents.

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(1).

RAI C-4: In WCS CISF SAR Figure C.7-21, "Top End Drop Buckling," revise the erroneous abscissa labeling, "Time," to read, "Deceleration (g)," as appropriate to recognize that the canister end drop buckling capability is tracked against the load, in lieu of time increment.

This information is necessary to assure compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

SAR Appendix D, "Standardized NUHOMS®-61BTH Type 1 System"

RAI D-1: Provide the calculation package(s) from which the summary discussions can be assessed and reviewed by the staff for the evaluation discussed in WCS CISF SAR Section D.7.3, "Seismic Reconciliation of the Canister HSM Model 102, MP197 Cask."

The WCS CISF SAR summary discussion lacks clarity in a number of areas essential for assessing the applicability of analysis assumptions and results. For example, WCS CISF SAR Section D.7.3.1.3 states: "[T]he forces and moments for each HSM subcomponent (roof slab, walls, floor slab) are determined for the WCS CISF spectra obtained from the SSI analysis, and then compared to their respective capacities, calculated as described in Section 8.1.1.5.E of [D.7-2]. The comparison is shown in Table D.7-1." It's unclear whether the noted SSI analysis is related to the site-specific analysis of SAR Section 7.6.4, where no HSM concrete subcomponents are explicitly modeled for extracting shear forces and bending moments for developing the data reported in Table D.7-1.

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(2)(i).

RAI D-2: Clarify the use of "stress ratio," cited in WCS CISF SAR Section D.7.3.1.5.2, "Evaluation of Heat Shield," for presenting the Heat Shield stud evaluation methodology and results. To facilitate NRC staff review, also provide calculation package(s) to substantiate the interaction ratio safety margins determination.

The NRC staff notes that the "interaction ratio" evaluation is generally required of the stud embedment strength qualification, when the studs are subject to concurrent axial, bending, and shear stresses. The use of stress in lieu of interaction ratios suggests that the combined effects of axial, bending, and shear stresses may not have been considered for evaluating the structural adequacy of the studs. The stress ratio criterion alone is insufficient and is also deviated from that of Section 8.1.1.7 of the FSAR, Revision 14, of Docket No. 1004.

This information is needed to determine compliance with 10 CFR 72.24(c)(3), 72.24(d)(1) and (2) and 72.122(b)(2)(i).

SAR Appendix E, "NAC-MPC"

RAI E-1: Revise the discussion in WCS CISF SAR Section E.3.1.1.3, "Seismic Design," on the seismic response of the NAC-MPC to recognize that the storage pad peak earthquake motions are based on the WCS CISF SAR Section 7.6.3 SSI analysis. On the basis of the SSI analysis results, which show markedly higher accelerations at cask center of gravity than those seismic motions used in the quasi-static analysis to demonstrate cask seismic stability, revise the Section E.3.1.1.3 discussion on the seismic response of the NAC-MPC at the proposed WCS CISF site.

SAR Section E.3.1.1.3 notes that Section 11.2.2 of the NAC-MPC FSAR demonstrates cask seismic stability for the peak pad seismic motion of 0.25 g horizontal and 0.167 g vertical in a quasi-static analysis. These seismic motions are seen markedly lower than those calculated at the cask center of gravity in the site-specific SSI analysis in Section 7.6.3. Section 7.6.3 also notes that cask sliding is likely to occur. Thus, the cask seismic performance discussion should be based on the storage pad seismic motions evaluated in SAR Section 7.6.3 for the WCS CISF site. [Note: This request applies also to Section E.3.2.1.3 for the MPC-LACBWR storage system.]

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(2)(i).

RAI E-2: In WCS CISF SAR Section E.3.1.2, "Safety Protection Systems," in addition to those of the NAC-STC FSAR, add to the discussion of the other ITS SSCs to be considered for the WCS CISF safety evaluation. For the other ITS SSCs, also discuss the design description, design criteria, materials used for construction, and structural performance analysis in order to facilitate the staff safety review. [Note: This request applies also to WCS CISF SAR Section E.3.2.2 for the MPC-LACBWR storage system.]

The ITS SSCs listed in Tables 2.3-1 and 2.3-2 of the NAC-MPC FSAR are those associated primarily with the storage cask system, such as the transportable storage canister and basket, vertical concrete cask, and transfer cask. Safety classification for other ITS SSCs must also be evaluated for the WCS CISF discussed in Section E.4, "Operating Systems, NAC-MPC," including the ancillary equipment, adapter plate vertical cask transporter, rigging and slings, and storage pad used for receipt, handling, storage, and retrievability of the canisters.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI E-3: Provide design details for the lifting yoke used for moving the transfer cask in WCS CISF SAR Section E.4.1.3, “Transfer Cask.”

The lifting yoke as an ancillary component for transfer cask lifting is not part of the design approval review for the NAC-MPC SAR. As such, it must be evaluated for the WCS CISF site. [Note: This request applies also to Section E.4.2.3 for the MPC-LACBWR storage system.]

This information is necessary to assure compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI E-4: Provide safety classifications of the SSCs discussed in WCS CISF SAR Section E.4.1.4, “Auxiliary Equipment,” for the WCS CISF operation.

Section E.3.1.2, “Safety Protection Systems,” presents safety classifications for the NAC-MPC storage system focusing only on the cask system components for the general license approval. Auxiliary equipment needed for the site-specific operation is not addressed. As such, safety classification must also be identified for the Auxiliary Equipment used at the WCS CISF site. [Note: The request also applies to Section E.4.2.4 for MPC-LACBWR.]

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI E-5: Revise, as appropriate, the WCS CISF SAR Section E.4.1.4.2, “Rigging and Slings,” description by identifying the specific rigging attachments and corresponding load paths rating criteria for which the ANSI N14.6, special lifting device, standard applies. [Note: The request also applies to Section E.4.2.4.3 for MPC-LACBWR.]

The staff notes that ANSI N14.6 and NUREG-0612 are cited as the standards for the ITS rigging attachments; however, the rigging attachments cited in the section appear to be of commercial “off the shelf” items. If the rigging attachments are configured as special lifting devices, they need to be designed, fabricated, operated, tested, inspected, and maintained per the ANSI N14.6 standard accordingly.

This information is necessary to assure compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI E-6: Provide a rationale for the Section E.7.1, “Yankee Rowe MPC and Connecticut Yankee MPC,” lead paragraph statement:

> “Finally, bounding evaluations in Section E.7.1.11 are referenced to demonstrate that the confinement boundaries for the Yankee-MPC and CY-MPC canisters do not exceed ASME B&PV Subsection NB Article NB-3200 (Level A allowables) during normal conditions of transport to provide reasonable assurance that the confinement boundary is not adversely impacted by transport to the WCS CISF.”

The canister structural performance has already been certified by the NRC for the NCT under Docket 71-9235 and there appears no need to reevaluate the canister confinement boundary further for transport; however, if deemed necessary, revise, as appropriate, the evaluation in WCS CISF SAR Section E.7.1.11, “Structural Evaluation of Yankee-MPC and CY-MPC Canister Confinement Boundaries under Normal Conditions of Transport.”

The NRC staff notes that WCS CISF SAR Section E.7.1.11 refers to the confinement boundary evaluation of the NAC-STC with canisters as contents. The NAC-STC package has been certified for meeting the 10 CFR Part 71.71 requirements for Normal Conditions of Transport (Docket 71-7235). As such, it’s unclear why it is necessary to re-evaluate the canister confinement boundaries for transport of spent nuclear fuel to the WCS site. However, if the Normal Conditions of Transport are considered to address certain handling and transfer operations upon canister receipt at the site, specific descriptions must be provided in the SAR to justify their applicability. [Note: The request also applies to Section E.7.2 and Section E.7.2.11 for LACBWR-MPC.]

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI E-7: Provide for staff review NAC Calculation 30039-2010, Rev 0, “Concrete Cask Tip-Over Evaluation WCS,” including any computer based analyses input/output files, for the site-specific non-mechanistic tip-over analysis.

The calculation and input/output files are necessary for reviewing the summary discussion of the cask tip-over modeling approach, its implementation, and calculated cask decelerations of Section E.12.1.3, “Concrete Cask Non-Mechanistic Tip-Over Analysis”. [This request also applies to NAC Calculation 30039-2015, Rev 0, “Tip-Over DLF Calculation for WCS,” as applied to Section E-12.2.3 for LACBWR MPC].

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI E-8: In WCS CISF SAR Figure E.12-2, “CISF Configuration – Finite Element Model Set-Up,” (1) clarify the use of the annotations: BAS1E; CAN1E and VCC1E and (2) identify where the “liner,” as discussed in Section E.12.1.3.7, “Boundary Conditions,” is being modeled. [This request also applies to Figure E.12-8 and E.12.2.3.7 for LACBWR MPC.]

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI E-9: (a) Identify the locations in WCS CISF SAR Figure E.12-2 for which the peak basket accelerations are calculated for evaluating the dynamic load factor (DLF) effects reported in Table E.12-3, “Peak Accelerations and DLF for Yankee Rowe MPC VCC Systems.” (b) Provide a sample set of time-history response plots to indicate the time elapsed for which the peak basket accelerations are selected for determining the amplified basket accelerations associated with the short- and long-pulses. [This request also applies to Figure E.12-8 and Table E.12-7 for LACBWR MPC.]

WCS CISF SAR Table E.12-3 lacks information on whether the short- and long-pulse effects reported are associated with the same basket location. If not calculated for the same basket location, discuss the basis for selecting responses at different basket locations for determining the amplified basket responses.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI E-10: For the short-pulse DLF of 0.75 listed in Table E.12-7, "Peak Accelerations and DLF for MPC-LACBWR VCC System," explain why a triangular pulse, which is independent of the basket orientation, is not used for calculating the bounding DLF of 1.52 for the Connecticut Yankee MPC and Yankee Rowe VCC systems.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

SAR Appendix F, "NAC-UMS"

RAI F-1: Revise the NAC-UMS Seismic Ground Motion Design Criteria listed in WCS CISF SAR Table F.3.1,"Summary of WCS CISF Principal Design Criteria, which states, "[T]he maximum allowable ground acceleration for the NAC-UMS system is 0.26 g horizontal and 0.29 g vertical."

The staff notes that Section 11.2.8 of the NAC-UMS FSAR defines the design basis peak pad seismic motions at 0.26 g and 0.29 g for two orthogonal horizontal components and 2/3 of the horizontal resultant for the vertical.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI F-2: Revise the discussion in WCS CISF SAR Section F.3.1.1.3, "Seismic Design," on the seismic stability of the NAC-UMS to recognize that the storage pad peak earthquake motions are based on the WCS CISF SAR Section 7.6.3 SSI analysis. On the basis of the SSI analysis results, which show markedly higher accelerations at cask center of gravity than those seismic motions used in the quasi-static analysis to demonstrate cask seismic stability, revise the last two sentences of Section F.3.1.1.3, which state:

> "The existing analysis bounds the WCS CISF site pad design limits for accelerations at the top pad surface. Therefore, no further evaluations are required."

SAR Section F.3.1.1.3 notes that Section 11.2.8 of the NAC-UMS FSAR demonstrates cask seismic stability for the peak pad seismic motions of 0.25 g and 0.29 g horizontal components and 2/3 of the horizontal resultant for the vertical in a quasi-static analysis. These seismic storage pad motions are less severe than the ones resulting from the SSI analysis in SAR Section 7.6.3 for the

WCS CISF site. Section 7.6.3 also notes that cask sliding is likely to occur. Thus, the cask seismic performance discussion needs to be revised based on the storage pad seismic motions evaluated in SAR Section 7.6.3 for the WCS CISF site.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI F-3: Provide design details for the lifting yoke used for moving the transfer cask in WCS CISF SAR Section F.4.1.3, "Transfer Cask."

The lifting yoke as an ancillary component for transfer cask lifting is not part of the design approval review for the NAC-UMS SAR. As such, it must be evaluated for the WCS CISF site.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI F-4: Provide safety classifications of the SSCs discussed in WCS CISF SAR Section F.4.1.4, "Auxiliary Equipment," for the WCS CISF operation.

Section F.3.1.2, "Safety Protection Systems," presents safety classifications for the NAC-UMS storage system focusing only on the cask system components for the general license approval. Auxiliary equipment needed for the site-specific operation is not addressed. As such, safety classification must also be identified for the Auxiliary Equipment used at the WCS CISF site.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI F-5: Provide a rationale for the WCS CISF SAR Section F.7.1, "Maine Yankee," lead paragraph statement:

> "Finally, bounding evaluations in Section F.7.1.11 are referenced to demonstrate that the confinement boundaries for the NAC-UMS canisters do not exceed ASME B&PV Subsection NB Article NB-3200 (Level A allowables) during normal conditions of transport to provide reasonable assurance that the confinement boundary is not adversely impacted by transport to the WCS CISF."

The canister structural performance has already been certified by the NRC for NCT under Docket 71-9270 and there appears no need to reevaluate the canister confinement boundary further for transport; however, if deemed necessary, revise, as appropriate, the evaluation in Section F.7.1.11, "Structural Evaluation of NAC-UMS Canister Confinement Boundaries under Normal Conditions of Transport."

The staff notes that Section F.7.1.11 refers to the confinement boundaries evaluation of the NAC-UMS Transport cask canisters as contents. The NAC-UMS package has been certified for meeting the 10 CFR Part 71.71 requirements for Normal Conditions of Transport (Docket 71-7290). As such, it's unclear why it is necessary to evaluate the canister confinement boundaries for transport of spent nuclear fuel to the WCS site. However, if the Normal Conditions of Transport need to be considered to address certain handling and transfer operations upon canister receipt at the site, specific descriptions must be provided in the SAR to justify their applicability. [Note: The request is similar to that discussed previously for the NAC-MPC cask system]

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI F-6: In WCS CISF SAR Figure F.12-2, "CISF Configuration – Finite Element Model Set-Up," (1) clarify the use of the annotations: BAS1E; CAN1E and VCC1E and (2) identify where the "liner," as discussed in Section F.12.1.3.7, "Boundary Conditions," is being modeled. [Note: The request is similar to that discussed previously for the NAC-MPC cask system]

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI F-7: (a) Identify the locations in Figure F.12-2 for which the peak basket accelerations are calculated for evaluating the dynamic load factor (DLF) effects reported in Table F.12-3, "Peak Accelerations and DLF for UMS VCC Systems." (b) Provide a sample set of time-history response plots to indicate the time elapsed for which the peak basket accelerations are selected for determining the amplified basket accelerations associated with the short- and long-pulses. [Note: The request is similar to that discussed previously for the NAC-MPC cask system]

WCS CISF SAR Table F.12-3 lacks information on whether the short- and long-pulse effects reported are associated with the same basket location. If not calculated for the same basket location, discuss the basis for selecting responses at different basket locations for determining the peak amplified basket responses.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI F-8: Verify that the wording, "Reference 4," is correctly cited for the WCS CISF SAR page F.12-13 statement, "The acceleration used in the basket and canister evaluations for the UMS system in Reference 4 was 40g's."

"Reference 4" cannot be located in Section F.12.2, "References."

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

SAR Appendix G, "NAC-MAGNASTOR"

RAI G-1: Revise the discussion in WCS CISF SAR Section G.3.1.1.3, "Seismic Design," on the seismic stability of the MAGNASTOR to recognize that the storage pad peak earthquake motions are based on the SSI analysis of SAR Section 7.6.3. On the basis of the SSI analysis results, which show markedly higher accelerations at cask center of gravity than those seismic motions used in the quasi-static analysis to demonstrate cask seismic stability, revise the last two sentences of Section G.3.1.1.3, which state:

> "The existing analysis bounds the WCS CISF site pad design limits for accelerations at the top pad surface. Therefore, no further evaluations are required."

SAR Section G.3.1.1.3 notes that Section 11.2.8 of the MAGNASTOR FSAR demonstrates that the cask is stable during a 0.37 g horizontal storage pad motion. The vertical acceleration for this evaluation is defined as 2/3 of the horizontal motion. These storage pad accelerations are less severe than the ones resulting from the SSI analysis in SAR Section 7.6.3 for the WCS CISF site. Section 7.6.3 also notes that cask sliding is likely to occur. Thus, the cask seismic performance discussion needs to be revised based on the storage pad seismic motions evaluated in SAR Section 7.6.3 for the WCS CISF site.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI G-2: Provide safety classifications of the SSCs discussed in WCS CISF SAR Section G.4.1.7, "Auxiliary Equipment," for the WCS CISF operation.

WCS CISF SAR Sections G.3.1.2, "Safety Protection Systems," presents safety classifications for the MAGNASTOR storage system focusing only on the cask system components for general license approval. Auxiliary equipment needed for the site-specific operation is not addressed. As such, safety classification must also be identified for the Auxiliary Equipment used at the WCS CISF site.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI G-3: Provide a rationale for the WCS CISF SAR Section G.7.1, "Undamaged and Damaged PWR Fuel," lead paragraph statement:

> "Finally, bounding evaluations in Section G.7.1.9 are referenced to demonstrate that the confinement boundaries for the NAC-UMS canisters do not exceed ASME B&PV Subsection NB Article NB-3200 (Level A allowables) during normal conditions of transport to provide reasonable assurance that the confinement boundary is not adversely impacted by transport to the WCS CISF."

The canister structural performance has already been certified by the NRC for NCT under Docket 71-9356 and there appears no need to reevaluate the canister confinement boundary further for transport; however, if deemed necessary, revise, as appropriate, the evaluation in Section G.7.1.9, "Structural Evaluation of NAC-MAGNASTOR Canister Confinement Boundaries under Normal Conditions of Transport."

The NRC staff notes that Section G.7.1.9 refers to the confinement boundaries evaluation of the NAC MAGNATRAN Transport cask canisters as content. The

NAC-MAGNATRAN package has been certified for meeting the 10 CFR Part 71.71 requirements for Normal Conditions of Transport (Docket 71-9395). As such, it's unclear why it is necessary to evaluate the canister confinement boundaries for transport of spent nuclear fuel to the WCS site. However, if the Normal Conditions of Transport need to be considered to address certain handling and transfer operations upon canister receipt at the site, specific descriptions must be provided in the SAR to justify their applicability.

This information is needed to determine compliance with 10 CFR 72.24(c)(3) and 72.24(d)(1) and (2).

RAI G-4: In WCS CISF SAR Figure G.12-2, "CISF Configuration – Finite Element Model Set-Up," (1) clarify the use of the annotations: BAS1E; CAN1E and VCC1E and (2) identify where the "liner," as discussed in Section F.12.1.3.7, "Boundary Conditions," is being modeled. [Note: The request is similar to that discussed previously for the NAC-MPC cask system]

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI G-5: (a) Identify the locations in WCS CISF SAR Figure G.12-2 for which the peak basket accelerations are calculated for evaluating the dynamic load factor (DLF) effects reported in WCS CISF SAR Section G.12.1.3.10, "Determination of Amplified Accelerations." (b) Provide a sample set of time-history response plots to indicate the time elapsed for which the peak basket accelerations are selected for determining the amplified basket accelerations associated with the short- and long-pulses. [Note: The request is similar to that discussed previously for the NAC-MPC cask system]

WCS CISF SAR Section G.12.1.3.10 lacks the information on whether the short- and long-pulse effects are associated with the same basket location. If not calculated for the same basket location, discuss the basis for selecting responses at different basket locations for determining the peak amplified basket responses.

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

RAI G-6: Verify that the wording, "Reference 5," is correctly cited for the WCS CISF SAR page F.12-14 statement, "The acceleration used in the basket and canister evaluations for the MAGNASTOR system in Reference 5 was 35g's."

"Reference 5" cannot be located in Section G.12.2, "References."

This information is needed to determine compliance with 10 CFR 72.24(c), 72.24(d)(1) and (2), and 72.122(b)(1).

<u>SAR Appendix H, "Canisterized GTCC Waste," H.1., "Introduction and General Description of Installation"</u>

RAI H-1: Revise WCS CISF SAR Appendix H.1 to address whether the confinement boundary of the GTCC canister does not exceed ASME B&PV Subsection NB Article NB-3200 (Level A allowables) during normal conditions of transport to provide reasonable assurance that the confinement boundary is not adversely impacted by transport to the WCS CISF.

The applicant made a similar statement in WCS CISF SAR Sections A.3.4.4, E.7.1, F.7.1 and G.7.1 to confirm that the canisters, received at WCS CISF, do not exceed ASME B&PV Subsection NB Article NB-3200 (Level A allowables) during normal conditions of transport to provide reasonable assurance that the confinement boundary is not adversely impacted by transport to the WCS CISF.

The applicant should add a similar statement (underlined above) in the WCS CISF SAR Appendix H if the confinement boundary of the GTCC canister does not exceed ASME B&PV Subsection NB Article NB-3200 (Level A allowables) during normal conditions of transport to provide reasonable assurance that the confinement boundary is not adversely impacted by transport to the WCS CISF.

This information is needed to determine compliance with 10 CFR 72.120(a).