SAR Chapter 7, “Installation Design and Structural Evaluation”

RAI NP-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).

Response to RAI NP-7-5:

The maximum calculated differential settlement for the ISFSI concrete pad was originally determined to be 0.25 inch or less per Section 6.2 and Section 7.0 of NAC004-CALC-02 [1]. In response to RAIs received from the NRC, the settlements have been recalculated in the revised Geotechnical Exploration Report [4]. The newly calculated maximum differential settlement based on the settlements reported in Appendix H of Reference [4] is calculated to be 0.70 inches. Per Table 5-7 of Reference [2], the recommended maximum limit for the differential settlement of buildings with raft-type footings (similar to the concrete pad under consideration) on clayey soils and sandy soils is 35 mm (1.38 in.) and 25 mm (0.98 in.), respectively.

Section 9.2.2 of American Concrete Institute (ACI) 349-06 [3], states that “Where the structural effects of differential settlement, creep, shrinkage, or expansion of shrinkage-compensating concrete are significant, they shall be included with the dead load in Eq. (9-4) through (9-9)”. Since the calculated maximum differential settlements are significantly lower than the permissible limits defined in Table 5-7 of Reference [2], it is considered that the additional loads due to the differential settlements of the pad would be negligible when compared with the other relatively large design loads, including various dead and live loads. Consequently, the loads due to the differential settlements have not been included in the load cases listed in WCS CISF SAR Sections 7.6.1.4 and 7.6.5.3. This is determined to have negligible impact on the results of the analysis or the design of the pad.

The responses to several additional RAIs all address the evaluation of the Storage Pads for the NAC systems. All of the required changes to SAR Sections 7.6.1 and 7.6.2, including subsections, along with the above clarifications are included as part of the response to RAI NP-7-3. Similarly, RAI NP-7-8 addresses the evaluation of the Storage Pad for the NUHOMS® system. All of the required changes to SAR Sections 7.6.4 and 7.6.5, including subsections, along with the above clarifications are included as part of the response to RAI NP-7-8.

References:

1. “Liquefaction Potential and Elastic Settlement Evaluation for Independent Spent Fuel Storage Installation (ISFSI) Concrete Pad at WCS Site in Andrews, TX,” NAC004-CALC-02, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

2. Bowles, Joseph E. (1996), "Foundation Analysis and Design", Fifth Edition, McGraw-Hill, New York.

3. ACI 349-06, "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-06) and Commentary."

4. GEOServices Project No. 31-151247, "Report of Geotechnical Exploration Consolidated Interim Storage Facility (CISF) Andrews, Texas," Revision 2.

Impact:

No additional changes as a result of this RAI.

RAI NP-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).

Response to RAI NP-7-6:

The casks are modeled with rigid frame members originating at the eight contact points (between top of the concrete and bottom of the cask, spaced at 45 degrees around the outer perimeter of the cask) and terminating at the cask center of gravity (CG). The weight of the cask and the seismic forces are applied at the CG, located at the apex of the frame members. The lower ends of the frame members are pin-connected to the top of mat; thus, they do not transfer bending moments, but sliding and uplifting of the casks is prevented. The cross-sectional area and moments of inertia of the frame members are established to simulate the rigid behavior of the cask. Since sliding would reduce the magnitude of the forces transmitted to the pad, this approach is conservative. Furthermore, the cask is not released vertically from its foundation as cask overturning has been shown not to occur at the design seismic load. The cask overturning stability evaluation as listed in Section 6.2.2 of NAC004-CALC-01 [1] is performed as part of the soil-structure interaction (SSI) analysis and provides evidence that cask overturning will not occur under the governing design loads. Since the pad is modeled by plate elements, the horizontal membrane (in-plane) stiffness added to the slab by the frame members acts at the centerline of the plate and does not affect its bending stiffness. However, the frame members do add vertical stiffness to the mat. It is estimated that this increased vertical stiffness reduces the vertical deflection of the mat, but the bending moments and shears are increased due to the increased mat curvature between adjacent casks and the more severe application of cask seismic moments (as opposed to the cask just “sitting” on the pad, unable to exert uplift forces). Overall, these modeling features produce conservative moments and shears in the pad.

The responses to several additional RAIs all address the evaluation of the Storage Pads for the NAC systems. All of the required changes to SAR Sections 7.6.1 and 7.6.2, including subsections, along with the above clarifications are included as part of the response to RAI NP-7-3.

References:

1. “Licensing Design of Independent Spent Fuel Storage Installation (ISFSI) Concrete Pad at Andrews, TX,” NAC004-CALC-01, Revision 2. (Provided Enclosure 9)

Impact:

No additional changes as a result of this RAI.

License Application, Attachment A, "Proposed License Conditions"

RAI PLC-3

Provide the following information on the incorporation of aging management programs (AMPs):

1. Clarify the meaning of "applicable portions of License Renewals" that will be incorporated by reference through license amendments described in proposed Condition 20. As appropriate, clarify the language of proposed Condition 20.

    ISP has proposed License Condition #20 to incorporate AMPs through license amendments. The proposed License Condition #20 states:

    - The Licensee shall submit License Amendment(s) to this license to incorporate applicable portions of License Renewals listed below, within 120 days of the effective date of License Renewal Approval for each of the following:

    Clarify the criteria for determining what portions of the License Renewals are "applicable" or whether updated time limited aging analyses (TLAAs) and any other supporting analyses included in the certificate of compliance (CoC) renewals will be included in the license amendments identified in proposed License Condition #20.

    The NRC staff acknowledges that ISP has indicated in response to RAI 15-13 that the AMPs for the renewed 72-1004 system will be incorporated into the WCS CISF application.

2. Describe the content and timing of amendments to address aging management activities including AMPs and TLAAs for systems that either have entered, or will enter, the period of extended operation if the current CoC holder is not able to complete the CoC renewal or has chosen not to renew the CoC. As appropriate, clarify the language of proposed License Condition #20.

    The proposed License Condition #20, as written, states that ISP will "incorporate applicable portions of License Renewals listed below, within 120 days of the effective date of License Renewal Approval." The proposed license condition does not address the possibility that the current CoC holder either would choose to not renew the CoC or may not be able to renew the CoC and, therefore, applicable AMP and TLAA information would not be supplied by the CoC holder for incorporation by ISP. The applicant should describe how the licensing basis provides a process for ensuring that appropriate and timely AMP and TLAA information is proposed for incorporation into the ISP license if a CoC renewal application was not submitted and completed by the current CoC holder.

This information is needed to ensure that the NRC can make the findings required by 10 CFR 72.40(a) for issuance of a license.

Response to RAI PLC-3:

1. The “applicable portions of License Renewals” are the applicable aging management programs (AMPs) and TLAAs required by 10CFR72.42 for the systems incorporated by reference in appendices to the WCS CISF SAR. Proposed License Condition #20 has been revised to replace “portions of License Renewals” with new wording to clarify this commitment. As explained in the response to RAI NP-15-13, the AMPs and TLAAs may be adjusted to reflect operations at the WCS CISF. AMPs are included in the WCS CISF SAR and the TLAAs are, in general, incorporated by reference.

   As demonstrated in the response to RAI NP-15-13 (and RAI NP-15-13-S), ISP included the applicable AMPs and TLAAs. The response to RAI NP-15-13 lists the changes that were made to the AMPs in the renewed Certificate of Compliance (CoC) allowing the staff to verify that it agrees that all of the applicable AMPs are included. A review of the response to RAI NP-15-13 and associated SAR changed pages provides a map for the method ISP intends to use to address this topic.

2. This license application includes seven cask systems that have been previously approved by the NRC under six Dockets: 72-11, 72-1029, 72-1004, 72-1025, 72-1015 and 72-1031. The AMPs for the four NUHOMS® cask systems have been added as part of this license amendment in the ISP response to RAI 15-13. The remaining three NAC cask systems, originally approved by the NRC under Dockets 72-1025, 72-1015 and 72-1031, do not currently have NRC-approved AMPs and, therefore, are those relevant to this RAI.

   For CoC 1025 under Docket 72-1025 (NAC-MPC), the CoC expires on 4/10/2020 and the certificate holder applied for renewal on 12/18/19 (ML19357A176) to achieve a timely application for renewal, as specified in 10 CFR Part 72.240 (b). For CoC 1015 under Docket 72-1015 (NAC-UMS), the CoC expires on 11/20/2020 and the certificate holder must therefore apply for renewal by 10/21/2020 to achieve a timely application for renewal, as specified in 10 CFR Part 72.240 (b). Finally, for CoC 1031 under Docket 72-1031 (MAGNASTOR), the CoC expires on 2/4/2029 and the certificate holder must therefore apply for renewal by 1/5/2029 to achieve a timely application for renewal as specified in 10 CFR Part 72.240 (b).

   Assuming that the WCS CISF license is issued in mid-2021 for the requested 40 years, per 10 CFR Part 72.42, the WCS CISF license would not be due for renewal until 2058. Nonetheless, ISP has committed in Proposed Condition #20 to incorporate the applicable AMPs and TLAAs within 120 days of the effective date of License Renewal Approval for CoC 1015. ISP has further stated in Section 1.1 of the WCS CISF SAR that “[a]ny canisters stored at the WCS CISF will have been loaded under these previously approved NRC CoCs and licenses, and their “time in service” clock for triggering the implementation of required AMP activities will have begun at the time of loading for each individual canister.” ISP anticipates that this licensing commitment will be referenced in the Staff’s Safety Evaluation Report (SER) and become part of the facility’s licensing basis. Therefore, once the AMPs have been incorporated into the WCS CISF license, the “time in service clock” for triggering the incorporated AMPs will be that date of their original loading. Assuming that the CoC holder for the 72-1025, 72-1015 and 72-1031 SSCs including the canisters develops NRC approved AMPs, as described in the response to Item 1 of the RAI, an amendment to the WCS CISF license will follow within 120 days of approval.

In the event that current CoC holder chooses to not renew the CoC and, subsequently, applicable AMP and TLAA information will not be supplied by the CoC holder for incorporation by ISP; in accordance with 10 CFR Part 72.240 (a) and revised proposed Condition #20, ISP will apply for a renewal for that cask design. Proposed Condition #20 has been updated to specify that ISP will submit AMP and TLAA information within one (1) year of the timely renewal deadline, as defined in 10 CFR 72.240 (b), for the subject CoC.

Finally, Conditions 9, 11, 12, 14, 15, 16 and 25 have been revised or deleted and text added just before the list of Conditions based on the graded approach pilot CoC 1004 Amendment 16 endorsed by the NRC in Reference [1].

Reference:

1. Letter to Rodney McCullum (Energy Institute) from Andrea Kock (NRC), "Endorsement of Independent Spent Fuel Storage Installation License And Cask Certificate of Compliance Format, Content, and Selection Criteria-Graded Approach," dated January 8, 2020.

Impact:

The proposed Materials License in the License Application has been revised as described in the response.

SAR Chapter 13, "Conduct of Operations"

RAI NP-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)

Response to RAI NP-13-1:

Enclosure 8 contains two Draft Pre-operational Test Plans for operations, transfer operations, and overpack loading and retrieval, one for the NUHOMS® systems and one for the NAC systems. Plan 1004118, Revision 0 Draft, "WCS CISF NUHOMS® Dry Run Training Exercise" is for Dry Run Training Exercises to perform functional tests of the transfer operations, and canister insertion and retrieval operations at the WCS CISF Storage Pad. Plan 1004119, Revision 0 Draft, "WCS CISF NAC Systems Dry Run Training Exercise" is for dry run training exercises to perform functional tests of the transfer operations, and placement of the loaded vertical concrete casks (VCCs) on the storage pad. As stated in WCS CISF SAR Section 13.2.2.1, The Pre-operational Test Plan, including test summaries for all systems, will be made available to the NRC at least 90 days prior to the start of testing. Subsequent changes to the Pre-operational Test Plan will also be made available to the NRC.

Test procedures will be developed for conducting the tests at the WCS CISF to ensure that structures, systems, and components satisfactorily perform their required functions. These test procedures will further ensure that the WCS CISF has been properly designed and constructed, and is ready to operate in a manner that protects the health and safety of the public.

The test procedures will include the elements listed in the Test Plans and will detail the type of test, the response expected, test acceptance criteria and the validation method for each component or system tested. Review and approval of test procedures will be in accordance with TIP 3.5, "Preparation of Test, Inspection, Maintenance and Operations (TIMO) Procedures, current Revision, which is the applicable implementing procedure for the TN Americas LLC Quality Assurance Program Description Manual for 10 CFR Part 13-271, Subpart H and 10 CFR Part 72, Subpart G," current revision, which is the applicable NRC-approved Quality Assurance Program for the WCS CISF. Any revisions necessitated by matters such as operational experience, changes to systems or components, new requirements, or clerical errors will be reviewed and approved in the same manner as the original procedure.

Impact:

No change as a result of this RAI.

RAI NP-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.

Response to RAI NP-13-3:

ISP has revised Section 13.3 to point to the existing training program (SPM 2.1) developed under the governing TN Americas Quality Assurance Program (see Section 1.4.4.3 of the WCS CISF SAR). Enclosure 9 includes a copy of SPM 2.1, Revision 9 for NRC review.

Impact:

SAR Section 13.3 has been revised as described in the response.

SAR Appendix E, "NAC-MPC"

RAI NP-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).

Response to RAI NP-E-8:

Response to Item (1):

BAS1E: This part of the Finite Element (FE) model represents the fuel basket, fuel and canister. This is a one-element strip along the edge of the basket region.

CAN1E: This part of the FE model represents the canister shield lid, canister structural lid, canister shell in this region and support rings. This is a one-element strip along the edge of the CANLID region.

VCC1E: This part of the FE model represents the vertical concrete cask (VCC) lid and shield plug and other remaining components in the top region of VCC.

Response to Item (2):

Liner is modeled as a one element thick layer adjacent to the VCC. The liner is divided into different regions (such as pedestal, basket, canister lid and VCC lid regions) and the corresponding region weights are included in parts pedestal, basket, CANLID and VCCLID. The fuel basket, canister and liner are not modeled in detail, as the main objective of the analysis is to predict the maximum accelerations experienced by the fuel basket and the canister. They are represented using rigid bodies. However, their weights are considered in the analysis.

The above response is also applicable to the LACBWR MPC and Figure E.12-8 and Section E.12.2.3.7.

Impact:

No change as a result of this RAI.

RAI NP-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).

Response to RAI NP-E-9:

<u>MPC-Yankee Rowe</u>

(a) Figure NP-E-9-1 shows the location (Node 21794) at which peak basket acceleration is calculated.

(b) As explained in Section E.12.1.3.10 of the WCS CISF SAR, the general pattern of the acceleration time history is shown in Figure E.12-4. Figure NP-E-9-2 below schematically shows the details, where t_1 = elapsed time for short pulse, and t_2 = elapsed time for long pulse.

The short and long pulse effects reported are associated with the same basket location.

The acceleration time history response at Node 21794 of basket is shown in Figure NP-E-9-3.

The details related to the discussion above are given in NAC Calculations 30039-2010 [1], Appendix A; and 30039-2015 [2].

The short and long pulse effects reported are associated with the same basket location. (as indicated by node number 21794 in the acceleration time history plot).

<u>LACBWR MPC</u>

The above response is applicable to comment on Figure E.12-8 Table E.12-7 for LACBWR MPC.

(a) Figure NP-E-9-4 shows the location (Node 21856) at which peak basket acceleration is calculated.

(b) As explained in Section E.12.2.3.10 of the WCS CISF SAR, the general pattern of the acceleration time history is shown in Figure E.12-10. Figure NP-E-9-2 schematically shows the details, where t_1 = elapsed time for short pulse and t_2 = elapsed time for long pulse.

As previously mentioned, the short and long pulse effects reported are associated with the same basket location.

The acceleration time history response at Node 21856 of basket is shown in Figure NP-E-9-5.

The details related to the discussion above for the LACBWR MPC details are given in NAC calculations 30039-2010 [1], Appendix C; and 30039-2015[2].

The short and long pulse effects reported are associated with the same basket location. (as indicated by Node 21856 in the acceleration time history plot).

References:

1. "Concrete Cask Tip-Over Evaluation – WCS," 30039-2010, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

2. "Tip-Over DLF Calculation for WCS," 30039-2015, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

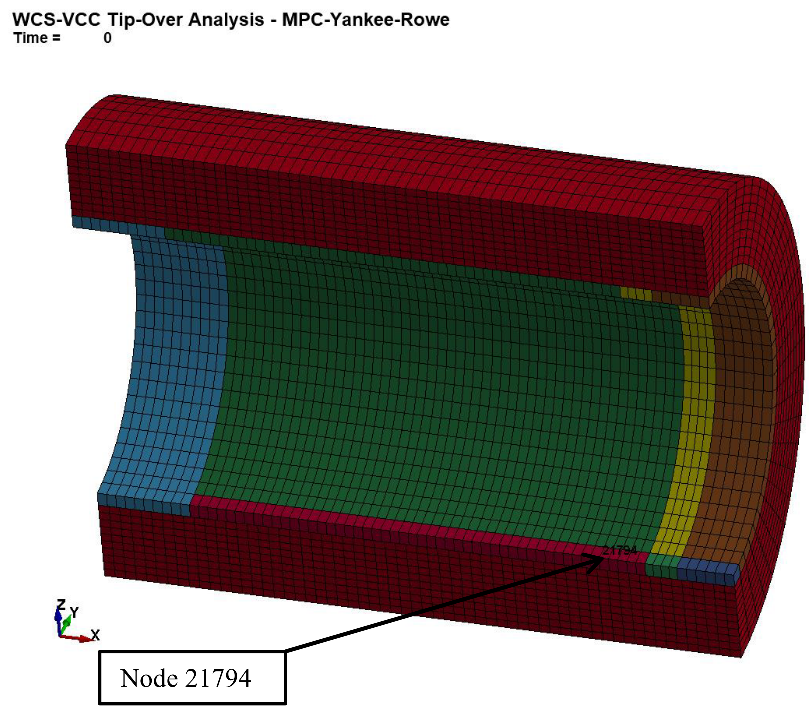


Figure NP-E-9-1
Location of Node 21856 (MPC-Yankee Rowe)

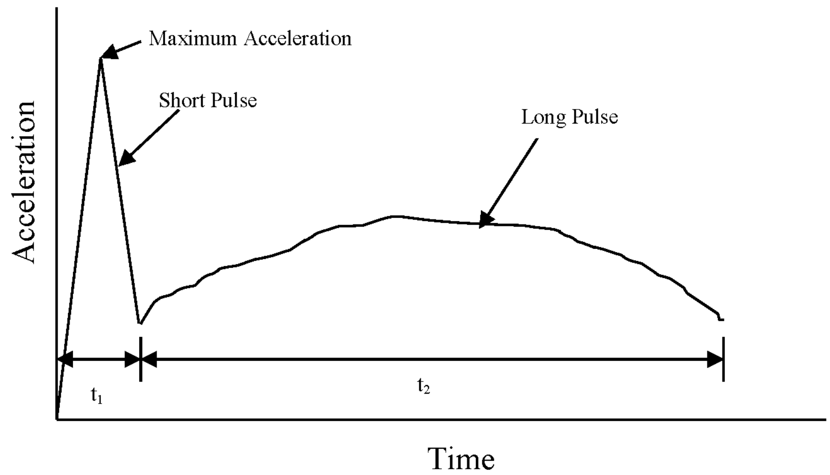
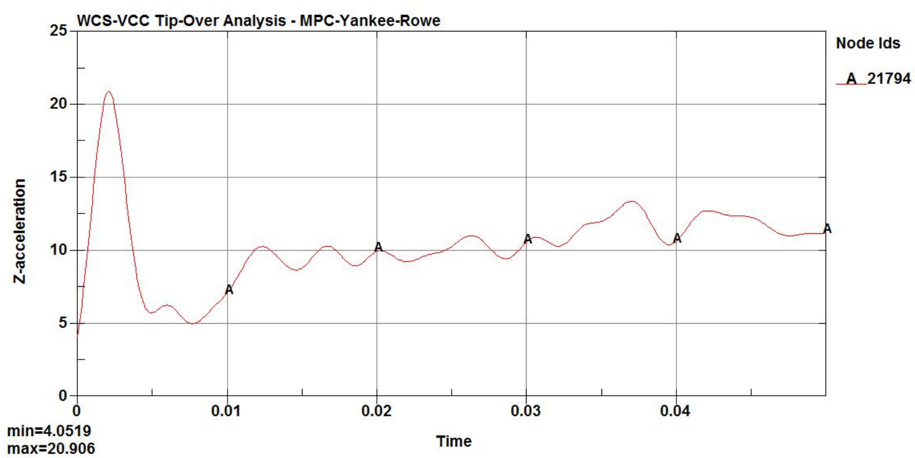


Figure NP-E-9-2
Acceleration Time History



Where,
t_1 = 0.0043 sec (elapsed time for short pulse)
t_2 = 0.0423 sec (elapsed time for long pulse)

Figure NP-E-9-3
Time History for Node 21794 (MPC-Yankee Rowe)

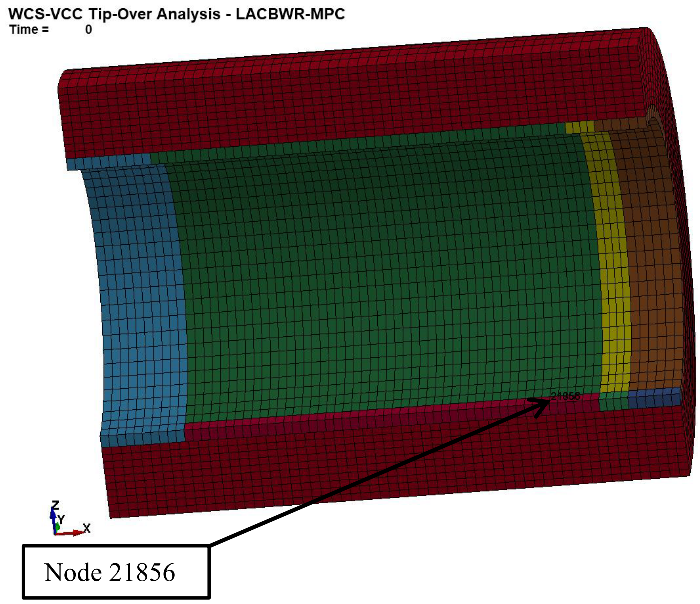
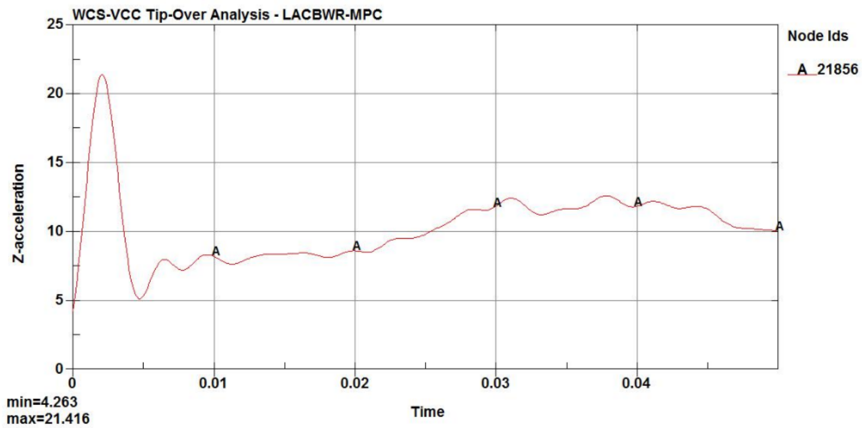


Figure NP-E-9-4
Location of Node 21856 (LACBWR MPC)



Where,
t_1 = 0.0043 sec (elapsed time for short pulse)
t_2 = 0.0454 sec (elapsed time for long pulse)

Figure NP-E-9-5
Time History for Node 21856 (LACBWR MPC)

Impact:

No change as a result of this RAI.

RAI NP-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).

Response to RAI NP-E-10:

For the short pulse, the maximum dynamic load factor (DLF) possible is 1.52 for any pulse duration and frequency shown in the graph for the DLF. When this maximum value is applied to the peak accelerations for the Connecticut Yankee MPC and Yankee Rowe vertical concrete cask (VCC) systems, the resulting acceleration is still less than the design acceleration used in the basket evaluations. This is both conservative and bounding since the actual DLF using the triangular pulse for the Connecticut Yankee MPC and Yankee Row VCC systems would be less than 1.52.

In evaluating the MPC-LACBWR VCC system, the DLF for the short pulse is computed using the triangular pulse. Using the duration listed and the frequency for the MPC-LACBWR, the DLF is 0.75, as listed in Table E.12-7 of the Safety Analysis Report.

Impact:

No change as a result of this RAI.

SAR Appendix F, "NAC-UMS"

RAI NP-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).

Response to RAI NP-F-6:

Response to Item (1):

BAS1E: This part of the finite element (FE) model represents the fuel basket, fuel and canister. This is a one-element strip along the edge of the basket region.

CAN1E: This part of the FE model represents the canister shield lid, canister structural lid, canister shell in this region and support rings. This is a one-element strip along the edge of the CANLID region.

VCC1E: This part of the FE model represents the vertical concrete cask (VCC) lid and shield plug and other remaining components in the top region of VCC.

Response to Item (2):

The liner is modeled as a one-element thick layer adjacent to the VCC. The liner is divided into different regions (such as pedestal, basket, canister lid, and VCC lid regions) and the corresponding region weights are included in parts pedestal, basket, CANLID and VCCLID. The fuel basket, canister and liner are not modeled in detail, as the main objective of the analysis is to predict the maximum accelerations experienced by the fuel basket and the canister. They are represented using rigid bodies. However, their weights are considered in the analysis.

Impact:

No change as a result of this RAI.

RAI NP-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).

Response to RAI NP-F-7:

(a) Figure NP-F-9-1shows the location (Node 63210) at which peak basket acceleration is calculated.

(b) As explained in Section F.12.1.3.10 of the WCS CISF SAR, the general pattern of the acceleration time history is shown in Figure F.12-4. Figure NP-F-9-2 below schematically shows the details, where t_1 = elapsed time for short pulse and t_2 = elapsed time for long pulse.

The short and long pulse effects reported are associated with the same basket location.

The acceleration time history response at Node 63210 of basket is shown in Figure NP-F-9-3.

The details related to the discussion above are given in NAC calculations 30039-2010 [1], Appendix D; and 30039-2015 [2].

The short and long pulse effects reported are associated with the same basket location. (as indicated by node number 63210 in the acceleration time history plot).

References:

1. “Concrete Cask Tip-Over Evaluation – WCS,” 30039-2010, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

2. “Tip-Over DLF Calculation for WCS,” 30039-2015, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

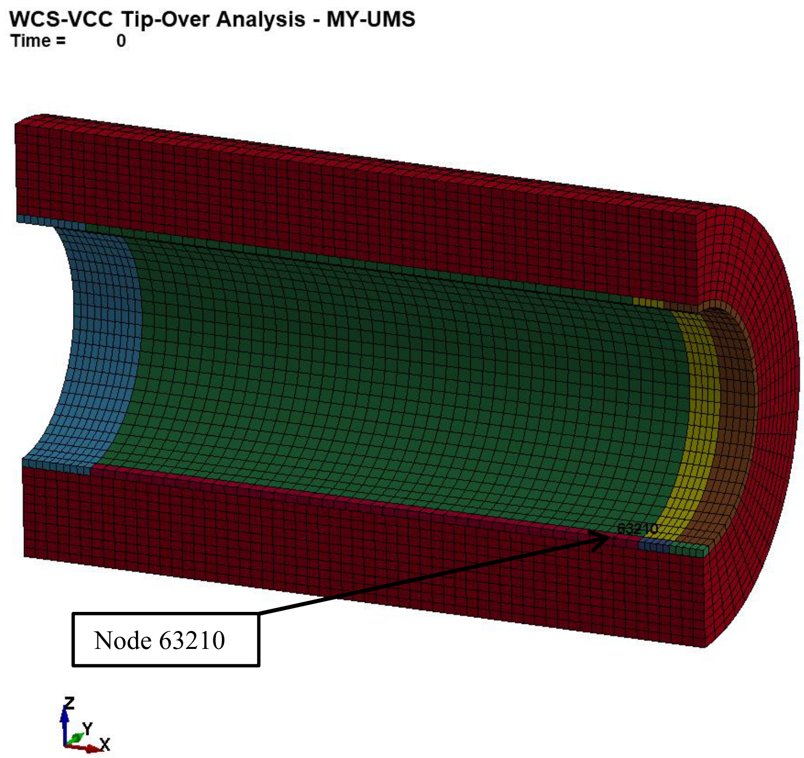


Figure NP-F-9-1
Location of Node 63210

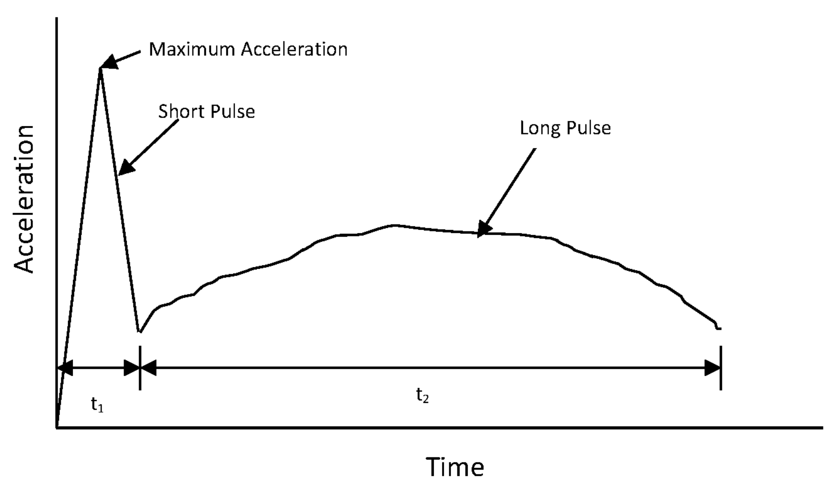
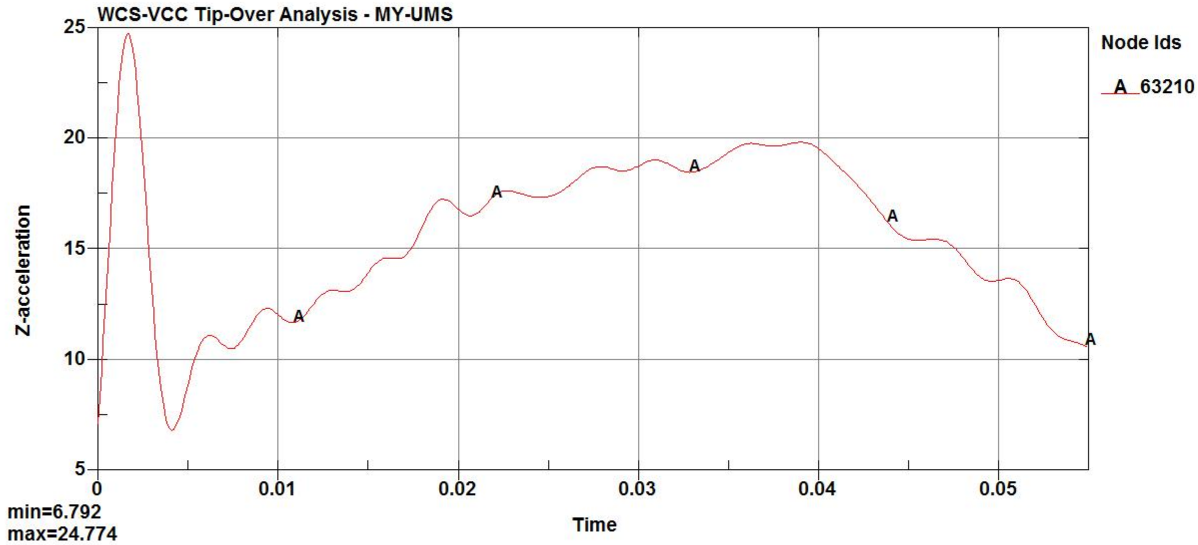


Figure NP-F-9-2
Acceleration Time History



Where,
t_1 = 0.004 sec (elapsed time for short pulse)
t_2 = 0.0509 sec (elapsed time for long pulse)

Figure NP-F-9-3
Time History for Node 63210

Impact:

No change as a result of this RAI.

SAR Appendix G, "NAC-MAGNASTOR"

RAI NP-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).

Response to RAI NP-G-4:

<u>Response to Item (1)</u>:

BAS1E: This part of the finite element (FE) model represents the fuel basket, fuel and canister. This is a one-element strip along the edge of the basket region.

CAN1E: This part of the FE model represents the canister shield lid, canister structural lid, canister shell in this region and support rings. This is a one-element strip along the edge of the CANLID region.

VCC1E: This part of the FE model represents the vertical concrete cask (VCC) lid and shield plug and other remaining components in the top region of VCC.

<u>Response to Item (2)</u>:

Liner is modeled as a one-element thick layer adjacent to the VCC. The liner is divided into different regions (such as pedestal, basket, canister lid and VCC lid regions) and the corresponding region weights are included in parts pedestal, basket, CANLID and VCCLID. The fuel basket, canister and liner are not modeled in detail, as the main objective of the analysis is to predict the maximum accelerations experienced by the fuel basket and the canister. They are represented using rigid bodies. However, their weights are considered in the analysis.

Impact:

No change as a result of this RAI.

RAI NP-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).

Response to RAI NP-G-5:

(a) Figure NP-G-9-1shows the location (Node 1355) at which peak basket acceleration is calculated.

(b) As explained in Section G.12.1.3.10 of the WCS CISF SAR, the general pattern of the acceleration time history is shown in Figure G.12-4. Figure NP-G-9-2 below schematically shows the details, where t_1 = elapsed time for short pulse and t_2 = elapsed time for long pulse.

The short and long pulse effects reported are associated with the same basket location.

The acceleration time history response at Node 1355 of basket is shown in Figure NP-G-9-3.

The details related to the discussion above are given in NAC calculations 30039-2010 [1], Appendix E; and 30039-2015 [2].

The short and long pulse effects reported are associated with the same basket location. (as indicated by Node 1355 in the acceleration time history plot).

References:

1. “Concrete Cask Tip-Over Evaluation – WCS,” 30039-2010, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

2. “Tip-Over DLF Calculation for WCS,” 30039-2015, Revision 0. (Provided to NRC via transmittal WCS-CISF-16-002 dated November 16, 2016)

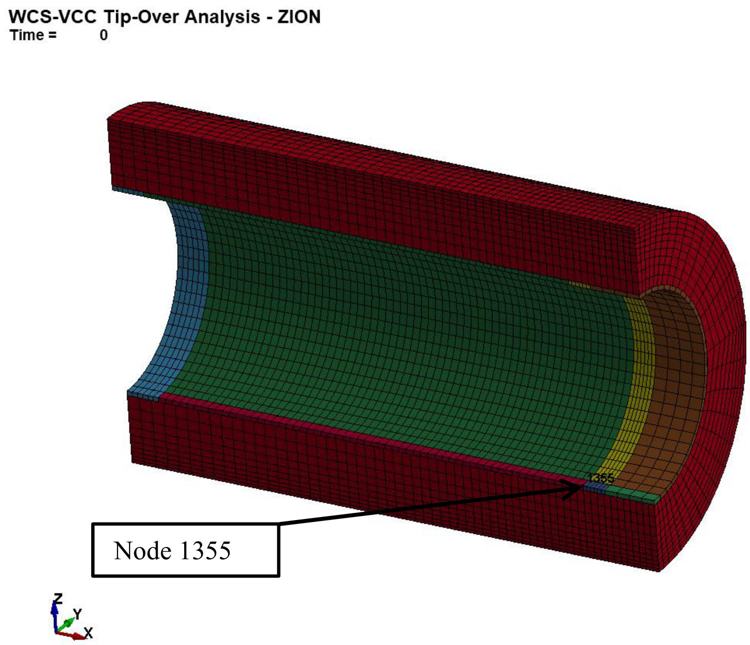


Figure NP-G-9-1
Location of Node 1355

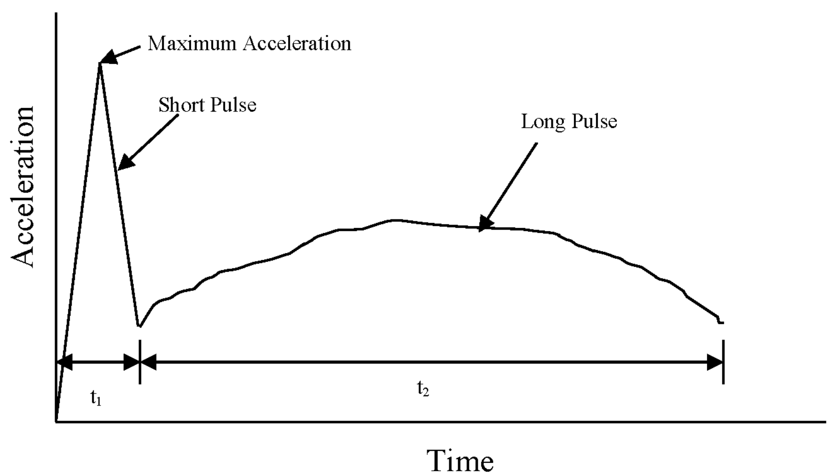
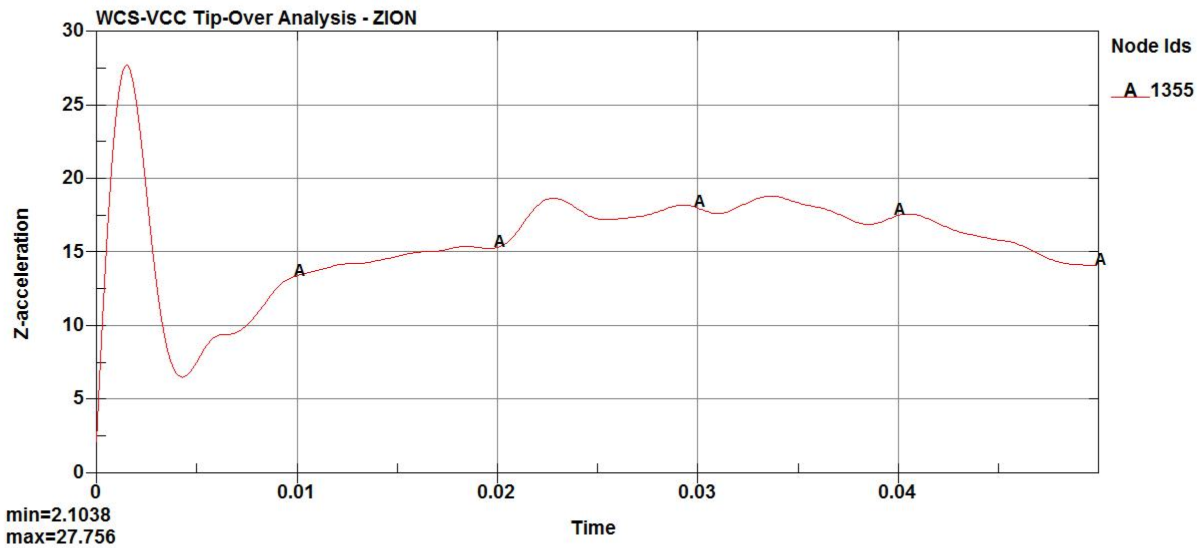


Figure NP-G-9-2
Acceleration Time History



Where,
t_1 = 0.004 sec (elapsed time for short pulse)
t_2 = 0.0457 sec (elapsed time for long pulse)

Figure NP-G-9-3
Time History for Node 1355

Impact:

No change as a result of this RAI.

Proprietary Information on This Page
Withheld Pursuant to 10 CFR 2.390

License Application

RAI LA-1

Provide an estimated cost of construction (including a breakdown of the various cost components, such as materials, labor, engineering and design, etc.) for the proposed facility and how construction of the proposed facility will be funded (i.e., proposed amounts of debt financing, equity investment, other sources of funding, etc.) which is specific to the proposed facility and its location.

The application lists what a similar facility would cost per an Electric Power Research Institute (EPRI) study; however, the application does not provide information regarding what ISP estimates for the cost of construction. The licensee states, “The Electric Power Research Institute estimated cost for construction of the CISF that will be used to store 5,000 MTU is approximately $170 million.” Staff notes that the EPRI study is approximately 10 years old, and the application makes no allowance for possible cost variances, inflation or other possible cost increases; therefore, these statements do not provide adequate information to make a reasonable assurance determination with regard to the cost of construction activities.

With regard to funding construction activities, the application states that “Orano and Waste Control Specialists will provide initial capitalization of ISP.” It also states that “[t]he funding for constructing the CISF is expected to be primarily through future contracts for storage of SNF with the DOE or other SNF Title Holder(s). The funding may include a combination of debt financing, equity investments, and net income.” These statements do not provide adequate information for staff to make a reasonable assurance determination with regard to the funding of construction activities.

This information is necessary to determine compliance with 10 CFR 72.22(e).

Response to RAI LA-1:

The generic cost estimate in the Environmental Report (ER) is higher than ISP’s 2019 project-specific cost estimate. ISP considers the existing (higher) generic cost estimate in the ER as reasonable for evaluation of costs and benefits of the WCS CISF project.

With respect to the Staff's question on construction funding, proposed License Condition 17 requires that prior to commencing construction of the WCS CISF, funding be fully committed that is adequate to construct the first phase of the facility. In addition, proposed License Condition 23 requires that ISP, before commencing operations of the CISF, obtain contracts with the Department of Energy or SNF Title Holders that stipulate the that clients are responsible for funding the operations of the WCS CISF with respect to the materials authorized to be possessed by ISP.

LA Section 1.6 has also been revised to provide updated financial qualification information of the ISP member companies.

Impact:

LA Sections 1.6 and 1.6.1 have been revised as described in the response.

RAI LA-2

Provide the estimated operating costs for the proposed facility (including a breakdown of labor, materials, security, etc.) and how ISP intends to fund the operation of the proposed facility using future contracts with SNF title holders which is specific to the proposed facility.

While the application lists what a similar facility would cost per an EPRI study, the application does not provide enough information regarding what ISP estimates the operating costs for the proposed facility will be. The licensee states, “The Electric Power Research Institute estimated the operating and labor cost needed to store 5,000 MTU of SNF at an interim consolidated storage facility for 40 years at $394,612,500.” Staff notes that the EPRI study is approximately 10 years old, and the application neither makes allowance for possible variances in costs nor accounts for inflation. Therefore, ISP needs to provide the estimated operating costs for a facility at the proposed site.

This information is necessary to determine compliance with 10 CFR 72.22(e).

Response to RAI LA-2:

LA Section 1.6.2 has been revised to incorporate ISP’s 2019 estimate of operating costs. The referenced generic cost estimate in the Environmental Report (ER) is higher than ISP’s 2019 project- specific cost estimate. ISP considers the existing (higher) generic cost estimate in the ER as reasonable for evaluation of costs and benefits of the WCS CISF project.

Impact:

LA Section 1.6.2 has been revised and Table 1-2 has been added as described in the response.

RAI LA-3

Identify the funding mechanism to be used to provide decommissioning funding assurance.

While the application provides the projected total cost to decommission the facility (separate from the stored material), the application does not provide enough information for NRC staff to determine the type of method that the applicant intends to use for decommissioning funding assurance. The licensee states in the application, "Alternatively, ISP may [emphasis added] use a surety bond combined with a conformity external sinking fund as authorized by 10 CFR 72.30(e)(3). Payments from storage operations would be deposited into the external sinking fund as waste is received. A surety bond would be used to assure the difference in the decommissioning cost estimate and the value of the sinking fund until the sinking fund is fully funded." Therefore, ISP needs to provide more specificity about their plans to fund decommissioning of the proposed facility.

This information is necessary to determine compliance with 10 CFR 72.30(b)(6) and 10 CFR 72.30(e)(3).

Response to RAI LA-3:

Section 1.6.3 has been revised to clearly identify the method that ISP will employ to ensure decommissioning funding.

Impact:

LA Section 1.6.3 has been revised as described in the response.