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

January 29, 2018

Mr. John P. Zimmerman
Deputy Manager, Idaho Cleanup Project
1955 Fremont Avenue, MS 1222
Idaho Falls, ID 83415

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE TECHNICAL REVIEW OF THE APPLICATION FOR RENEWAL OF THE THREE MILE ISLAND UNIT 2 INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE NO. SNM-2508 (CAC/EPID NOS. 001028/L-2017-RNW-0019 AND 000993/L-2017-LNE-0007)

Dear Mr. Zimmerman:

By letter dated March 6, 2017, the U.S. Department of Energy, Idaho Operations Office (DOE-ID) submitted an application for renewal of License No. SNM-2508 for the Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17075A198). In my letter dated, May 5, 2017, I acknowledged acceptance of your application for a detailed technical review and provided a proposed schedule for the U.S. Nuclear Regulatory Commission (NRC) review (ADAMS Accession No. ML17125A284).

In connection with the NRC staff's technical review, we need the information identified in the enclosed request for additional information (RAI). Discussion of the RAI and RAI response date occurred on November 30, 2017 and December 15, 2017. We request that you provide this information by September 30, 2018. Inform us at your earliest convenience, but no later than September 16, 2018, if you are not able to provide the information by that date. To assist us in rescheduling your review, you should include a new proposed submittal date and the reasons for the delay.

Please reference Docket No. 72-20 and CAC/EPID Nos. 001028/L-2017-RNW-0019 and 000993/L-2017-LNE-0007 in future correspondence related to this request. The NRC staff is available to clarify these questions, and if necessary, to meet and discuss your proposed responses.

If you have any questions regarding this matter, please contact me at (301) 415-7116 or via Kristina.Banovac@nrc.gov.

Sincerely,

/RA/

Kristina L. Banovac, Project Manager
Renewals and Materials Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No.: 72-20
License No.: SNM-2508

CAC/EPID Nos.: 001028/L-2017-RNW-0019
000993/L-2017-LNE-0007

Enclosure:
Request for Additional Information

cc: TMI-2 ISFSI Service List

TMI-2 ISFSI Service List

cc:

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TMI-2 ISFSI Service List

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REQUEST FOR ADDITIONAL INFORMATION FOR THE TECHNICAL REVIEW OF THE APPLICATION FOR RENEWAL OF THE THREE MILE ISLAND UNIT 2 INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE NO. SNM-2508 (CAC/EPID NOS. 001028/L-2017-RNW-0019 AND 000993/L-2017-LNE-0007)
DATE: JANUARY 29, 2018

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Request for Additional Information
U.S. Department of Energy, Idaho Operations Office
Docket No. 72-20
License No. SNM-2508
License Renewal

By letter dated March 6, 2017, the U.S. Department of Energy, Idaho Operations Office (DOE-ID, the applicant) submitted an application for renewal of License No. SNM-2508 for the Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI). This request for additional information (RAI) identifies information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its technical review of the license renewal application (LRA). The requested information is listed by chapter number and title in the LRA. NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel" was used by the staff in its review of the LRA.

Each individual RAI describes information needed by the staff for it to complete its review of the LRA and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

Chapter 2: Scoping Evaluation

RAI 2-1

With respect to the two sets of drawings identified in Table 2-2, Table 2-3, and Table 2-4 of the LRA, i.e. the "design drawings" and the "final safety analysis report (FSAR) drawings":

a) Propose any changes to the design bases documents (i.e., license, technical specifications, or updated final safety analysis report (UFSAR)) to ensure the "design drawings" are adequately captured in the design bases,

b) Explain the discrepancies in safety classification (quality category) of the same structures, systems, and components (SSCs) between the two sets of drawings,

c) Clarify the actual safety classification (quality category) used for the procurement and fabrication of all SSCs, and justify that these meet or exceed the quality category in the previously reviewed and approved FSAR drawings,

d) Harmonize the discrepancies in safety classification (quality category) between the two sets of drawings referenced in the proposed UFSAR supplement to be incorporated upon renewal of the specific license, and

e) Provide (1) the "design drawings," and (2) any versions of FSAR drawings not included in the latest revision of the UFSAR, used for the scoping evaluation and referenced in the proposed UFSAR supplement.

Table 2-2 of the LRA defines the existence of two separate sets of drawings (i.e. a set of "FSAR drawings" and a set of "design drawings," the latter described in Section 2.2.1 to have been used for fabrication) that were used in the scoping evaluation. Table 2-3 and Table 2-4 of the in-scope and out-of-scope SSCs, respectively, also reference both sets of drawings. The staff

notes that the “design drawings” were not part of the initial design bases for which the NRC issued the TMI-2 ISFSI license. However, the applicant used the “design drawings” for the scoping evaluation and aging management review in the LRA and has proposed to add Table 2-3 of the LRA, which references these drawings, to the UFSAR upon renewal of the specific license. As the “design drawings” contain the information necessary for the applicant to identify the specific functions performed by the SSCs in the scoping evaluation in the LRA, the “design drawings” may now be considered to be part of the ISFSI design bases, per the definition in 10 CFR 72.3. The “design drawings” also contain the information necessary for the applicant to identify the materials that the SSCs are fabricated of in the aging management review in the LRA and for the staff to make its findings with respect to the LRA.

Also, aging management activities in the period of extended operation may include maintenance, repair, and replacement of SSCs. These activities could result in changes to the design bases (e.g., replacement of an SSC that involves a change in materials or design of the SSC). Any changes to the design bases need to follow the appropriate change control process. Thus, the applicant should propose any changes to the design bases documents (i.e., license, technical specifications, or UFSAR) to adequately capture the “design drawings” to ensure that appropriate regulatory change control processes (i.e., 10 CFR 72.7, 10 CFR 72.48 and 10 CFR 72.56) will be applied and followed for any activities that may result in modifications to the design bases.

The staff has identified discrepancies between the safety classification designations (quality category in the drawings) of the same SSCs between the two sets of drawings. The applicant is asked to explain these discrepancies. Further, the applicant is asked to clarify the actual safety classification used for procurement and fabrication of each SSC and justify that these meet or exceed the quality category in NRC previously reviewed and approved FSAR drawings. The review by the staff would benefit from a tabulated comparison of the safety classification for all SSCs per the two sets of drawings. The applicant is asked to harmonize the discrepancies in the safety classification for the SSCs in the proposed UFSAR supplement. The applicant is also asked to make any corresponding changes to the proposed UFSAR supplement as part of its response to the RAI.

The staff also notes that Table 2-2 of the LRA cites revisions of drawings not included in the latest revision of the UFSAR (Revision 8, March 2017). For example, Table 2-2 cites Revision 3 of Drawing No. 1161300-D, while the latest UFSAR includes Revision 1B of the same drawing. As the drawings used for the scoping evaluation and referenced in the UFSAR supplement contain the necessary information to determine which SSCs are within the scope of the renewal review and for the staff to make its findings with respect to the renewal application, the applicant is asked to provide (1) the referenced “design drawings” and (2) any versions of referenced FSAR drawings not included in the latest revision of the UFSAR.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 2-2

Clarify if the shielding analyses in the approved design bases rely on the relative placement of the TMI-2 canisters to the dry shielded canister (DSC) vent/purge ports, as controlled by the TMI-2 canister basket, modifying the LRA as described below.

Based on the discussion in Section 7.3.2.1 of the UFSAR, the staff is unclear if the basket is relied on for maintaining the TMI-2 canisters away from the DSC vent/purge ports. While the

relative placement of the canisters may not affect the off-site dose rates, it may affect personnel doses and the evaluations for doses/dose rates at these ports were the basket not credited and the canisters allowed to align with one or both of the ports. If the basket is relied on for assuring a given TMI-2 canister configuration in the shielding analyses, justify its exclusion from the scope of renewal review. Alternatively, include the basket in the renewal scope, provide an aging management review and any corresponding time-limited aging analyses (TLAAs) or aging management programs (AMPs), and revise the UFSAR Supplement in Appendix C, as appropriate.

This information is needed to determine compliance with 10 CFR 72.24(e), 72.122(h)(5), and 72.42(a).

RAI 2-3

Clarify how the extra horizontal storage module (HSM) and DSC overpack are considered in the ISFSI design bases and modify the LRA as described below.

The approved design bases in the technical specifications, technical specification bases, and UFSAR includes an extra unloaded HSM (i.e., HSM-15) with a pre-installed DSC overpack, which provides backup in case a challenged canister needs additional confinement for what is described in Section 8.2.7.4 of the UFSAR as recovery from a non-credible event. Section 2.3.3.1 of the LRA scoped out HSM-15 from the scope of renewal review. It is not clear how the HSM-15 and DSC overpack would be used in the operation of the ISFSI (e.g., only associated with the emergency plan and restoring the facility to a safe condition after what the UFSAR states is a non-credible accident). The bases do not appear to limit the use of these SSCs. If the bases allow for the HSM and DSC overpack to be used for storage at the ISFSI, then these SSCs should be included in the renewal review; or a license condition or technical specification should be added to preclude the use of these SSCs for storage at the ISFSI.

The applicant is asked to clarify how the extra HSM and DSC overpack are considered in the ISFSI design bases and specifically explain where in the bases the extra HSM and DSC overpack are precluded from use for storage at the ISFSI. If the extra HSM and DSC overpack are not precluded from being used for storage at the ISFSI, then the applicant is asked to justify their exclusion from the scope of renewal review or offer a suggested license condition or technical specification to preclude the use of the extra HSM and DSC overpack for storage at the ISFSI. Alternatively, the applicant should revise the LRA to include the extra HSM and DSC overpack in the renewal scope, provide an aging management review and any corresponding TLAAs or AMPs, and revise the UFSAR Supplement in Appendix C, as appropriate.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 2-4

Provide a scoping evaluation, aging management review and any corresponding TLAAs or AMPs, and revise the UFSAR Supplement in Appendix C, as appropriate, for the two transfer casks described in the TMI-2 ISFSI licensing bases, the MP-187 and the OS-197. Alternatively, propose a suggested license condition or technical specification to use a transfer cask that is aged less than 20 years.

The transfer casks are identified as important to safety, per Table 3.4.1 of the UFSAR. The LRA properly defines the transfer casks to be within the scope of renewal review. However, the

LRA does not present TLAAs or AMPs for the transfer casks since DOE-ID does not possess a transfer cask associated with the TMI-2 ISFSI license. Instead, the LRA discusses how DOE-ID would acquire access to a transfer cask when needed for future retrieval of the DSCs and provides information on procurement of a transfer cask under the DOE-ID Quality Assurance Program. The LRA discusses how the procurement process, as controlled by the DOE-ID Quality Assurance Program, will ensure that the transfer cask will comply with all applicable conditions in the TMI-2 ISFSI license, technical specifications, and UFSAR. The LRA also discusses how the procurement process will include any aging management activities, if required for a transfer cask aged longer than 20 years, as part of the procurement.

The staff notes that once the TMI-2 ISFSI license is renewed, the entire licensing bases for the ISFSI is renewed, including the design considerations for the transfer casks. Therefore, if TLAAs or AMPs for the transfer casks are not included in the LRA, the staff cannot determine compliance with 10 CFR 72.42(a). However, the staff recognizes the unique situation of DOE-ID not currently possessing a transfer cask, as it is not needed until retrieval of the DSCs starts in the future. The staff also recognizes that DOE-ID may choose to procure a new transfer cask or a transfer cask that is aged less than 20 years (the initial licensing term for the TMI-2 ISFSI), which would not be in its period of extended operation where aging management considerations would need to be addressed.

Therefore, the applicant could include in the LRA an aging management review and considerations for the transfer casks. If the applicant chooses not to include the transfer casks in the LRA in terms of an aging management review and considerations, an alternate path is a license condition or technical specification that limits the age of a transfer cask that can be used at the TMI-2 ISFSI to 20 years (the initial licensing term for the TMI-2 ISFSI), thereby preventing the transfer cask from entering its period of extended operation in which aging issues would need to be addressed. This reflects the possibility that a new transfer cask or transfer cask aged less than 20 years may be used. In the case where DOE-ID may choose to use a transfer cask that was already in its period of extended operation, DOE-ID would need to request a license amendment to change the license condition or technical specification to allow for the use of such a transfer cask, by demonstrating that aging effects for the transfer cask will be managed so that the transfer cask will continue to perform its intended function(s) in the period of extended operation.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 2-5

Clarify if the transfer cask bottom/top spacers are credited in the shielding analyses for maintaining a given DSC configuration inside the transfer cask, modifying the LRA as described below.

The LRA did not include the transfer cask spacers in the scope of renewal review. Section 2.3.3.2 of the LRA references Section 3.1.2.1 of the UFSAR for justifying their exclusion. However, Section 3.1.2.1 does not specifically discuss the transfer cask spacers, which are separate subcomponents from the transfer cask. Therefore, the basis for the LRA conclusion is unclear, particularly when Sections 4.2.5.2 and E.4.2.5.2 of the UFSAR state that these spacers ensure that the DSC will not rotate out of position during transfer operations (e.g., during retrieval). Also, based on information in Chapter 7 of the UFSAR (e.g., Figure 7.3-2), it appears that the shielding analysis for a DSC in a transfer cask relies on these spacers to maintain the DSC's axial position versus the cask's radial shielding to minimize public and occupational

doses. If the transfer cask spacers are credited in the shielding analyses for maintaining a given DSC configuration inside the transfer cask, justify their exclusion from the scope of renewal review. Alternatively, include the transfer cask spacers in the renewal scope, provide an aging management review and any corresponding TLAAs or AMPs, and revise the UFSAR Supplement in Appendix C, as appropriate.

This information is needed to determine compliance with 10 CFR 72.42(a).

Chapter 3: Aging Management Review

RAI 3-1

Clarify if the potential presence of the Plastisol polyvinyl chloride (PVC) resin may lead to accelerated aging when present on DSC surfaces. Justify that the AMP for the DSC properly accounts for any potential accelerated aging due to the presence of Plastisol.

Section 3.4.2.1 notes that Plastisol was used to cover portions of the DSC surface to protect surfaces prior to welding, and although the Plastisol was likely completely stripped prior to commencing field welds, it is noted that some areas may have been left with the material. The staff is unclear about the stability of the Plastisol PVC resin and potential to generate additional chlorides due to radiolysis or thermolysis of the resin. It is unclear how the degraded resin may contribute to accelerated corrosion of those DSC subcomponents based on data from either prior inspection results or accelerated separate-effects testing. If the resin residue may lead to accelerated aging, the applicant is asked to justify that the proposed AMP remains adequate.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-2

Clarify and provide supporting information demonstrating that the radiation source terms from the fuel canister are bounding for the filter and knockout canisters.

Section 3.3.1.2.2 of the LRA states that the fuel canister payload's source term bounds the source term from the filter and the knockout canisters. However, the basis for this statement is unclear. The UFSAR, in Section 7.2, "Radiation Sources," does not appear to clearly identify the fuel canister source terms as bounding for the filter and knockout canisters, nor does the calculation package in Reference 3.11.24 of the LRA. The UFSAR describes analyses of what is described as the design-basis source terms, without a discussion of how those source terms are bounding or design-basis for all three canister types. This information is needed to understand the radiation environment that SSCs are exposed to, and the use of this information to support the LRA evaluation of aging effects related to radiation exposure.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-3

Revise the neutron fluence and gamma dose analyses for the TMI-2 canisters to account for the time the canisters were loaded with debris prior to the canisters being loaded into the DSCs and stored in the ISFSI HSMs, or justify that the current analysis is bounding.

As stated in Section 3.3.1.2.2 of the LRA, the LRA analyses use the source terms in the UFSAR for the ISFSI, which is based on a decay of 19 years after the accident. This 19 years decay corresponds to the time when loading of the TMI-2 canisters into the DSCs began. This source term is appropriate for the LRA analyses for the DSCs and the HSMs. However, it is not clear that it is appropriate for the TMI-2 canisters, which were loaded about 6.5 years after the accident (approximately 14 years before DSC loading).

While the radiation exposures prior to the 19-year time pre-date the ISFSI, the canisters are components of the ISFSI; thus, the cumulative exposure of both storage at and prior to the ISFSI needs to be addressed to demonstrate that the canisters will perform their functions for the duration of the renewed ISFSI license. To account for the additional 14 years of irradiation the TMI-2 canisters experienced, the LRA states that the analyses of adverse radiation effects to SSCs consider an irradiation time of 60 years (accounting for the first ISFSI license term, requested renewal term, and conservatively an additional 20 years to cover the additional time since the TMI-2 canisters where loaded). However, the source term for the canisters' analyses, described in LRA reference 3.11.24, should use the source terms for 6.5 years of decay, not 19 years. This includes the source terms for the fuel and the AmBeCm sources. Based on the staff's estimates using only 6.5 years of decay, all source terms will increase, with significant increases in the gamma source term. As an alternative, recognizing that the source terms decay with time, the applicant may provide justification for why the current analysis with the 19-year decayed source terms is bounding. Such justification should include calculations that show that the applicant's current analysis method results in cumulative exposures that bound the exposures that a realistic analysis that accounts for the canisters' exposure prior to loading into the DSCs and decay of the source over time would estimate.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-4

Clarify the following items, modifying the LRA as appropriate:

a) The dose rate of 100 millirem per hour (mrem/hr) on the DSC purge and vent port filter housings discussed in Section 3.8.4.5 of the LRA is a total (neutron and gamma) dose rate. LRA references 3.11.102 and 3.11.103 "Results" sections indicate in one place that the dose rate is gamma only and in another place that the dose rate is gamma and neutron; so, it is not clear what dose rate is being reported. The LRA should include the total dose rate as well as the gamma and neutron components of the dose rate.

b) The location(s) of the neutron dose rates reported in LRA references 3.11.102 and 3.11.103. These references discuss neutron dose rates of 1 to 5 mrem/hr for HSMs 4 and 22; however, it is not clear whether these dose rates were measured on the HSM rear access doors or the DSC purge and vent port filter housings. The LRA should include the locations of the neutron dose rates.

c) Discussions in LRA references 3.11.102 and 3.11.103 that indicate that neutron dose rates are only for the HSMs that include canisters with the AmBeCm sources. The fuel debris is also a source of neutron radiation; therefore, all of the HSM should have some neutron dose rates. It is not clear if neutron dose rates are measured for all HSMs and how the neutron dose rates are accounted for in the HSMs that do not contain the AmBeCm sources.

d) The basis for using a different fuel weight for the decay heat analyses in Section 3.3.1.2.3 of the LRA (1100 pounds) versus the fuel weight used for the irradiation effects in Section 3.3.1.2.2 of the LRA and described in Section 7.2.1 of the UFSAR (1908 pounds). A greater fuel weight leads to a larger decay heat. It would seem that the same fuel weight should be used for both analyses.

e) The discussion in Section 3.3.1.2.3 to ensure consistency of statements with related statements in the UFSAR. For example, page 3-49 of the LRA describes the 1.879 factor as a factor to account for differences in enrichments; however, UFSAR Section 7.2.1 and LRA Section 3.3.1.2.2 describe this as a factor to convert core average burnup to maximum assembly average burnup. The application of the factor should also be checked for appropriate use in the analyses.

This information is needed to understand the meaning of the dose rates described in the LRA and the referenced reports and their use to support the LRA evaluations of the SSCs' shielding performance and to ensure the analyses of the environments that SSCs are exposed to are appropriate.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-5

Justify the position that aging effects due to aggregate reactions (alkali silica reaction, ASR) in the HSM concrete are not credible and should not be managed, modifying the LRA as described below.

Section 3.5.4.2.5 appears to include contradicting results to the conclusion that aging effects due to ASR in the HSM concrete are not credible. The section states that there was evidence of ASR (isolated small patches of white ASR gel) observed in one core sample taken during the HSM concrete evaluation in 2009. Although operating experience has not yet shown the occurrence of ASR-induced damage in HSMs, it is unclear why evidence of ASR in the TMI-2 ISFSI HSMs is being dismissed.

Justify the position that aging effects due to ASR are not credible. Alternatively, include this aging mechanism in the aging management review and revise the HSM AMP and UFSAR Supplement in Appendix C, as appropriate, to address this aging mechanism. This information is needed to determine if the aging management review is comprehensive in identifying all pertinent aging mechanisms and effects applicable to the SSCs within the scope of renewal and that a summary of the information is included in the AMP and UFSAR supplement.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-6

Define the allowable degradation of the Licon material credited in the top-end dose rate analyses, quantifying the effects on dose rates resulting from that degradation.

Section 3.8.4.5 identifies the postulated aging effects of loss of material, cracking, or reduction in material properties considered on the Licon material. However, it does not quantify the assumed aging effects when making conclusions regarding the top-end dose rate analyses. Therefore, the concluding statement in Section 3.8.4.5 that "any postulated aging effects on the

Licon material will not credibly cause a spike in dose rates and will not credibly reduce the current shielding properties afforded by the Licon" is not justified. Section 3.8.4.5 states that, "although the Licon was included in a top-end dose rate model, its inclusion, and therefore relative impact on shielding for gamma radiation will be negligible, with respect to the stainless steel and steel shielding function of the TMI-2 Fuel Canister and DSC SSCs, respectively." It is unclear what "negligible" implies, and whether any degradation of the Licon is allowed per the design bases model. This information is needed to determine if the aging management review for Licon is comprehensive and if the conclusion that there are no credible aging effects that need to be managed in the period of extended operation is reasonable.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-7

Demonstrate that the postulated aging effect of materials losses in the Licon material would not affect the second criticality analysis in Section 3.3.4.3 of the UFSAR so that the subcritical limit is exceeded (i.e., the storage system will continue to maintain sub-criticality), accounting for canister component dimensional tolerances.

The evaluation should define the credible bounding material losses considered for the Licon material and provide a justification for the assumed values. An evaluation of the dimensional effects of these material losses should account for the tolerances of the TMI-2 canister components in determining the bounding k_{eff} for the various canisters and the DSC.

The first criticality analysis appears to include added margins (e.g., addition of a 0.05 factor to k_{eff} values discussed in Section 3.3.4.2.F of the UFSAR) as well as results in a k_{eff} that is significantly below the subcritical limit (0.95). The staff expects that sensitivities to tolerances and expected corrosion and material losses would not be enough to cause the results of this analysis to exceed the subcritical limit. However, it is unclear if this is true for the second criticality analysis, which is much closer to the limit. It is also not clear that the same factors or margins (e.g., the 0.05 factor discussed in Section 3.3.4.2.F of the UFSAR) were added to the second criticality analysis as was done for the first analysis.

The staff requests that the applicant demonstrate that the second criticality analysis would continue to show the storage system will be subcritical when considering material losses (accounting for dimensional tolerances).

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-8

Provide additional justification that changes to the Licon material properties, as a result of aging, are not significant or important to maintaining the sub-criticality function.

Section 3.8.4.5 of the LRA indicates that postulated changes to the Licon properties will not affect the ability of the storage system to meet the sub-criticality function. The criticality analyses used to support this evaluation only address the water content of the Licon. To fully support the evaluation in the LRA, the LRA should include an analysis that evaluates the reactivity effects of degradation of all of the Licon material properties, not just the variation in the water content, and demonstrates that sub-criticality is maintained for the Licon properties that maximize reactivity. This analysis should include a case that neglects the Licon altogether if the

applicant intends to show that the Licon is not relied on for nuclear criticality safety. This would include neglecting the material properties as well as any other properties that help to retain canister geometry under normal, off-normal, and accident conditions.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-9

Clarify the following with respect to criticality analyses and the water content in the TMI-2 canisters to ensure the discussion in Section 3.8.4.5 of the LRA regarding nuclear criticality safety is adequately justified.

a) The amount of water (bound and unbound) that remained in the canisters after drying.

b) The lack of preferential moisture absorption by debris canisters with Licon versus the filter and knockout canisters if multiple canister types can be present in the same DSC.

The LRA Reference 3.11.5 describes a variety of different water amounts that can be left in the TMI-2 canisters based on different conditions. It is not clear which water amount (total of both bound and unbound water) was achieved when the canisters were dried. For example, Section 5.3 describes the remaining water to be about 1.5 liters (L), whereas Section 7.2 describes 7.3 L remaining, and Section 7.4.2 indicates that the maximum allowed water content in the canister is 2.3 L. If the Section 7.2 value is correct, adding in the estimated accumulation that is derived in another calculation would result in a total water content that exceeds the 8 L limit allowed by the criticality analyses. Thus, it is not clear that the conditions of the criticality analyses and the 8 L limit would be met for the duration of extended operations based on the evaluations and information regarding water content in the TMI-2 canisters. Also, since Licon can act as a desiccant when dry, it is not clear that the canisters would uniformly absorb moisture from the DSC cavity as described in LRA Section 3.8.4.5 if multiple canister types are loaded in the same DSC.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-10

Quantify the change to the thermal conductivity of the Licon material as a result of water absorption during the period of extended operation.

Section 3.8.4.5 of the LRA stated that “any credible changes to the Licon effective thermal conductivity will not adversely affect the ability to comply with the TMI-2 core debris temperature limit described in UFSAR Section 3.3.7.1.1.” It is unclear what are the “credible changes” considered in Section 3.8.4.5. Further, Section 3.8.4.5 references a statement in the UFSAR that: “small differences in the weight percent of the Licon constituents have negligible effect on the thermal analysis results of the core debris and canisters.” However, the allowable difference in water composition per the design bases thermal analyses is not quantified.

Since Section 3.8.4.5 discusses that absorption of water is possible during the period of extended operation, it is unclear if absorbed water will impact the effective thermal conductivity assumed in the design-bases thermal evaluation. This information is needed to ensure that the dry storage system continues to maintain heat-removal capability during the period of extended operation.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-11

Provide a justification that radiation-induced localized corrosion will not compromise the intended functions of stainless steel subcomponents, which considers any indications of localized corrosion observed in the canisters during prior wet storage at the Test Area North (TAN) pool or during canister inspections prior to loading in the DSCs.

The interaction of gamma radiation with water, which may be present on non-encased sheltered components, can generate radiolytic oxidizing products such as hydrogen peroxide and nitric acid. These radiolytic products could affect the corrosion process of stainless steel subcomponents and promote radiation-induced localized corrosion including pitting corrosion, crevice corrosion, and stress corrosion cracking. The applicant is asked to evaluate the presence of residual moisture in stainless steel subcomponents and justify that radiation-induced localized corrosion does not require aging management. The justification would benefit from considering any indications of localized corrosion of stainless steel subcomponents observed during prior wet storage of the canisters at the TAN pool or during canister inspections prior to loading in the DSCs.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI 3-12

Justify that irradiation embrittlement of the metallic TMI-2 canister internals is not credible.

Section 3.8.4.2.10 references the cumulative neutron fluence at the TMI-2 canister shell to show that it is below the threshold for embrittlement of the metallic SSCs. However, the discussion does not address irradiation embrittlement of metallic subcomponents internal to the TMI-2 canister shell, which may be exposed to a higher neutron fluence.

This information is needed to determine compliance with 10 CFR 72.42(a).

Appendix A: Aging Management Programs

RAI A-1

Clarify whether the defense-in-depth enhancements described in Sections A1.4.4 and A1.6.2 of the DSC AMP are relied on as indirect indicators of degradation, and modify the LRA as described below.

Sections A1.4.4 and A1.6.2 describe using tracking and trending of dose rate measurements from limiting condition for operation (LCO) 3.2.2 and hydrogen levels from LCO 3.2.3 to help identify, as a defense-in-depth approach, potential corrosion problems. However, this is not included in the UFSAR Supplement for the DSC AMP (Table C-7 of the UFSAR supplement, Table A-1 of the LRA). If these defense-in-depth enhancements are being relied on as indirect indicators of degradation or corrosion for the DSC AMP, they should be included in the UFSAR supplement.

In addition, Section A1.6.2 includes two acceptance criteria for the evaluation of the dose rate measurement data. It is not clear that Criterion 1 accounts for the continuous decay of the source terms. The meaning of "typically expected radiation levels" in Criterion 2 should be clarified and include accounting for source decay and other items that affect what characterizes the "typically expected" dose rates at the time of the measurements. Criteria that do not account for decay of the source term are not adequate for identifying potential adverse degradation unless that degradation is substantial, which would be beyond the point where other AMP inspection methods would likely have identified degradation. Therefore, if these dose rate measurements are relied on as indirect indicators of degradation, justify the adequacy of the acceptance criteria for these measurements and ensure the criteria address the considerations described above.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI A-2

Justify that the proposed inspection frequency in the HSM AMP in Appendix A2 is adequate for ensuring that aging effects of the HSM fillers (chemical grouts) and sealants will be addressed before loss of an HSM intended function or propose an alternate frequency and revise the HSM AMP and UFSAR Supplement in Appendix C, as appropriate.

Section 3.5.2.4 of the LRA defines various filler (chemical grouts) and sealant materials used in the HSM roof slab and walls during repairs made in 2009 and from 2011-2015. Per Section 3.5.4.5 of the LRA, although not important to safety, premature degradation of these materials potentially could adversely affect the protected concrete and steel HSM SSCs structural integrity intended functions. The materials were described to be susceptible to degradation due to ultraviolet radiation, in addition to radiation exposure from the TMI-2 core debris. The applicant included these aging effects to be addressed under the aegis of the HSM AMP. However, a technical basis (test results, operating experience) was not discussed to justify that the inspection frequency is adequate so that degradation of these fillers and sealants is addressed before loss of an HSM intended function.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI A-3

Provide information on the specific system that will be used for obtaining, aggregating, and reporting operating experience to ensure continued AMP effectiveness in the period of extended operation, and revise Table 3-11, the DSC AMP, the HSM AMP, and the UFSAR supplement in Appendix C, as appropriate.

LRA Sections A.1.10.1 and A2.10.1 of the DSC and HSM AMPs, "Learning AMP," states that the AMPs will be updated, as necessary, to incorporate new information on degradation due to aging effects identified from TMI-2 ISFSI inspection findings, related industry operating experience, and related industry research. The LRA also proposes periodic tollgate assessments in Section 3.9 and Table 3-11 to evaluate this information and perform written assessments in the period of extended operation. However, the LRA doesn't reference the system to be used to obtain, aggregate, and enter or report operating experience or discuss how the applicant intends to provide timely reporting of operating experience to this system.

NUREG-1927, Revision 1 recommends that renewal applicants should reference the specific system used to obtain, aggregate, and enter operating experience. NEI 14-03, Revision 1, "Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management," recommends the use of the new Aging Management INPO Database (AMID) system to collect and disseminate dry cask storage aging management information. In addition, NEI 14-03 recommends that licensees document and share their periodic assessments of AMP effectiveness ("tollgates") through AMID. NUREG-1927 references the AMID system as one means of sharing operating experience within the industry to ensure AMP effectiveness.

This information is required to determine compliance with 10 CFR 72.42(a).

Appendix B: Time-Limited Aging Analyses

RAI B-1

Clarify if the referenced thermal fatigue evaluation for the DSC in Section 3.4.4.2.9 of the LRA is a TLAA.

Section 3.4.5 states that there are no TLAAs required for addressing DSC aging effects. However, as the LRA states, the thermal fatigue evaluation was previously incorporated in the approved design bases (Section 8.3.2 of the UFSAR), and it appears to meet all the criteria for a TLAA in 10 CFR 72.3.

This information is needed to determine compliance with 10 CFR 72.42(a).

RAI B-2

Clarify if the irradiation evaluation of HSM concrete subcomponents in Section 3.5.4.2.4 of the LRA is a TLAA.

Section 3.5.5 states that there are no TLAAs for addressing HSM aging effects. However, as the LRA states, radiation effects on HSM concrete were previously incorporated in the approved design bases (Section 8.1.1.5.D of the UFSAR), and the analysis appears to meet all criteria for a TLAA in 10 CFR 72.3.

This information is needed to determine compliance with 10 CFR 72.42(a).