REQUEST FOR ADDITIONAL INFORMATION
Portland General Electric Company
License Renewal Application
Docket No. 72-17
License No. SNM-2509

This request for additional information (RAI) identifies information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the renewal application. NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses" was used by the staff in its review of the application. Each individual RAI describes information needed by the staff for it to complete its review of the application and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

In responding to the following RAIs, the staff notes that activities a licensee is performing during the current licensing period may be credited towards aging management in the renewed period, provided that the applicant demonstrates that the activities can effectively manage the effects of aging.

CHAPTER 2 - SCOPING EVALUATION

RAI 2-1. Provide additional justification for excluding the independent spent fuel storage installation (ISFSI) storage and service pads from the scope of renewal. Alternatively, include the pads in the renewal scope, provide an aging management review (AMR), and describe the aging management activities used to manage the identified aging effects.

License Renewal Application (LRA) Table 2-1: Summary of Scoping Evaluation Results of the LRA states that the ISFSI storage and service pads are neither important-to-safety (ITS) nor could prevent the fulfillment of an ITS function as applied to scoping criteria 1 and 2 of the LRA.

Although the ISFSI pads are not listed as ITS in the safety analysis report (SAR) and drawings, it is not clear whether the failure of the pads (e.g., via cracking, settling) may affect the ability to retrieve the spent fuel with the transfer cask (scoping criterion 2).

This information is required to determine compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) 72.42(a).

RAI 2-2. Resolve the discrepancies between the LRA and drawings regarding subcomponent safety functions, and revise the scoping and aging management review, if necessary.

Table RAI 2-2 below summarizes discrepancies between the LRA scoping Tables 2-2 through 2-6 and drawings.

If the resolution of these discrepancies causes a subcomponent to be added to the scope of renewal, an aging management review and aging management activities for these subcomponents should be provided.

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

TABLE RAI 2-2: Safety Function Discrepancies of LRA vs Drawings

LRA TABLE	DISCREPANCY
Table 2-2 (MPC)	Item 17 (plugs): Identified as not important to safety (NITS) in drawing, but has a Shielding function in LRA table.
	Items 28, 29 (vent and drain tube and cap): Identified as ITS-C in drawing, but "N/A" in LRA table.
	Item 32 (set screw): Identified as NITS in drawing, but has a Confinement function in LRA table.
Table 2-4 (Transfer Cask)	Items 23, 28, 30, 33, 34, 35 (top lid and door items): Identified as ITS-B in drawing, but "N/A" in LRA table.
Table 2-6 (Transfer Station)	Items 8-10 and 12 of Drawing D-AI-200 (nuts, washers, threaded rod): Components do not appear in LRA table.

CHAPTER 3: AGING MANAGEMENT REVIEW

RAI 3-1. Clarify the material of construction for the Lid Bolt and, if necessary, revise the aging management review.

LRA Table 3-2, Aging Management Review for Transfer Cask Subcomponents, identifies the Lid Bolt to be constructed of stainless steel. However, item 17 on Drawing 3555, sheet 2 is identified as Cr-Mo alloy (ferritic) steel (ASME SA-193 B7).

If the material designation as stainless steel is correct, provide a reference to the applicable design basis information. If the material designation is not correct, provide the AMR for the corrected material and revise the material designation in other areas of the application, as appropriate.

This information is required to determine compliance with 10 CFR 72.24(c) and 10 CFR 72.42(a).

RAI 3-2. Demonstrate why concrete degradation due to corrosion of the concrete cask reinforcement bar is not an aging effect that must be managed in the period of extended operation.

LRA Table 3-3: AMR for Concrete Cask Subcomponents, sheet 3-28 line item for reinforcement bar does not address corrosion. The staff notes that corrosion of reinforcing steel can be caused by the presence of chlorides, and that chloride attack has been well established in the technical literature (Cheung et al., 2009). The presence of corrosion products at the steel surface can generate internal stresses within the concrete matrix, causing cracks and spalling of the concrete cover with consequent structural damage.

Justify why the management of concrete degradation due to corrosion is not required or revise the AMR and aging management program (AMP) to address the corrosion of concrete cask reinforcement bar.

This information is required to determine compliance with 10 CFR 72.24(c) and 10 CFR 72.42(a).

Reference:

Cheung, M.M.S., J. Zhao, and Y.B. Chan. "Service Life Prediction of RC Bridge Structures Exposed to Chloride Environments," Journal of Bridge Engineering, Vol. 4, pp. 164-178, 2009.

RAI 3-3. Justify why cracking due to differential settlement is not included as an aging effect for the transfer station pad. Alternatively, revise the AMR and state how differential settlement is addressed with an AMP or time-limited aging analyses.

LRA Table 3-5, Aging Management Review for Transfer Station Subcomponents, states that loss of strength, spalling, cracking, and scaling are aging effects requiring management for the transfer station pad. The associated aging mechanisms are identified as alkali silica reaction, CaOH leaching, and freeze/thaw. Differential settlement is a result of the uneven deformation of the supporting foundation soil (Das, 1999; NAVFAC, 1986). Differential settlement, which causes distortion (loss of form) and damage (cracking) to concrete structures, is a function of the uniformity of the soil, stiffness of the structure, stiffness of the soil, and distribution of loads within the structure (U.S. Department of the Army, 1990; NAVFAC, 1996).

The staff notes that, while cracking due to concrete degradation mechanisms (e.g., alkali silica reaction, leaching) is managed by the Transfer Station AMP, it is not clear that the AMP activities are also appropriate for managing cracking due to settlement.

This information is required to determine compliance with 10 CFR 72.24(c) and 10 CFR 72.42(a).

RAI 3-4. Justify why the impact limiter foam has no aging effects that require management. Otherwise, describe the foam material and identify any aging effects that could impact an important-to-safety function. For those aging effects, TLAAs or AMPs should be provided to ensure that safety functions are maintained.

LRA Table 3-5, Aging Management Review for Transfer Station Subcomponents, states that the transfer station impact limiter foam has no aging effects requiring management. The table also states that the current licensing basis requirements for periodic impact limiter foam coupon testing will be maintained. The LRA does not describe, or provide the technical justification for, the aging effects that the coupon testing is intended to address, nor does it provide justification for the effectiveness of that testing in the period of extended operation.

This information is required to determine compliance with 10 CFR 72.24(c) and 10 CFR 72.42(a).

RAI 3-5. Clarify the interior environment of the transfer cask neutron shield and, if necessary, revise the AMR and associated aging management activities.

LRA Table 3-2, Aging Management Review for Transfer Cask Subcomponents, identifies the environment of the components exposed to the neutron shield water as being sheltered; however, the staff is unable to identify documentation that shows that the shield is drained when not in use. If the stated environment is not correct (the neutron shield has remained filled), revise the AMR for all subcomponents that are exposed to water and correct the environment designation in other areas of the application, as appropriate.

In addition, the staff is unable to identify documentation that shows whether or not the neutron shield water is borated. The staff notes that Chapter 7 of the SAR, Operating Procedures, does not define what water is to be used to fill the water jacket, i.e., borated or fresh/demineralized water. Clarify the type of water used.

This information is required for the staff to determine compliance with 10 CFR 72.42(a), 10 CFR 72.104, and 10 CFR 20.1301(a) and (b).

APPENDIX A – Aging Management Program:

Transfer Cask AMP:

RAI A-1. Clarify if the Transfer Cask AMP specifically addresses the aging management activities associated with the loss of material of the Holtite shield or justify why not.

LRA Table 3-2, Aging Management Review for Transfer Cask Subcomponents, states that loss of material due to corrosion of the Holtite shielding will be managed by the Transfer Cask AMP. However, it does not appear that any activities in the AMP specifically address this aging effect, as the Holtite shielding is not accessible for the proposed visual inspections.

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

RAI A-2. Clarify the extent of coverage for the inspections of accessible surfaces in LRA Appendix A: Transfer Cask AMP element 4, Detection of Aging Effects.

Transfer Cask AMP element 4 states that accessible painted surfaces will be inspected for corrosion and chipped, cracked, or blistered paint.

It is unclear whether the proposed inspections include the transfer cask internal (cavity) components, such as the inner shell. The AMP should clearly state whether the internal components are considered to be accessible and will be included within the scope of the inspections. If the internal surfaces are not considered to be accessible, the AMP should address how the aging of the internal components will be managed.

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

RAI A-3. Demonstrate that the Trojan Quality Assurance (QA) program includes provisions to ensure that the proposed visual inspections of the transfer cask and transfer station will be capable of detecting degradation.

The LRA states that visual inspections of the transfer cask and transfer station will be performed using a QA validated procedure.

It is unclear to the staff whether the proposed visual inspections will be capable of identifying corrosion, paint degradation, or other surface damage. As recommended in NUREG–1927, Revision 1, AMPs should define a visual inspection methodology that has been demonstrated to be capable of identifying the inspected parameters, using consensus codes and standards (e.g., ASME Section XI VT-3 with controls for distance and lighting), as applicable. If the Transfer Cask and Transfer Station AMPs will not use a consensus code to define the visual inspection method, the staff requires additional information (QA program documents or summaries thereof) regarding how the Trojan QA program will establish visual examination requirements to ensure that degradation will be detected, taking into account the need for inspection parameters for lighting, distance, offset, and assessment of base metal when coating degradation is present.

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

RAI A-4. Describe the criteria for entering an issue into the Corrective Acton Program (CAP) in LRA Appendix A, Transfer Cask AMP element 6, Acceptance Criteria.

Transfer Cask AMP element 6, Acceptance Criteria, states that, if degradation of material is detected on any of the identified subcomponents within the transfer cask, the issue would be entered into Trojan's CAP and an engineering evaluation would be performed to determine the impact on intended functions. However, AMP element 7, Corrective Actions, states that, if the engineering evaluation shows that the transfer cask has indications that exceed acceptable limits, the issue will be entered in the CAP.

It is unclear to the staff what specific criteria will be used to determine if degradation is present and the issue is entered into the CAP. Also, the AMP appears to have conflicting information regarding whether the engineering evaluation is part of the CAP or whether it is used to determine entrance in to the CAP. If the intent of the AMP is to enter into the CAP <u>any</u> indication of the parameters monitored (e.g., chipped or cracked paint, signs of corrosion, leaks, scratches), then the AMP should clearly state so. If the intent of the AMP is to enter into the CAP some other threshold that is determined through evaluation, then the AMP should identify that threshold.

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

RAI A-5. Describe what inspections have been performed on the transfer cask and whether any indications of degradation were identified for LRA Appendix A: Transfer Cask AMP element 10, Operating Experience.

The LRA states that the transfer cask was used during the initial loading of the Trojan ISFSI and the transfer cask was inspected before use in accordance with existing operating procedures.

NUREG–1927, Rev. 1, Section 3.6.1.10, Operating Experience, recommends that the operating experience element of the program support a determination that the effects of aging will be adequately managed. Operating experience is useful in providing justification for the effectiveness of each AMP program element and critical feedback for enhancement.
It is unclear to the staff what inspections have been performed on the transfer cask and whether

those inspections identified any indications of degradation. The LRA should provide any available inspection details (e.g., scope, methodology, results) that support the adequacy of the proposed aging management activities.

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

Concrete Cask AMP:

RAI A-6. Provide the specific parameters that will be inspected to identify concrete degradation before a loss of intended function for LRA Appendix A: Concrete Cask AMP, element 3, Parameters Monitored/Inspected.

The LRA states that exposed exterior concrete surfaces will be examined for indications of surface deterioration.

The AMP does not provide sufficient detail for the staff to evaluate whether the proposed inspection methods are capable of identifying conditions and quantifying their severity. If all parameters associated with the ACI 349.3R acceptance criteria will be monitored (e.g., popouts, spalling, cracks, leaching), then the AMP should clearly state those parameters.

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

RAI A-7. Provide details on the concrete inspection method, inspection coverage, and the qualification of the inspector and the individual that reviews inspection results for LRA Appendix A, Concrete Cask AMP element 4, Detection of Aging Effects.

The LRA states that a qualified individual will perform the concrete inspections and a qualified individual will review inspection results for possible entry into the CAP. The LRA also states that these inspections will be performed in accordance with the Trojan ISFSI Structural Inspection Program, which is described in the Trojan ISFSI safety analysis report.

The staff notes that the description of the Structural Inspection Program in the Trojan ISFSI SAR does not provide any detail on the inspection methods, inspection coverage, or inspector qualifications. The LRA should include sufficient information to demonstrate that the inspections are capable of identifying and evaluating the concrete degradation parameters, citing relevant standards (e.g., ACI), as applicable. The LRA should provide details on the visual inspection method (e.g., distance, lighting requirements, use of gauges), coverage (extent of concrete areas inspected), and to which standard(s) inspectors and those reviewing inspection results are qualified.

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

RAI A-8. Describe the criteria for entering metal subcomponent conditions into the corrective action program for LRA Appendix A: Concrete Cask AMP element 6, Acceptance Criteria.

The LRA states that the loss of material due to age-related corrosion of exterior metal subcomponents will be evaluated in accordance with ACI 349.3R-02. For interior metal surfaces, the LRA states only that minor corrosion will not require further evaluation.

The Concrete Cask AMP does not provide sufficient detail to describe the criteria by which metal conditions will be entered into the CAP. For the exterior metal subcomponent, it is unclear what specific section of ACI 349.3R-02 will be used to define the acceptance criteria, and why these criteria are appropriate for all the intended functions of the exterior metal components (e.g., radiation shielding function of the cask lid). For the interior metal components, it is unclear at what threshold "minor" corrosion is exceeded such that corrective actions are taken to ensure that the structural, radiation shielding, and heat transfer functions of the steel components are maintained. The staff notes that the AMP includes inspections for coating degradation; however, the degree of coating degradation that will prompt corrective actions is not defined in the acceptance criteria.

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

Transfer Station (TS) AMP:

RAI A-9. Clarify that the AMP manages aging effects for concrete in LRA Appendix A: Transfer Station AMP or justify why not.

The introduction to the Transfer Station AMP states that the AMP manages loss of material due to corrosion. However, LRA Table 3-5 states that the AMP is also used to manage loss of strength, spalling, cracking, and scaling of concrete.

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

RAI A-10. Provide the specific parameters that will be inspected to identify concrete degradation before a loss of intended function for LRA Appendix A: Transfer Station AMP element 3, Parameters Monitored or Inspected.

The LRA states that the AMP addresses degradation of the concrete pad.

The AMP does not provide sufficient detail for the staff to evaluate whether the proposed inspection methods for the pad are capable of identifying conditions and quantifying their severity. If all parameters associated with the ACI 349.3R acceptance criteria will be monitored (e.g., popouts, spalling, cracks, leaching), then the AMP should clearly state those parameters.

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

RAI A-11. Provide details on the concrete inspection method, inspection coverage, and the qualification of the inspector and the individual that reviews inspection results for LRA Appendix A: Transfer Station AMP element 4, Detection of Aging Effects.

The LRA states that a qualified individual will perform the inspections of the concrete transfer station pad and that the inspections identify the current condition of the structure.

The LRA should include sufficient information to demonstrate that the inspections are capable of identifying and evaluating the concrete degradation parameters, citing relevant standards (e.g., ACI), as applicable. The LRA should provide details on the visual inspection method (e.g.,

distance, lighting requirements, use of gauges), coverage (extent of concrete areas inspected), and to which standard(s) inspectors and those reviewing inspection results are qualified.

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

RAI A-12. Describe the criteria for entering metal subcomponent conditions into the CAP for LRA Appendix A: Transfer Station AMP, element 6, Acceptance Criteria.

Transfer Station AMP element 6, Acceptance Criteria, states that if corrosion of material is detected on any of the identified subcomponents within the Transfer Station, the issue would be entered into Trojan's CAP and an engineering evaluation would be performed to determine the extent and impact of the corrosion on the ability of the Transfer Station to perform its intended function. However, AMP element 7, Corrective Actions, states that, if the engineering evaluation shows that the transfer station has indications that exceed acceptable limits, the issue will be entered in the CAP.

It is unclear to the staff what specific criteria will be used to determine if degradation is present and the issue is entered into the CAP. Also, the AMP appears to have conflicting information regarding whether the engineering evaluation is part of the CAP, or whether it is used to determine entrance in to the CAP. If the intent of the AMP is to enter into the CAP any indication of the parameters monitored (e.g., chipped or cracked paint, signs of corrosion, scratches), then the AMP should clearly state so. If the intent of the AMP is to enter into the CAP some other threshold that is determined through evaluation, then the AMP should identify that threshold.

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

RAI A-13. Provide further detailed description for LRA Appendix G: Proposed Changes to Trojan ISFSI SAR, Section 9.7.8 Aging Management Program summaries.

The Appendix G, AMP SAR supplemental information does not provide sufficient level of detail for the NRC staff to reach reasonable assurance that the AMPs will be effectively implemented. The level of detail in the SAR focused briefly on scope, inspections method, and frequency. NUREG-1927 Section 1.4.7 recommends that the staff, when reviewing the information in the SAR, consider the specific details of the AMPs that were the basis for the staff’s decision to issue the renewal.

NUREG-1927 Section 1.4.4 recommends that the SAR supplement should include the scoping and AMR results and a summary of AMPs. The Appendix G AMP summaries do not include some details that the staff considers essential to supporting its safety findings, including the specific aging mechanisms to be managed, inspection method standard (if applicable), timing of the first inspection, and the specific acceptance criteria for each inspection.

Section 2.2.2.8 of NEI 14-03, Revision 2, “Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management,” provides industry guidance for the content of the SAR supplement. Although the NRC has yet to make a final decision to endorse this document, the staff notes that the recommendations in NEI 14-03 are similar to those discussed above.

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

APPENDIX B – Time-Limited Aging Analyses:

RAI B-1. Provide information to address the design code fatigue evaluations of fuel basket subcomponents in Appendix B of the renewal application.

LRA Table 3-1, Aging Management Review for multi-purpose canister (MPC) Subcomponents, does not contain fatigue-related items for the fuel debris process can capsule, failure fuel can, damaged fuel container and basket components. SAR Section 4.8, Materials, shows the basket and fuel items to be designed to ASME Code Subsection NG. NG-3222.4 includes calculations to verify that cyclic loading is not an issue.

NUREG-1927, Revision 1, states that renewal applications should address aging-related design-basis analyses in the initial license that involve time-limited assumptions to demonstrate that functions will be maintained in the period of extended operation.

It does not appear that TLAAs associated with the fuel basket components are addressed by the MPC fatigue evaluation in LRA Appendix B. The application should demonstrate that the fuel basket fatigue analyses performed for the initial license remain valid for the period of extended operation.

This information is required to determine compliance with 10 CFR 72.24(c) and 10 CFR 72.42(a).