Request for Additional Information
for Cooper Nuclear Station License Renewal

A. Additional Information Request for the Review of the Environmental Report (ER)

1. Relative to the review of Cooper Nuclear Station (CNS) environmental permits, the staff requests the submittal of the 14 CNS permits (CNS Permits Index) supporting the license renewal application:
   (1) CNS operating license
   (2) NPDES permit (NPDES Permit Application)
   (3) Industrial Stormwater Permit
   (4) Air Construction Permit (Low Emitter Status Notice and Open Burn Permits)
   (5) RCRA Notification
   (6) Injection Well Permit
   (7) Registered Well Information
   (8) Water Withdrawal Right
   (9) Public Drinking Water Supply Permit
   (10) South Carolina Waste Transport Permit
   (11) Tennessee Radioactive Waste License
   (12) Utah Generator Site Access Permit
   (13) Construction Stormwater Permit – ISFSI
   (14) 404 Permit – Dredge Intake (404 Permit – Ice Deflector)

2. The CNS Environmental Report referred to Hydrogeologic Investigation Workplan, dated November 2007, and prepared for Nebraska Public Power District (NPPD) by Conestoga Rovers and Associates. The staff requests the submittal of this reference (and 2009 Hydrogeologic Report as appropriate), for the license renewal (LR) review.

3. During the onsite environmental audit, the applicant stated that a company Jebro is a state-licensed oil recycling and disposal facility, and it takes ownership of the used oil that NPPD sends to Jebro. The staff requests documentation and information related to Jebro's qualification/permit to dispose of the waste for review.

4. During the onsite environmental audit, the applicant stated that NPPD sends mixed waste to a disposal facility in Clive, Utah. The facility is licensed for receipt of hazardous low-level radioactive waste. The staff requests documentation related to the mixed-waste facility and the method of mixed-waste treatment (disposal) be provided, for the LR review.

5. During the onsite environmental audit, the applicant stated that CNS environmental programs are governed by NPPD Environmental Policy Directive which describes the corporate commitment to environmental compliance and stewardship. The staff requests documentation related to NPPD Environmental Policy Directive and associated CNS recycling implementations be provided, for the LR review.

6. During the onsite environmental audit, the applicant stated that the average 2007 dose (40 CFR 190) to members of the public (combined dose from gaseous, liquid, and direct shine radiation) has been calculated to be 0.5 mrem. The staff requests documentation related to this calculation be provided, for LR review.

B. Additional Information Request for the Review of the License Renewal Application (LRA)

B.1 Inconsistent identification of structure and component within scope of license renewal

RAI 2.2-1

Auxiliary condensate (AC) system is a system identified in LRA Table 2.2-2 as not within scope of license renewal in accordance with 10 CFR 54.4. The licensee identifies the reactor building auxiliary condensate supply system as the water supply for each emergency core cooling system pump discharge line in Chapter VI, Section 3.0, of the USAR. On LRA drawing 2049 sheet 03, components in the reactor building auxiliary condensate system are highlighted as within scope for 10 CFR 54.4 (a)(2). The staff requests the applicant to justify the exclusion of the AC system from the scope for license renewal (LRA Table 2.2-2). In addition, the staff requests that the licensee provides a detailed description and function of the auxiliary condensate system and the components within scope of license renewal.

RAI 2.2-2

LRA Table 2.2-3 identifies the turbine building as within scope for license renewal in accordance with (iaw) 10 CFR 54.4 (a)(2) because it contains Structures and Components (SCs) that are safety-related and are within scope of license renewal iaw 10 CFR 54.4 (a)(1). The seal oil system for the main generator is located in the turbine building but is not listed as within scope for license renewal. In accordance with 10 CFR 54.4 (a)(2), the applicant is required to put SCs within scope of license renewal if the nonsafety-related SCs has the potential to affect the function of SCs identified under 10 CFR 54.4 (a)(1), i.e. safety-related. The staff requests the applicant to justify the exclusion of the main generator seal oil system from the scope of license renewal

RAI 2.2-3

In the Cooper USAR, Chapter XII, Section 2.1, the applicant provides a definition of Class I structures and equipment applicable to structural design requirements, followed by a list of Class I structures and equipment. In the preceding USAR section, the applicant states that Class I structures and components (SCs) are required for safe shutdown and isolation of the reactor. In this USAR section, the applicant lists several structures and equipment as Class I; however, the applicant does not identify these structures and equipment in the LRA as within scope under 10 CFR 54.4 (a)(1). The definition of Class I in the USAR as noted above and in Appendix A, Section 2.2.2, includes components whose failure could cause significant release of radioactivity or vital to a safe shutdown. This definition aligns with components defined as required to be within scope of license renewal under 10 CFR 54.4 (a)(1).

These components may not be identified as safety-related in the applicant's current licensing basis. In accordance with NEI 95-10, if an applicant's definition of safety-related may not match that of 10 CFR 54.4(a)(1), then the applicant should apply the 10 CFR 54.4(a)(1) definition for purposes of identifying the systems, structures, and components that are within scope of license renewal. In LRA, the applicant identifies the following structures and equipment as Class I: the radwaste building (below grade), radwaste storage tanks, reactor water cleanup phase separators, and reactor building floor drain sump pumps.

The staff requests the applicant to justify the exclusion of those SCs identified as Class I in the USAR from inclusion as within scope of license renewal in accordance with 10 CFR 54.4(a)(1).

RAI 2.2-4

In the Cooper USAR, Chapter XII, Section 2.1, the applicant definition of Class II structures and equipment applicable to structural design requirements states that Class II designated items shall not degrade the integrity of any items designated Class I. In USAR Chapter 12, Section 2.1.3.1, the applicant identifies the turbine building and circulation water system structure among the list of Class II structures; however, in LRA Table 2.2-4, the applicant includes the discharge structure (seal well) in the list of structures of not within scope of license renewal. The staff noted that the safety-related service water systems utilize the discharge structure as its flow path to the river; LRA drawing 2006 sheet 3 does not show the discharge structure to be within scope of license renewal. The applicant has identified safety-related components in the turbine building, a class II structure; hence, their identification of Class II structures aligns with structures and components in scope under 10 CFR 54.4(a)(2).

According to 10 CFR 54.4 (a)(2), the applicant is required to specify SCs within scope of license renewal if the nonsafety-related SCs has the potential to affect a function of a system identified under 10 CFR 54.4(a)(1). The staff requests the applicant to justify the exclusion of the discharge structure and other Class II structures and equipment from the scope of license renewal, in accordance with 10 CFR 54.4 (a)(2).

B.2 <u>Aging Management Program (AMP) Audit April 20-24, 2009</u>

RAI 3.0-1

<u>Background</u>

Several of the aging management programs proposed by Cooper Nuclear Power Station are described as “new”. These programs do not include operating experience. While the staff acknowledges the fact that theses programs are new and that no operating experience with these programs exists per se, there may be plant or industry activities or operating experience which may be relevant to the development of these new programs. In addition, the Branch Technical Position, RLSB-1 (SRP Appendix A.1) states that “the applicant may have to commit to providing operating experience in the future for new programs to confirm their effectiveness.”

<u>Issue:</u>

The staff finds it difficult to evaluate the sufficiency of the proposed new aging management programs in the absence of operating experience.

<u>Request:</u>

For each of the aging management programs designated as “new”, please provide operating experience related to the subject of the aging management program. Operating experience should provide a sufficient basis to support adequacy of the new aging management programs.

Information should be provided for the following programs which were identified in the LRA as new programs:

(a) Above Ground Tanks (B.1.1)
(b) Buried Piping and Tanks Inspection (B.1.3)
(c) Metal Enclosed Bus Inspection Program (B.1.22)
(d) Non Environmentally Qualified Bolted Cable Connections (B.1.24)
(e) Non Environmentally Qualified Medium Voltage Cable (B.1.25)
(f) Non Environmentally Qualified Circuits Test Review (B.1.26)
(g) Non Environmentally Qualified Insulated Cables and Connections (B.1.27)
(h) One Time Inspection (B.1.29)
(i) One Time Inspection of Small Bore Piping (B.1.30)
(j) Selective Leaching (B.1.34)
(k) Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (B.1.37)

Additionally, for each of the new programs please commit to providing future operating experience.

RAI 3.1.2-1

Background:

In LRA Table 3.1.2-2 (page 3.1-52) and Table 3.3.1, item 3.3.1-47, the applicant states that the loss of material due to pitting and crevice corrosion in the shroud support is managed by the Water Chemistry Control – BWR Program and the effectiveness of the water chemistry program will be confirmed by the One-Time Inspection Program. The applicant also states that the Inservice Inspection – ISI Program of the LRA is not applicable to most reactor vessel internals components since they are not part of the pressure boundary.

Issue:

In contrast, the ASME Section XI inservice inspection requires periodic visual inspections for integrally welded core support structures and interior attachments to reactor vessels as described in Examination Category B-N-2.

It is not clear why the applicant does not credit the Category B-N-2 examination for the loss of material in the core shroud support.

Request:

Clarify whether the applicant performs the Category B-N-2 examination. Provide further justification why the water chemistry program is adequate to manage the loss of material without further periodic inspections.

RAI 3.3.1-1

Background:

In the LRA, the GALL Report Reactor Water Cleanup System (RWCU) AMP is not credited for the aging management of the stainless steel IGSCC in the RWCU system. Instead, the Water

Chemistry Control Program in conjunction with the One-Time Inspection Program was credited to manage the aging effect. The applicant's approach might cause no further periodic inspections on the RWCU System.

The GALL Report recommends the following three criteria should be met to discontinue the IGSCC inspection of the RWCU system piping welds outboard of the second isolation valve:

(a) Satisfactory completion of GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance"

(b) No IGSCC detected in RWCU piping welds inboard of the second isolation valve (ongoing GL 88-01 inspection)

(c) No IGSCC detected in RWCU piping welds outboard of the second isolation valve after inspecting a minimum of 10 percent of the susceptible piping welds

The LRA Table 3.3.1, item 3.3.1-37, indicates:

- The applicant has complied with the requirements of GL 89-10
- Portions of the RWCU System were replaced with a SCC-resistant material
- No significant indications of SCC were observed on the piping that was not replaced

Issue:

It is not clear whether the applicant met all of the three criteria to discontinue the RWCU system inspections.

Request:

(a) Clarify whether all of the three criteria are met to discontinue the inspections of the outboard piping of the RWCU system.

(b) If all of the three criteria are not met, clarify what inspections will be performed for the inboard and outboard portions of the RWCU system piping, respectively, over the extended period of operation.

RAI 4.3-1

Background:

In Section 4.3 of the LRA, it states that "If the component has a fatigue TLAA that remains valid (i) or is projected to cover the period of extended operation (ii), then cracking due to fatigue is not an aging effect requiring management for those components during the period of extended operation".

Issue:

If cracks developed while the TLAA has concluded that the component is qualified for either 10 CFR 54.21(c)(1)(i) or 10 CFR 54.21(c)(1)(ii), then it is most likely because either the TLAA results have been questionable or the pre-operational inspection results and handling of the inspection results have been questionable. Cracking is a major safety issue for any operating structural components. Immediate remedial actions must be taken for cracks that are detected at any time.

Request:

The statement quoted under the Background subtitle above implies that cracking could be ignored as long as the stated conditions are met. Provide the basis to justify this statement and discuss how CNS would handle the situation

RAI 4.3-2

Background:

In Section 4.3 of the LRA, it states that "… flaw indications discovered during inservice inspection are TLAA for those analyses based on time-limited assumptions defined by the current operating term…. A review of such flaw growth analyses for CNS has identified none that are TLAA".

Issue:

The statement quoted above hints that CNS has discovered flaw indications, and those indications were not revealed during inservice inspections. Then, these indications most likely were discovered during the plant pre-operational phase.

Request:

(a) Clarify whether there were flaw indications during the ISI. If the indications were discovered during the pre-operational phase, what remedial or corrective actions have been taken?

(b) If flaw indications were discovered, describe the geometry of the flaws, including flaw size, flaw orientation, component, analysis method used, repair and disposition.

(c) Elaborate on the last part of the above quoted statement, i.e., "A review of such flaw growth analyses for CNS has identified none that are TLAA".

RAI 4.3.1-1

Background:

In Section 4.3.1 of the LRA, it states that "… For CNS, two transients (normal startup and turbine roll) are expected to exceed their analyzed value prior to the end of the period of extended operation. Specifically, normal startups project to reach the analyzed number of cycles for the feedwater piping, feedwater nozzles, main steam piping and core spray piping during the period of extended operation. As additional operating data is accumulated, subsequent projections will refine the number of cycles expected in 60 years. Continued improvements in plant operation could reduce the projected number of normal startups in 60 years to less than the analyzed number of cycles".

Issue:

It appears that the quoted statement requires some clarification.

Request:

(a) Explain, considering the quoted statement, why only the feedwater piping, feedwater nozzles, main steam piping and core spray piping would exceed the analyzed number of cycles and why not others?

RAI 4.3.1-2

Background:

In LRA Table 4.3-1, under the 1st Column, Transient Description, the 5th item is shown as "Turbine roll (assumed same as startup)".

Issue:

This transient description requires clarification.

Request:

(a) Please clarify why Turbine Roll transient is assumed to be same as Startup transient. What are involved in the assumption and why is it necessary to make such an assumption?

(b) Describe the differences between the Turbine Roll and Startup transients and the relationship between the two.

RAI 4.3.1-3

Background:

LRA Table 4.3-1 provides the transients types and their respective cycles and 60-year projected number of cycles, based on which fatigue evaluations were made.

Issue:

The LRA does not correlate LRA Table 4.3-1 to the proper section of the USAR of CNS. While USAR Table III-3-1 shows the reactor vessel thermal cycles, description of the transients and their associated cycles is not quite consistent with the transient names and the cycles shown in LRA Table 4.3-1.

Request:

(a) Turbine roll, hot standby (feedwater cycling), pipe rupture and blowdown, OBE, safety/relief valve actuations, and core spray injection transients were not listed in USAR Table III-3-1. Were these transients considered in the original stress and fatigue analyses? If not, how could you make a 60-year projection since the fatigue TLAA for license renewal and the original fatigue analysis have different basis? In addition, if not considered in the original analyses, how could you have satisfied the ASME III stress qualification and fatigue requirements in the first 40-year term license application?

(b) According to LRA Table 4.3-1, since the ratios of the 60-year projected cycles to the design cycles are distinct for each transient, there exists no single constant for making a quick and simple 60-year CUF projection. Please describe how CNS obtained the 60-year CUF values reported in Table 4.3-3.

RAI 4.3.1-4

Background:

LRA Section 4.3.1.1 discusses the TLAA for the Reactor Vessel. It indicates that the fatigue analysis involved measurement uncertainty recapture (MUR) power uprate in the spring of 2008. In this Section, the LRA states that "… Results of these analyses have been submitted to the NRC as part of the MUR request. Fatigue analyses for several locations were done using modern techniques and removing some conservatism that resulted in significantly lower CUFs".

Issue:

Clarifications are necessary as described below.

Request:

(a) Describe the modern techniques used for these analyses.

(b) Describe the conservatism which was removed in the new analyses and show differences between the new and old analysis results.

RAI 4.3.1-5

Background:

LRA Section 4.3.1.2.2 discusses feedwater nozzle cycles analyzed. It first discussed the feedwater on/off cycles and then followed by a discussion of feedwater rapid cycling.

Issue:

Clarifications are necessary as described below. In addition, the feedwater rapid cycling transient is not included in LRA Table 4.3-1.

Request:

(a) For the feedwater on/off cycles, the LRA states that CNS does not monitor these transients but assumes 6 cycles per shutdown. Please confirm this assumption is conservative by reviewing the records of actual cycles logged and calculate average cycles to date to compare with the assumed value of 6 cycles per shutdown.

(b) For the Feedwater rapid cycling, the LRA states that "…based on years of operation, and the number of analyzed years (40) will be exceeded during the period of extended operation". However, the feedwater rapid cycling transient is not included in LRA Table 4.3-1. Please explain why it is not included in LRA Table 4.3-1 and appropriately reflect it in Table 4.3-1.

(c) Describe the differences between the feedwater on/off cycles and the feedwater rapid cycling transients. Per the discussion in LRA Section 4.3.1.2.2, these are two different types of thermal events and none of these thermal events is included in USAR Table III-3-1. Then just like discussed in RAI 4.3.1-3, how could you make a 60-year projection since the fatigue TLAA for license renewal and the original fatigue analysis have different basis? Again, how could you have satisfied the ASME III stress qualification and fatigue requirements in the first 40-year term license application?

RAI 4.3.1-6

Background:

LRA Section 4.3.1.3 discusses TLAA for Reactor Vessel Internals, in which it states, "A qualitative review of the internals was performed for the measurement uncertainty recapture, concluding that the governing stresses for all RPV internal components in the MUR condition remain bounded by the existing values".

Issue:

It is unclear how a qualitative review could produce creditable results to conclude that all RPV internal components in the MUR condition remain bounded by the existing values.

Request:

(a) Provide basis to justify that a qualitative review is sufficient to conclude that all RPV internal components in the MUR condition remain bounded by the existing values.

(b) LRA Table 4.3-2 contains the CUF results for the RV internals. However, only a single location in the RV internal is reported, Core plate plugs. Why only one single location is reported? Is this the result from the original stress and fatigue analyses, or the value is reflecting the qualitative review and the value has accounted the MUR condition?

(c) Note 3 under Table 4.3-2 states that "Core plate plug CUF is for 32 EFPY and must be recalculated, or the plugs replaced, prior to the period of extended operation". This statement is translated to a commitment. Please confirm and include it in the Commitment list since it does not seem such an item existing in the current commitment list.

RAI 4.3.1-7

Background:

LRA Section 4.3.3 discusses TLAA concerning effects of reactor water environment on fatigue life. LRA Table 4.3-3 shows the projected 60-year environmentally assisted fatigue usage, EAF CUF, as well as the 60-year projected CUF without considering the reactor water effects, and the Fen values for all NUREG/CR-6260 locations. Note 1, which is intended for the results of the 60-year CUF without considering the reactor water effects states that the values were “recalculated for license renewal by removing conservatism and using the projected 60-year cycles from Table 4.3-1”.

Issue:

Clarification required.

Request:

Specify the elements that constitute the "conservatism", and describe analysis methods used in the recalculation that helped you to achieve the goal for lowering the CUF value.

RAI B.1.1-1

Background:

LRA Appendix B.1 Aging Management Programs and Activities, Section B.1.1 Aboveground Steel Tanks, states that the Aboveground Steel Tanks Program will be consistent with the program described in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report, Section XI.M29.* Appendix A.1, “Aging Management Review– Generic,” Table A.1-1, “Elements of an Aging Management Program for License Renewal identifies the ten elements of an acceptable AMP.

Issue:

LRA Section B1.1 commits to consistency with the Gall Report which includes the AMP ten elements. The CNS Aging Management Program Evaluation Report Non-Class 1 Mechanical, CNS-RPT-07-LRD07, Revision 2, Section 3.1 quotes the GALL Report XI.M29 element writeup and compares the CNS AMP to that. Description of the CNS AMP elements is not provided to evaluate the acceptability of the AMP.

Request:

For AMP B1.1, provide additional description of the basis, actions, support and specifics for the following elements:

A. Scope of Program
    1. Since the fire water storage tanks’ external painted surfaces are covered with insulation, clarify how periodic system walkdowns are adequate to manage the effects of corrosion and identify damaged coatings.
    2. The AMP states that paint was applied to the external surface of the tanks upon initial installation. Identify the current condition of the external paint and the basis for that determination.
B. Parameters Monitored or Inspected
    1. Since the fire water storage tanks’ external painted surfaces are covered with insulation, clarify how periodic system walkdowns are adequate to manage the effects of corrosion and identify damaged coatings.
    2. Identify if tank side and bottom wall thickness will be periodically monitored or inspected.

3. The AMP states that sealant was applied to the interface edge between the tank and concreter foundation upon installation. Identify the current condition of the sealant and the basis for that determination.

C. Detection of Aging Effects
   1. Since the fire water storage tanks' external painted surfaces are covered with insulation, clarify how periodic system walkdowns are adequate to manage the effects of corrosion and identify damaged coatings.
   2. Clarify how, and the frequency of, internal inspection or monitoring will adequately detect external corrosion, including at the steel/concrete interface.
   3. Provide basis for loss of material conditions and not measuring tank bottom surfaces prior to extended operation, and measuring thickness during the first ten years of extended operation.

D. Monitoring and Trending
   1. Since the fire water storage tanks' external painted surfaces are covered with insulation, clarify how periodic system walkdowns are adequate to manage the effects of corrosion and identify damaged coatings.

E. Acceptance Criteria
   1. Clarify that any degradation of the fire water storage tanks external surface pain and sealant at the steel/concrete interface will be an acceptance criteria, will be reported and will require further evaluation, or justify other criteria.

RAI B.1.2-1

Background:

In the CNS LRA, the B.1.2 "Bolting Integrity Program" states that it follows the guidance contained in NUREG-1339, EPRI NP-5769, and EPRI TR-104213. These guidance documents are referenced by the GALL XI.M18 Bolting Integrity Program. However, CNS states in their program basis documents that it also follows the guidance contained in other industry based recommendations including EPRI NP-5067, which is not referenced in the GALL Report.

Issue:

The use of references not explicitly identified in the GALL Report is considered an exception, and should be stated as such. Additionally, it is not clear when this guidance is used, and whether or not its usage will contradict the GALL guidance.

Request:

Please provide clarification on the use of EPRI NP-5067 as guidance for this program. Specifically, provide an explanation of any contradictions between the two sets of guidance and their impact on this program.

RAI B.1.2-2

Background:

In the CNS LRA, the B.1.2 "Bolting Integrity Program" is not clear in how it satisfies the GALL Report program element "monitoring and trending". Specifically, the element recommends bolting connections for pressure retaining components (not covered by ASME Section XI) to be "inspected daily. If the leak rate does not increase, the inspection frequency may be decreased to biweekly or weekly".

Issue:

CNS credits their corrective action program for meeting this inspection frequency. However it was not readily apparent how this is achieved. If this recommendation is not specifically addressed in written procedures and guidance, then an exception will be needed.

Request:

Please provide detailed plans for inspection frequency which satisfy this GALL element or identify this as an exception, and provide the basis for taking it as an exception.

RAI B.1.2-3

Background:

In the CNS LRA, the B.1.2 "Bolting Integrity Program" identifies an enhancement to the GALL report program element "preventive actions" regarding enhancement of guidance to clarify that actual yield strength is used in selecting materials for low susceptibility to SCC, to clarify the prohibition on use of lubricants containing MoS_2 for bolting at CNS, and to specify that proper gasket compression will be visually verified following assembly.

Issue:

The CNS LRA is not clear whether or not guidance being updated as a result of the enhancements will be applied to existing components to verify their compliance with the enhancements.

Request:

Please provide clarification on how the guidance which will be updated as a result of the listed enhancements will be applied to existing components.

RAI B.1.2-4

Background:

In the CNS LRA, the B.1.2 "Bolting Integrity Program" is stated to be a stand alone program which manages all bolts within the scope of license renewal with the exception of the reactor head studs. Upon closer review of the LRA, the staff has identified 3 line items which manage bolting, that are credited to be managed by other programs- Buried Piping and Tanks Inspection, and the Periodic Surveillance and Preventive Maintenance Program.

Issue:

The GALL Bolting Integrity Program allows for supplementation by other AMPs. However, a review must be done to ensure that these supplemental programs carry out the aging management recommendations of the Bolting Integrity Program. Since the LRA appears to have contradictory information, it is not clear which AMP will be used to manage the components and how it will be done.

Request:

Please provide clarification on the 3 line items described above, as well as the Bolting Integrity Program in regards to the use of programs to supplement it.

RAI B.1.3-1

Background:

The applicant states that the proposed aging management program (B.1.3) is consistent with the GALL Report. The scope of the proposed aging management program includes stainless steel. The scope of the Buried Piping Inspection Aging Management Program contained in the GALL Report includes “buried steel piping and tanks”. According to chapter IX.C of Volume 2 of the GALL Report, the definition of steel includes carbon steel as well as several types of cast iron and low alloy steels. Stainless steel is specifically not included in the definition of steel.

Issue:

Unlike steel, stainless steel is an active passive metal which is normally in its passive state. While it is possible for stainless steel to maintain its corrosion resistance in a non oxidizing environment if it is not physically damaged, to ensure the corrosion resistance of stainless steel, it is preferable to use it only in an oxidizing environment.

The aging management program (B.1.3) as proposed, includes stainless steel piping and tanks. Aging management program B.1.3, as proposed, also requires all pipes be coated. It is possible that the coating of stainless steel could place it in a reducing environment or an environment in which anaerobic bacteria could be prevalent. This could result in poor corrosion performance of the stainless steel piping.

Request:

Please justify the inclusion of stainless steel in the proposed aging management program or propose a different program for buried stainless steel components.

RAI B.1.3-2

Background:

The GALL Report recommends that the protective coatings applied to buried piping be in accordance with industry standard practice. The proposed aging management program states that protective coatings will be applied to buried piping but does not state that these coatings will be in accordance with industry standard practice.

Issue:

Based on the wording of the proposed aging management program (B.1.3) it would be possible to utilize a non standard coating and still comply with the proposed program. A non standard coating may, or may not, be effective in preventing corrosion of buried piping.

Request:

Please confirm that all piping coatings are in accordance with industry standard practice. Please identify the standard.

RAI B.1.6-1 (same as RAI B.1.8-1)

Background:

The applicant stated that LRA AMP B.1.6 and B.1.8 are consistent with GALL AMP XI.M8 and AMP XI.M4, respectively. The GALL AMPs provide the same inspection guidelines for Inconel 182 welds and stainless steel welds. However, recent industry experience at Pilgrim Nuclear Station indicated that CRD return line cap weld (Inconel 182 weld) experienced through wall crack due to IGSCC.

Issue:

Since Inconel 182 welds are more susceptible to IGSCC when exposed to BWR RCS water than the stainless steel welds, the inspection criteria for the 182 welds is different from stainless steel welds.

Request:

Identify where Inconel 182 welds exposed to RCS water are used in the following systems: (1) BWR Attachment Welds; and (2) BWR Vessel Penetrations. How this aging effect is managed?

RAI B.1.7-1

Background:

In LRA Table 3.1.1, item 3.1.1-41, the applicant states that for some components of the Reactor Coolant System (RCS), to which the BWR Stress Corrosion Cracking (SCC) AMP is not applicable, SCC is managed by the Water Chemistry Control – BWR Program and either the Inservice Inspection – ISI or One-Time Inspection Program is used.

Issue:
It is not clear what components of the RCS do not credit the BWR SCC AMP.

Request:

Clarify what components of the RCS do not credit the BWR SCC AMP. Provide the justification to use a different aging management program for the components rather than the BWR SCC AMP.

RAI B.1.7-2

Background:

In LRA Tables 3.2.2-2 and 3.2.2-8-2, the Core Spray System AMR items do not include any AMR item to manage stainless steel stress corrosion cracking (SCC) of piping in a treated water (> 140 °F) environment. The GALL Report recommends the BWR Stress Corrosion Cracking

Program to manage SCC in the Engineered Safety Features System including the Core Spray System.

Issue:

It is not clear whether an adequate AMP is credited for SCC in the Core Spray System.

Request:

Provide what AMP and AMR items are used to manage SCC in the Core Spray System if the system has the components subject to SCC.

RAI B.1.7-3

Background:

In the LRA, the applicant describes the AMR items of stainless steel piping in the Engineered Safety Features (ESF) System such as RHR, HPCI and RCIC Systems that are subject to stress corrosion cracking in a treated water (> 140 °F) environment. The consistency note for the AMR items is Note E, which means that the material, environment, and aging effect are consistent with the GALL Report, but a different aging management is credited rather than the BWR SCC program.

In the LRA, the applicant also describes the AMR items for stainless steel piping in the Auxiliary System that are subject to stress corrosion cracking in a treated water (> 140 °F) environment. The consistency note for the AMR items is also Note E as its implication is described above. In contrast to the Note E, LRA Table 3.2.1, item 3.2.1-18 and Table 3.3.1, item 3.3.1-38 indicate that none of the Engineered Safety Features System or Auxiliary System components are within the scope of the BWR Stress Corrosion Cracking Program and all relevant components are included in the reactor vessel, internals and reactor coolant system.

Issue:

It is not clear whether SCC in all components of the ESF and Auxiliary Systems is managed by an adequate aging management program.

Request:

Clarify what portions of the ESF and Auxiliary Systems are managed by the BWR SCC Program. Provide what aging management program is used to manage SCC in the other portions of the ESF and Auxiliary Systems if a different aging management program is used rather than the BWR SCC program.

RAI B.1.7.4

Background

The staff found that the ASME Code Section XI, 2001 Edition, 2003 Addenda was used for the program elements, Acceptance Criteria and Corrective Actions, of the applicant's program rather than the ASME Code Section XI, 1986 Edition as recommended by the GALL Report.

Issue

The edition and addenda of the ASME Code Section XI that the applicant program uses in the program are different from those the GALL Report recommends.

Request

Provide the justification for the program's use of a different edition and addenda of the ASME Code Section XI for the program elements.

RAI B.1.8.1 (same as RAI B.1.6.1)

Background

The applicant stated that LRA AMP B.1.6 and B.1.8 are consistent with GALL AMP XI.M8 and AMP XI.M4, respectively. The GALL AMPs provide the same inspection guidelines for Inconel 182 welds and stainless steel welds. However, recent industry experience at Pilgrim Nuclear Station indicated that CRD return line cap weld (Inconel 182 weld) experienced through wall crack due to IGSCC.

Issue

Since Inconel 182 welds are more susceptible to IGSCC when exposed to BWR RCS water than the stainless steel welds, the inspection criteria for the 182 welds is different from stainless steel welds.

Request

Identify where Inconel 182 welds exposed to RCS water are used in the following systems: (1) BWR Attachment Welds; and (2) BWR Vessel Penetrations. How this aging effect is managed?

RAI B.1.9-1

Background:

LRA AMP B.1.9, "BWR Vessel Internals," manages the aging degradation of various reactor vessel internals (RVI) components. Top guide grid beams are one of the RVI components that are susceptible to irradiated stress corrosion cracking (IASCC) when exposed to a neutron fluence value greater than 5×10^{21} (E > 1 MeV). Table IV B1-17 in NUREG 1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report," states that 5 percent of these top guide locations that are exposed to a fluence value greater than the aforementioned threshold value will be inspected using EVT-1 within six years after entering the period of extended operation. An additional 5 percent of these top guide locations will be inspected within 12 years after entering the period of extended operation.

Issue:

Contrary to this guidance in GALL, the applicant, in Appendix C, "Response to BWRVIP Applicant Action Items Cooper Nuclear Station," of the LRA stated that it will comply with the inspection requirements specified in the BWRVIP-26 report which does not include the GALL's inspection guidelines for the top guide components.

Request:

Clarify the inspection approach, method, frequency, and acceptance criteria that will be implemented.

RAI B.1.9-2

Background:

Reduction in ductility and fracture toughness can occur in stainless steel RVI components when they are exposed to high-energy neutrons (E > 1 MeV). In August 2006, the BWRVIP issued a staff-approved BWRVIP-100-A report, "Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds," which discusses fracture toughness results for the irradiated stainless steel materials. For stainless steel materials with exposure to a neutron fluence value equal to or greater than 1 X 10^{21} n/cm^2 (E > 1 MeV), the BWRVIP-100-A report identified lower fracture toughness value than that of the value reported in Appendix C of the BWRVIP-76 report, "BWR Vessel and Internals Project BWR Core Shroud Inspection and Flaw Evaluation Guidelines." During the license renewal period, core shroud welds and base materials may be exposed to neutron fluence values 1 X 10^{21} n/cm^2 (E > 1 MeV) or greater. The GALL AMP XI.M9 recommends that the flaw evaluation guidelines of the BWRVIP-76 shall be applied for cracked core shroud components.

Issue:

Since the inspection -100-A report, the staff is concerned that less conservative fracture toughness values could be used in the BWRVIP-76 report is based on fracture toughness values which are less conservative than the BWRVIP in the flaw evaluation methodology.

Request:

The staff requests that the applicant make a commitment that it will incorporate the crack growth rate evaluations specified in the BWRVIP-100-A report and develop generic inspection intervals for core shroud welds that are exposed to a neutron fluence value equal to or greater than 1 X 10^{21} n/cm^2. Provide the basis for using the non-conservative fracture toughness values of BWRVIP-76 instead of the values identified in BWRVIP-100-A report.

RAI B.1.9-3

Background:

The GALL AMR line item IV B1-14 indicates that cumulative fatigue evaluation is a TLAA for core shroud components.

Issue:

In Section 5.5 of the applicant's report CR-CNS-07-LRD04, "CNS Licensing Renewal Project – TLAA-Mechanical Fatigue," the applicant stated that the fatigue evaluation of the core shroud components is not based on the life of the plant and, therefore, it is not a TLAA.

Request:

Describe the details of any fatigue/cyclic or crack growth analysis that was performed for the core shroud. Also, please identify whether that analysis is a TLAA and demonstrate how the requirements of 10 CFR 54.21(c)(1) are met.

RAI B.1.10-1

Background:

As documented in LR-ISG-2006-01, past operating experience in Mark I steel containments has shown that loss of material due to corrosion may be significant in inaccessible sand bed regions. During our discussions, the applicant informed us that they performed a drywell sand cushion drain vacuum test in 1993 to address this issue.

Issue:

In looking at the results of the vacuum test, the staff found that only four of the eight sand cushion drains were tested to verify the areas were free of water. Although these tests did not reveal moisture, this does not ensure that the sand bed region is free of moisture as the remaining four sand drains were not tested. In addition, since the test was completed more than 15 years ago, there is no reasonable assurance that the results from the test are still valid.

Request:

Explain how CNS will verify that the remaining four (4) sand cushion drains are obstruction free. Furthermore, how CNS ensures there is no leakage causing moisture in the sand bed region, which could lead to corrosion of the drywell shell during the period of extended operation.

RAI B.1.12-1

Background:

LRA Section B.1.12 states that the Acceptance Criteria program element will be enhanced to specify the acceptance criterion for UT thickness measurements of the bottom surfaces of the diesel fuel oil day tanks, the diesel fuel oil storage tanks, and the diesel fire pump fuel oil storage tank.

Issue:

The LRA did not provide information pertaining to how the acceptance criteria for the UT thickness measurements of the bottom surfaces will be established.

Request:

Please clarify how the acceptance criteria for the UT thickness measurements of the bottom surfaces will be established and what this criteria will be based on.

RAI B.1.12-2

Background:

LRA Section B.1.12 states that sampling of fuel oil in diesel oil storage tank B showed indications of excessive water in the tank in 2005. The applicant stated that corrective actions were taken which included dewatering the diesel storage tank B so it was within acceptable limits. Later, in 2005 and 2006, samples of fuel oil were taken from the same tank and showed water. Further evaluation of these results indicated that the water was within acceptable limits. The applicant revised its testing procedures in order to clarify testing methods.

Issue:

The LRA did not provide information on the cause of the excessive water in the diesel oil storage tank B. Also, the LRA did not specify if any inspections were performed on the tank to see if the water had degraded the interior of the diesel storage tank B.

Request:

(a) Clarify the cause of the water in the diesel fuel that was discovered in the diesel oil storage tank B for the later time periods and provide details on the steps taken to correct these deficiencies to prevent recurrence in the future.

(b) Clarify if any inspections were performed to verify the condition of the tank interior and confirm that degradation has not occurred and provide a summary of the results.

(c) Provide a summary of results from subsequent sampling results of the fuel oil and any corrective actions that were taken based on these results.

RAI B.1.13-1

Background:

NUREG-1801 for program element, “Acceptance Criteria” states:

> *Acceptance Criteria:*
> 10 CFR 50.49 acceptance criteria are that an inservice EQ component is maintained within the bounds of its qualification basis, including (a) its established qualified life and (b) continued qualification for the projected accident conditions. 10 CFR 50.49 requires refurbishment, replacement, or requalification prior to exceeding the NUREG-1801, Rev. 1 X E-4 September 2005 qualified life of each installed device. When monitoring is used to modify a component qualified life, plant-specific acceptance criteria are established based on applicable 10 CFR 50.49(f) qualification methods.

Issue:

Part (b) of the acceptance criteria, “continued qualification for the projected accident conditions,” is not included in B.1.13, program element, “Acceptance Criteria.”

Request:

Provide the justification for the missing acceptance criteria or revise to include the missing information under part (b).

RAI B.1.13-2

Background:

NUREG- 1801, Rev 1, X.E1, Program Element states:

> Operating Experience: EQ programs include consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended functions during accident conditions after experiencing the effects of inservice aging.

A review of CNS-RPT-07-LRD05 condition reports for electrical, instrument, and control components did no clearly differentiate condition reports relating to EQ. The EQ program operating experience is not referenced in B.1.13 including information and discussion on the EQ improvement project.

Issue:

A review of CNS-RPT-07-LRD05 condition reports for electrical, instrument, and control components did no clearly differentiate condition reports relating to EQ. The EQ program operating experience is not referenced in B.1.13 including information and discussion on the EQ improvement project.

Request:

Please provide representative recent operating experience (post EQIP) for electrical components related to EQ. In addition provide a summary discussion related to B.1.13 to include a discussion on the EQ improvement project.

RAI B.1.14-1

Background:

GALL AMP XI.M36 states that this program is limited to the detection of loss of material due to general, pitting and crevice corrosion for components fabricated of steel only. Further, the GALL Report, NUREG-1801, Vol. 2, Rev. 1, in Section IX, p.IX-12, provides a definition of "steel" as:

> For a given environment, carbon steel, alloy steel, cast iron, gray cast iron, malleable iron, and high strength low alloy steel are vulnerable to general, pitting, and crevice corrosion, even though the rates of aging may vary. Consequently, these metal types are generally grouped for AMRs under the broad term "steel. Note that this does not include stainless steel.

Issue:

In the External Surfaces Monitoring Program basis document, CNS-RPT-07-LRD07, the applicant credits the External Surfaces Monitoring program with managing the loss of material in aluminum, copper alloy, gray cast iron, nickel alloy, and stainless steel components.

Request:

(a) Provide additional information to justify the basis for expanding the scope of material beyond steel components as recommended by GALL AMP XI.M36

(b) Provide justification that the CNS External Surfaces Monitoring Program will manage aging effects for these additional materials included in the scope of the program

(c) Why is crediting this program for managing loss of material for aluminum, copper alloy, gray cast iron, nickel alloy and stainless steel components not considered an exception to the GALL Report

RAI B.1.14-2

Background:

GALL AMP XI.M36 states that surfaces that are inaccessible or not readily visible during both plant operations and refueling outages are inspected at such intervals that would provide reasonable assurance that the effects of aging will be managed such that applicable components will perform their intended function during the period of extended operation.

Issue:

The CNS External Surfaces Monitoring Program basis document, CNS-RPT-07-LRD07, states that surfaces that are inaccessible or not readily visible during both plant operations and refueling outages are inspected at such intervals that would provide reasonable assurance that the effects of aging will be managed such that applicable components will perform their intended function during the period of extended operation. The referenced document, Section 5.1.2 of 98-03-04, does not state when and how these surfaces will be inspected.

Request:

(a) What are the components that are not accessible during both plant operations and refueling outages?

(b) How will they be inspected and at what frequency will they be inspected to assure that aging effects will be managed during the period of extended operation?

RAI B.1.14-3

Background:

GALL AMP XI.M36 states that this program may also be credited with managing loss of material from internal surfaces, for situations in which material and environment combinations are the same for internal and external surfaces such that external surface condition is representative of internal surface condition. When credited, the program should describe the component internal environment and the credited similar external component environment inspected.

Issue:

The CNS Aging Management Program Evaluation Report, CNS-RPT-07-LRD07, in Section 4 credits this program for managing loss of material for internal surfaces by visual inspection of the external surfaces for carbon steel components. It also specifies the systems for which the internal surfaces of components will be credited under this program. The aging management review documents for specific systems provide general descriptions of the environment, e.g., air indoor (int.) and air indoor (ext.) for general component groups, e.g., pipes.

Request:

Provide the documentation or the method of documenting for each component the internal surface environment and the corresponding similar external surface environment for the internal component surfaces for which this program is being credited.

RAI B.1.14-4

Background:

GALL AMP XI.M36 states that degradation of steel surfaces cannot occur without the degradation of the paint or coating. Confirmation of the integrity of the paint or coating is an effective method for managing the effects of corrosion on steel surfaces but not for stainless steel.

Issue:

The CNS Aging Management Program Evaluation Report states that the program also manages the aging effects of aluminum, copper alloy, gray cast iron, nickel alloy, and stainless steel surfaces. The document further states that general corrosion of these surfaces will manifest itself as visible rust or rust byproducts (e.g., discoloration or coating degradation) and be detectable prior to any loss of intended function.

Request:

Provide justification for claiming that general corrosion of surfaces of materials such as aluminum, copper alloy, gray cast iron, nickel alloy, and stainless steel that CNS is crediting under this program would manifest itself as visible rust or rust byproducts. Also, the staff questions whether general corrosion of stainless steel surfaces would manifest itself as visible rust or rust byproducts as this is not consistent with the GALL Report.

RAI B.1.14-5

Background:

GALL AMP XI.M36 states that the External Surfaces Monitoring Program uses standardized monitoring and trending activities to track degradation. Deficiencies are documented using approved processes and procedures such that results can be trended.

Issue:

The CNS Aging Management Program Evaluation Report, CNS-RPT-07-LRD07, states that deficiencies are documented so that results can be trended. The referenced documents, Section 4 of Systems Engineer Desktop Guide, 98-03-04, and Section 2 of Administrative Procedure 0.5 CR, discuss the philosophy of systems walkdowns and when and how to write a CR. However, these documents do not describe the trending activities.

Request:

Describe the trending activities that will be used at CNS. How does the program track reoccurrence of conditions? How does the program provide predictability of the extent of degradation and thus timely corrective or mitigative actions?

RAI B.1.14-6

Background:

GALL AMP XI.M36 states that for each component/aging effect combination, the acceptance criteria are defined to ensure that the need for corrective actions will be identified before loss of intended functions. Acceptance criteria include design standards, procedural requirements, current licensing basis, industry codes or standards, and engineering.

Issue:

The CNS Aging Management Program Evaluation Report states that engineering evaluations consider procedural requirements, current licensing basis, industry codes but does not specify the specific codes and standards.

Request:

Cite the specific codes or standards that will be used to determine acceptability. At what point or what criteria are used to decide when corrective actions will be implemented?

RAI B.1.14-7

Background:

CNS has added an enhancement to the External Surfaces Monitoring Program to enhance the guidance documents to clarify that inspections of systems within the scope of license renewal will be inspected. Also, the enhancement adds inspections of surrounding areas to indentify hazards to the subject systems and inspections of nearby systems that could impact the subject systems.

Request:

Provide examples of:

(a) hazards in areas surrounding the subject systems and

(b) SSCs in nearby systems that could impact the subject systems that are in the scope and subject to aging management for review for license renewal in accordance with 10 CFR 54.4 (a)(2) that will be inspected under this enhancement.

RAI B.1.15-1

Background:

Program Element 2 of NUREG-1801 (GALL Report) Section X.M1 is concerning preventive actions. For Program Element 2, the GALL Report states: “Maintaining the fatigue usage factor below the design code limit and considering the effect of the reactor water environment, as described under the program description, will provide adequate margin against fatigue cracking of reactor coolant system components due to anticipated cyclic strains”.

Under the CNS Fatigue Monitoring program, B.1.15 (CNS-RPT-LRD02, Revision 1), program element 2 subsection b states that: “The Fatigue Monitoring Program uses the systematic counting of design cycles and the evaluation of operating data to ensure that component design fatigue limits are not exceeded…”. In this same subsection, it brings up an Enhancement clause, stating that “Consideration of the effect of the reactor water environment will be accomplished through implementation of one or more of the following options for the feedwater nozzles, core spray nozzles and RHR pipe transition.”

Issue:

There is no discussion on why the FMP is limited only to 3 locations.

Request:

(a) Describe the locations that are monitored in the FMP for license renewal. If the program is limited only to 3 locations, please provide justification.

(b) Clarify the parameter CUF stated in bullet (2) of element 2 subsection b. Does it account for environmental effects? Or not?

RAI B.1.15-2

Background:

Program Element 3 of NUREG-1801 (GALL) Section X.M1 is concerning with parameter monitored/inspected. GALL requires the program to monitor all plant transients that cause cyclic strains, which are significant contributors to the fatigue usage factor.

Issue:

The CNS FMP only monitors the design cycles assumed in the RCS component design analyses.

Request:

(a) Please list those transients that would contribute to fatigue usage but are not included in the design transients and update CNS FMP Element 3 accordingly.

RAI B.1.15-3

Background:

Program Element 4 of NUREG-1801 Section X.M1 is concerning detection of aging effects. Under the CNS Fatigue Monitoring program, B.1.15 (CNS-RPT-LRD02, Revision 1), Program Element 4 subsection b states: "No actions are taken as part of this program to detect aging effects … If a design cycle assumption is approached, corrective action is taken which will include update of fatigue usage calculation, if necessary".

In addition, Program Element 5 of NUREG-1801 Section X.M1 is concerning with monitoring and trending. Under the CNS Fatigue Monitoring program, B.1.15 (CNS-RPT-LRD02, Revision 1), Program Element 5, subsection b, it states: "The Fatigue Monitoring Program monitors the number of pressure and temperature transient cycles and periodically compares this cycle count with the design cycle count to ensure that fatigue sensitive components remain within their allowable design….".

Issue:

Clarification is deemed necessary, as described below. Additionally, Element 5 indicates that only the feedwater nozzle will be monitored.

Request:

(a) Please provide basis why taking "no action" will achieve the goal of detecting aging effects.

(b) Clarify the term "design cycle assumption" in the statement quoted above. LRA Table 4.3-1 shows that design cycles of some of the transients will be exceeded during the period of the extended operation. Given that projected cycles for 60 years exceeds analyzed cycles for some transients, what corrective actions will be taken?

(c) GALL requires all high fatigue locations are monitored, not just at the most limiting location within the applicable NUREG/CR-6260 locations, as minimum. Please provide justification if fewer locations are monitored.

RAI B.1.15-4

Background:

Program Element 6 of NUREG-1801 Section X.M1 is concerning with acceptance criteria. Under the CNS Fatigue Monitoring program, B.1.15 (CNS-RPT-LRD02, Revision 1), Program Element 6 subsection b states: "The Fatigue Monitoring Program acceptance criteria are that none of the transients exceeded the allowable numbers in USAR Table III-3-1 …"

Issue:

Clarification is deemed necessary, as described below.

Request:

(a) LRA Table 4.3-1 shows that design cycles of some of the transients will be exceeded during the period of the extended operation. Explain why cycles defined in USAR Table III-3-1 can be used as the acceptance criterion. It should be noted that environmental effects must be considered in exercising the acceptance criteria.

(b) In contrast to GALL Section X.M1 Element 6, the cited paragraph from AMP B.1.15 does not specify that environmental effects are considered for all analyzed locations. Provide justification for exclusion of environmental effects from the acceptance criteria, or provide rewording of the AMP to indicate that environmental effects are considered for all analyzed locations.

RAI B.1.15-5

Background:

Program Element 10 of NUREG-1801 (GALL Report) Section X.M1 is concerning with operating experience. For Program Element 10, the GALL Report states: “The program reviews industry experience regarding fatigue cracking. Applicable experience with fatigue cracking is to be considered in selecting the monitored locations”. Under the CNS Fatigue Monitoring program, B.1.15 (CNS-RPT-LRD02, Revision 1), Program Element 10 subsection b states: “Operating experience shows that this program has been effective in managing aging effects …”

Issue:

The "operating experience" program element of the Fatigue Monitoring Program, B.1.15 made no mention about industry operating experience of any kind. The only operating experience presented is concerning with transient cycle tracking of CNS’ own plant.

Request:

(a) Describe the documents that CNS has reviewed in considering the industry experience on metal fatigue and provide the corresponding follow-up actions taken by CNS.

(b) List industry experiences which have been incorporated into the CNS Fatigue Monitoring Program.

RAI B.1.15-6

Background:

Engineering Procedure 3.20 provides for collection of RPV operational transients, as implemented by the Fatigue Monitoring Program.

Issue:

Engineering Procedure 3.20 does not provide criteria defining “a transient.”

Request:

(a) The record for 2003 states that the SCRAM on 12/2/02 “is not recorded as a transient.” What were the thermal and pressure characteristics of this SCRAM and why was it not identified as a transient?

(b) The record for 2003 also identifies a new transient on 4/20/00.

- Why was this transient not identified contemporaneous with its occurrence? If this was due to a redefinition of conditions that qualify as a transient, were there other newly identified transients?

- What corrective actions were implemented to ensure that future transients would not be missed?

RAI B.1.15-7

Background:

Under the Program Description of the Fatigue Monitoring Program, B.3.1.15, the LRA states that “the program ensures the validity of analyses that explicitly assumed a fixed number of thermal and pressure transients by assuring that the actual effective number of transients does not exceed the assumed limit.”

Issue:

In the LRA, there was no description or discussion regarding how CNS has been and will be monitoring the severity of pressure and thermal (P-T) activities during plant operations. It is essential that all thermal and pressure activities (transients) are bounded by the design specifications (including P-T excursion ranges and temperature rates). Furthermore, cycles of all significant thermal events should be captured and logged.

Request:

(a) Describe the procedures that CNS uses for tracking thermal transients.

(b) Confirm that all monitored transient events are bounded by the design specifications.

(c) Specify the time (years) over which actual transient monitoring and cycle tracking activities took place. If there have been periods where transient data were not recorded since the initial plant startup specify the affected time frame. For the time periods for which transients were not monitored, provide justification to demonstrate that the projected cycles for this unmonitored period are conservative.

(d) Provide a histogram of cycles accrued for normal start and normal shutdown transients.

(e) “Background” paragraph above indicates that the CNS Fatigue Monitoring Program is based on an assumed number of cycles of transients to ensure the validity of analyses.

Describe how those assumed number of cycles were established and explain why the assumed number of cycles can be used as basis to validate the Fatigue Monitoring Program.

RAI B.1.15-8

Background:

Under the Program Description of the Fatigue Monitoring Program, B.3.1.15, the LRA states "This program also addresses the effects of the coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant." Analysis concerning the effects of reactor water environment on fatigue is provided in LRA Section 4.3.3 and the results are presented in LRA Table 4.3-3.

The SRP provides guidance to review effects of the reactor coolant environment on the fatigue life.

Issue:

Note 2 under Table 4.3-3 of the LRA states that "F_{en} are based on the specific oxygen concentrations at each specific location, adjusted for the time spent with normal water chemistry and the time spent with hydrogen water chemistry". It is noted that value of F_{en} depends on the material of the structural component, strain rates, operating temperature and chemistry of the reactor water. However, information or technical discussions are not provided in the LRA.

Request:

(a) Specify the analysis method(s) used for computing fatigue usage factors (CUF) for *all* Class 1 components, including NUREG/CR-6260 locations. Clarify whether any of the CUF values shown in LRA Tables 4.3-2 and 4.3-3 were calculated using FatiguePro, which considers only a single component of a stress tensor. If the answer is positive, describe the corrective actions taken or commitments.

(b) Provide a summary of the environmental factor (F_{en}) calculation for each structural component analyzed, including the values of dissolved oxygen (DO) level, temperature and strain rate used in the calculations.

(c) Describe the equation that was used for the time and water chemistry adjusted F_{en} calculations.

(d) Summarize CNS's experience in control of DO concentration in the reactor water since the plant startup. Describe all water chemistry programs CNS has used, including procedures and requirements used for managing DO concentration as well as the inception date of each water chemistry program.

(e) Describe the control parameters used to maintain and demonstrate chemistry control, and how the dissolved oxygen values vary with the expected and acceptable variations in these parameters.

(f) Describe how chemistry upset conditions have been considered in the F_{en} calculations.

RAI B.1.16-1

Background

In its LRA, CNS proposed an 18-month functional testing cycle to the Halon & CO_2 fire suppression systems as exceptions to the NUREG-1801 program, which calls for a 6-month cycle. The Exception Notes at the bottom of page B-50 state, in part that "This frequency is sufficient based on station operating experience."

Issue:

It is not clear to the reviewer as to why the 18-month functional testing is sufficient based on station operating experience.

Request:

Please provide additional details on plant operating experience to justify the 18-month functional testing cycle, and (2) the specific edition/year of the NFPA 12 *Standard on Carbon Dioxide Extinguishing Systems* and NFPA 12A *Standard on Halon 1301 Fire Extinguishing Systems* Cooper references in its fire protection technical basis document. Please include the title and the document number of the technical basis document in the response.

RAI B.1.18-1

Background:

GALL Section XI.M17, "Flow-Accelerated Corrosion," states:

> The program relies on implementation of the Electric Power Research Institute (EPRI) guidelines in the Nuclear Safety Analysis Center (NSAC)-202L-R2 [Referencing Revision 2] for an effective flow-accelerated corrosion (FAC) program.

Issue:

LRA Section B1.18, for Flow Accelerated Corrosion states: The program, based on EPRI recommendations in NSAC-202L for an effective flow-accelerated corrosion program, predicts, detects, and monitors FAC… Later in the same section, it notes that the program will be enhanced by updating the System Susceptibility Analysis to reflect lessons learned and new technology that became available after the publication of NSAC-202L, Revision 1.

Based on the program enhancement, the current program is based on NSAC-202L, Revision 1. However, the LRA does not state, that following the enhancements, all elements of the program will implement the guidance of NSAC-202L, Revision 2 or later.

Request:

Provide information to indicate that, with the enhancement, all of the elements within the flow accelerated corrosion program will implement the guidance of NSAC-202L, Revision 2 or later. Alternately, identify differences between the proposed program and Revision 2 and provide justification for the proposed program in managing FAC at Cooper.

RAI B.1.18-2

Background:

GALL Section XI.M17, "Flow-Accelerated Corrosion," for the program scope states, in part, that the guidelines in NSAC-202L program assure the structural integrity is maintained for all carbon steel lines containing high-energy fluids. There are no operational-time limitations discussed in this GALL program, relative to excluding systems from the scope of the program.

Issue:

The program description in LRA Section B.1.18, "Flow-Accelerated Corrosion," states, in part, that this existing program applies to systems containing high-energy fluids that operate "greater than or equal to two percent of plant operating time per the criteria given in EPRI NSAC-202L." Although the EPRI guidance document does state that systems in operation less than 2 percent of plant operating time can be excluded from the scope of the program, the sentences, which immediately follow, caution that:

> …if service is especially severe (e.g., flashing flow), that system should not be excluded from evaluation based on operating time alone. A further caution – some lines that operate less than 2% of the time have experienced damage caused by FAC.

Request:

Provide justification for excluding systems from the scope of the FAC program that operate less than two percent of the time and describe how the associated caution statements in NSAC-202L will be addressed.

RAI B.1.18-3

Background:

GALL Section XI.M17, "Flow-Accelerated Corrosion," states:

> The program relies on implementation of the Electric Power Research Institute (EPRI) guidelines in the Nuclear Safety Analysis Center (NSAC)-202L-R2 [Referencing Revision 2] for an effective flow-accelerated corrosion (FAC) program.

NSAC-202L, Section 5.2, "Training and Engineering Judgment" notes, in part, that training of key personnel is essential and that personnel involved in the program be trained in FAC.

Cooper Nuclear Station's (CNS) Engineering Procedure 3.10, "Erosion/Corrosion Program," Section 2.1, "Training and Qualification," states, in part, that CNS personnel responsible for implementing the erosion/corrosion program will be qualified to TQD 0993, Erosion/Corrosion Program Engineer.

Issue:

Based on discussions during the audit, CNS routinely uses non-CNS personnel to implement certain engineering aspects of the FAC program. However, the controlling procedure, as written, does not address any training for non-CNS personnel involved in the program.

Request:

Provide information relative to training that will be required for non-CNS personnel involved in implementing the FAC program. If training will not be required, justify how the recommendations in NSAC-202L, regarding personnel training, will be addressed.

RAI-B.1.18-4

Background:

GALL Section XI.M17, "Flow-Accelerated Corrosion," for the program scope states:

> …the program includes the use of a predictive code, such as CHECWORKS, that uses the implementation guidance of NSAC-202L-R2 to satisfy the criteria specified in 10 CFR Part 50, Appendix B, criteria for development of procedures and control of special processes.

Issue:

Based on discussions during the audit, CNS classifies CHECWORKS as Level C Software "Business Important" through CNS Operations Manual, Station Computer Procedure 11.2, "Software Classification." Within this procedure, it notes for Level B Software, "Licensing Basis" that this level is for software products "that are important to compliance with regulatory requirements/**commitments** [emphasis added by staff]. In light of CNS' implementation of regulatory commitments associated with the Erosion/Corrosion Program, it appears that CHECWORKS should be classified as a Level B Software, "Licensing Basis."

Request:

Provide the basis for the current classification of CHECWORKS as Level C Software, "Business Important," and additionally address why it is not classified as Level B Software, "Licensing Basis."

RAI-B.1.19-1

Background:

In the CNS LRA Section B.1.19, "Inservice Inspection," the applicant stated that, "The Inservice Inspection – ISI Program is consistent with the program described in NUREG-1801, Section XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, with exceptions." It further described the exception that NUREG-1801 recommends the use of ASME Section XI Table IWB-2500-1 to determine the examination of category B-F and B-J welds whereas CNS uses examination category R-A in accordance with risk-informed methodology approved by the NRC for examination of Table IWB-2500-1 category B-F and B-J welds.

Issue:

The applicant needs to provide technical basis why the proposed alternative meets guidance specified in NUREG-1801, Section XI.M1.

Request:

Please provide technical basis that the proposed alternative meets guidance specified in NUREG-1801, Section XI.M1. Specifically, what is the sampling size as a result of the risk-informed methodology for each ASME Code category for the current inspection period, as compared to NUREG-1801 recommendation. Would the sampling size ever be zero for any category as a result of the proposed risk-informed methodology?

RAI B.1.21-1

Background:

The LRA states that aging management program B.1.21, "Masonry Wall Program," is consistent with the GALL report with one enhancement.

Issue:

For Element 4, "Detection of Aging Effect," the GALL report recommends "the most frequent inspection" for unreinforced masonry walls. However CNS does not discuss this in the basis document for this program.

Request:

Please discuss inspection frequency for the unreinforced masonry walls.

RAI B.1.21-2

Background:

For element 4, "Detection of Aging Effects," the GALL report recommends that the frequency of inspection is selected to ensure there is no loss of intended function between inspections.

Issue:

CNS states that inspections occur at least once every five years. There is no basis provided for this inspection frequency.

Request:

Please provide justification for the proposed inspection frequency.

RAI B.1.22-1

Background:

The applicant's "Metal Enclosed Bus" AMP is a new program that inspects non-segregated metal-enclosed bus. In the GALL Report external inspection of the segregated metal-enclosed bus is covered by GALL AMP XI.S6, "Structures Monitoring Program."

The applicant proposed an exception to GALL AMP XI.E4 to merge the external inspection portion of the "Metal Enclosed Bus" program GALL AMP XI.S6 into LAR AMP B.1.22. The applicant identified the affected program elements of GALL AMP XI.E4 as "Parameters Monitored or Inspected" and "Detection of Aging Effects."

Issue:

LAR AMP B.1.22 program elements are not consistent with the program elements of GALL AMP XI.S6 except for the identification of inspection of external surfaces and elastomers (Parameters Monitored and Inspected and "Detection of Aging effects" program elements).

Request:

Please reconcile the differences between GALL AMP XI.S6 program elements and LAR AMP B.1.22 including operating experience.

RAI B.1.22-2

Background:

The applicant's "Metal Enclosed Bus" AMP is a new program that inspects non-segregated metal-enclosed bus. In the GALL Report external inspection of the segregated metal-enclosed bus is covered by GALL AMP XI.S6, Structures Monitoring Program. Internal inspection is covered by GALL AMP XI.E4.

Applicant and staff walkdowns of in-scope segregated metal-enclosed bus duct between emergency station service transformer and 4.16 kV switchgear buses 1F and 1G and between start-up station service transformer and 4.16 kV switch gear buses 1A and 1B noted a potential for degraded environmental conditions due to numerous birds around and on the segregated bus duct and the associated support structure. The applicant stated that condition report CR-CNS-2009-01815 had previously been generated to address the degraded environment but was pending resolution

Issue:

The bus ducts experienced degraded conditions with a potential for long term degradation of the internal and external metal enclosed bus surfaces and elastomers. In addition, the staff is concerned that the observed degraded conditions may involve possible external and internal aging mechanisms not considered by the GALL Report.

Request:

Please provide condition report resolution. Provide justification that the resolution will control external and internal bus duct aging mechanisms due to bird infestation.

RAI B.1.24-1

Background:

The applicant states in LRA Table 3.6.1 that the plant specific Non-EQ Bolted Connections program is an alternate to GALL report AMP XI.E6.

The Non-EQ Bolted Cable Connection AMP Scope of Program states that bolted cable connections in an existing preventive maintenance program are also excluded from this AMP.

Issue:

The basis for the exclusion of bolted cable connections included in an existing preventive maintenance program is not discussed in LAR AMP B.1.24. See also GALL AMP XI.E6 or ISG LR-ISG-2007-02 scope of program descriptions.

Request:

For bolted cable connections that are part of an existing preventive maintenance program connections provide the justification for the exclusion of these connections from LRA AMP B.1.24. The justification should discuss the differences in inspection or test methods and the surveillance interval with respect to GALL AMP XI.E6. The analysis should demonstrate that the preventive maintenance program satisfies the program elements of GALL AMP XI.E6 or as revised by ISG LR-ISG-2007-02.

RAI B.1.24-2

Background:

The applicants' Non-EQ Bolted Cable Connection AMP description of Detection of Aging Effects follows either the GALL report AMP XI.E6 or ISG LR-ISG-2007-02 in that it specifies "other appropriate methods" for testing for LRA AMP B.1.24 program element, "Detection of Aging Effects".

Issue:

The type and application of "other appropriate methods" is not clear as to whether it may include either qualitative or quantitative inspections. The staff's concern is that a qualitative visual inspection does not support a one-time inspection program as proposed by ISG LR-ISG-2007-02. The type and application of "other appropriate methods" is not discussed by the applicant in LRA AMP B.1.24.

Request:

Establish whether CNS plans to employ qualitative visual inspections when insulated cable connections are not accessible for quantitative inspections such as contact resistance testing or thermography. Confirm that should visual inspections be employed, that they will be performed on a 5 year periodic basis with the first inspection prior to the period of extended operation.

RAI B.1.25-1

Background:

LRA AMP B.1.25 claimed that the program will be consistent with NUREG-1801, Section XI.E3, Inaccessible Medium-Voltage cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The Operating Experience element of the GALL Report states that minimizing exposure to moisture minimizes the potential for the development of water treeing. As additional operating experience is obtained, lessons learned can be used to adjust the program.

Issue:

Condition Report CR-CNS-2009-03078 documented results from a manhole inspection that were done for the license renewal aging management audit. As a result of this inspection significant water was found in the following manholes: MH7, MH8, and MH9. MH5. One manhole was not inspected since it is inside the main power transformer yard; however since it is part of the same duct, it is likely there is water inside that manhole as well.

Request:

(a) Explain how CNS meets the scoping of the program applicability of the GALL AMP XI.E3, when cables are exposed to significant moisture over long period of time (i.e. more than a few days).

(b) Explain how this operating experience and planed corrective actions will be used to enhance the Non-EQ Inaccessible Medium-Voltage Cables and Connections Program to minimize the potential for the development of water treeing before operating unit enters into extended operating period.

RAI B.1.27-1

Background:

NUREG-1800, Table 3.6-2, FSAR Supplement for Aging Management of Electrical and Instrumentation and Control System identifies when the inspection will be implemented and how often the inspection will be performed.

Issue:

Cooper USAR supplement for AMP B.1.27 does not provide the frequency of inspection.

Request:

Provide the inspection frequency for AMP B.1.27 in the USAR.

RAI B.1.29-1

Background:

LRA Section B.1.29 states in part:

A representative sample will be selected from each unique material and environment combination covered under each of the activities. Each sample size will be based on Chapter 4 of EPRI document 107514, Age Related Degradation Inspection Method and Demonstration, which outlines a method to determine the number of inspections required for 90% confidence that 90% of the population does not experience degradation (90/90). Components with the same material-environment combinations at other facilities may be included in the sample.

Issue:

The LRA did not provide the basis for the use of Chapter 4 of EPRI-107514. It is not clear how the inspection locations for the representative samples will be determined. It is not clear how components with the same material-environment combinations at other facilities will be included the sample.

Request:

(a) Please justify the basis for using Chapter 4 of EPRI-107514 to determine the sample size of inspections for each unique material and environment combination.

(b) Please clarify what is meant by the term “representative sample” and explain in detail how the inspection locations for this “representative sample” will be selected.

(c) Please clarify what is meant by the statement “Components with the same material-environment combinations at other facilities may be included in the sample” and justify the use of this information in CNS’s sample.

RAI B.1.30-1

Background:

In the CNS LRA Section B.1.30, “One-Time Inspection - Small Bore Piping,” the applicant stated that the program is consistent with the program elements in GALL AMP XI.M35, “One-Time Inspection of ASME Code Class 1 Small Bore Piping,” which recommends one time volumetric inspection of small bore piping.

Issue:

No specific information was provided regarding examination of small-bore piping socket welds. During an onsite audit discussion, the applicant indicated that there is a plan to address the issue.

Request:

Please provide information on examination of small bore piping socket welds at CNS.

RAI B.1.34-1

Background:

LRA Section B1.34, Selective Leaching, commits to consistency with the Gall Report which includes the AMP ten elements.

Issue:

The CNS Aging Management Program Evaluation Report Non-Class 1 Mechanical, CNS-RPT-07-LRD07, Revision 2, Section 3.5 quotes the GALL Report XI.M33 element wording and compares the CNS AMP to that. Description of the CNS AMP elements is not provided to evaluate the acceptability of the AMP.

Request:

For AMP B1.1.34, provide additional description of the basis, actions, support and specifics for the following elements:

A. Scope of Program
    1. Clarify the scope of the AMP for hardness measurements where feasible or other accepted mechanical inspection techniques. Clarify what are considered other accepted mechanical inspection techniques.
B. Preventive Actions
    1. Clarify whether water chemistry monitoring will be utilized for any components on this AMP.
C. Parameters Monitored or Inspected
    1. Provide description of the parameters to be monitored or inspected, including the methods or techniques to be used. Identify specifics of hardness testing or other industry accepted mechanical inspection techniques.
D. Detection of Aging Effects
    1. Clarify how, and identify the frequency of, inspection or monitoring will adequately detect internal or external corrosion caused by selective leaching.
E. Acceptance Criteria
    1. Identify and provide details of acceptance criteria for hardness or other mechanical inspection technique and clarify what constitutes "identification on of selective leaching," which would lead to further engineering evaluation and, if necessary a root cause analysis.
F. Operating Experience
    1. Confirm that CNS has had no operating experience that would indicate corrosion caused by selective leaching.

RAI B.1.35-1

Background:

The applicant indicates that the proposed aging management program is consistent with the aging management recommended by the GALL Report. In the Preventive Actions section of the proposed aging management program, the applicant states that chemical treatment is not used for biological control. The applicant also states that macro biofouling organisms have not been found at the plant. The operating experience reviewed (CR-CNS-2006-08450, CR-CNS-2007-

00259, CR-CNS-2007-00559, CR-CNS-2007-00716, CR-CNS-2007-01192) and responses to staff questions indicate that both of these statements are no longer correct.

Issue:

Plant conditions and operating practices appear to be in conflict with the proposed aging management program. Additionally, none of the operating experience reviewed indicated the details of the chemical treatments used (frequency, chemicals, dose rates, durations) or the effectiveness of those treatments. Appropriate actions relative to the mitigation of macro biofouling are different when clams are or are not present. The presence of clams at the plant may require a change in the proposed aging management program.

Request:

Please revise the proposed aging management program to reflect actual plant conditions and operations practices. Please provide information concerning the chemical treatments used (frequency, chemicals, dose rates, durations) and the effectiveness of those treatments. Please review the actions proposed by the aging management program in light of the presence of clams and revise the program as necessary.

RAI B.1.35-2

Background:

In the Preventive Actions section of the proposed aging management program, the applicant states that "components are lined or coated only where necessary to protect the underlying metal surfaces". The aging management program, Open-Cycle Cooling Water System (XI.M20) recommended by the GALL Report states that all piping should be lined or coated. Plant personnel indicate that internal linings or coatings are used on all buried piping and that all above ground piping is not internally coated. Operating experience reviewed indicates a significant number of failures of unlined piping.

Issue:

The proposed aging management program appears to be inconsistent with the program recommended by the GALL Report in that some of the piping in use at the plant is not coated as recommended. Based on the operating experience reviewed, this piping appears to be failing at a greater rate than the piping which is coated as recommended by the GALL Report.

Request:

Please justify why the proposed aging management program is consistent with the GALL report.

RAI B.1.35-3

Background:

In the Parameters Monitored section of the proposed aging management program, the applicant states that the proposed aging management program ensures "cleanliness and material integrity". Alternatively, in the same section, the aging management program recommended by the GALL Report states that the system should be periodically "inspected, monitored or tested to ensure heat transfer capabilities”.

Issue:

Ensuring cleanliness and material integrity differs from, and establishes a lower standard than, ensuring heat transfer capabilities.

Request:

Please modify the proposed aging management program to be consistent with the aging management program recommended by the GALL Report.

RAI B.1.35-4

Background:

In the Detection of Aging Effects section of the proposed aging management program, the applicant lists aging effects and mechanisms to be considered. This list does not include biofouling. The similar section of the aging management program recommended by the GALL report includes biofouling as an aging effect/mechanism.

Issue:

Biofouling is a critical issue in this aging management program which should be included in the Detection of Aging Effects section.

Request:

Please revise the proposed aging management program to include the detection of biofouling in the Detection of Aging Effects section.

RAI B.1.35-5

Background:

Generic Letter 89-13 establishes a variety of inspections and tests required to adequately maintain a service water system. Included within these requirements are testing intervals or frequencies.

Issue:

While many of these testing intervals are implicitly acknowledged by the applicant in supporting documents, explicit acknowledgement of some of the testing intervals appears to be lacking in documentation which can be readily connected to this aging management program.

Request:

Please identify all testing and inspection requirements imposed by Generic Letter 89-13. Please provide all testing intervals being utilized by the plant and demonstrate that these intervals are consistent with the requirements of Generic Letter 89-13.

RAI B.1.36-1

Background:

In the GALL Report AMP XI.S6, program element 3 and 4 states that for each structures/aging effect combination, the specific parameters monitored or inspected are selected to ensure that the aging degradation leading to loss of intended function will be detected and quantified before there is loss of intended function.

Issue:

As a results from a field walk-down with the applicant's technical staff on April 21, 2009, the staff noticed significant leaching deposits in the torus room between torus support # 15 and # 16 on and around RHR and HPCI piping penetrations and base of pipe support RH-H16; leaching deposits and water stains in the basement floor between torus support # 7 and 8, # 12 and 13, and at # 11; the nuts for several cast-in place anchors for the torus box beam assembly (main column support) have only couple of threads engaged. As a results, the applicant initiated CR-CNS-2009-03188, CR-CNS-2009-03185, and CR-CNS-2009-3194 respectively. For the intake structures: Division 1 and Division 2 of service water pump (E bay) where the staff noticed rusty/spalling on Division 1 of SW discharge strainer concrete pedestal, the applicant also initiated CR-CNS-2009-03204.

Request:

Please describe an aging effects included in the Structures Monitoring Program and how they are managed to ensure that there is no loss of intended function through the PEO.

RAI B.1.36-2

Background:

In the GALL Report AMP XI.S6, "acceptance criteria" program element stated that acceptance criteria are to be commensurate with industry codes, standards and guidelines, and are to also consider industry and plant-specific operating experience.

CNS's program basis document procedure LRD08 AMP 3.3 for Structures Monitoring Program, the applicant also stated that "…..Industry and plant-specific operating experience was also considered" (Ref. Section 7.3, 7.4 and 14.4, Administrative Procedure 0.27.1).

Issue:

There is no information provided as how industry and plant-specific operating experience considered.

Request:

Please provide how industry and plant-specific operating experience is included in the Structures Monitoring Program to be consistent with the GALL Report recommendations.

RAI B.1.36-3

Background:

As stated in LRA the Aging Management Program B.1.36 “Structures Monitoring Program,” is consistent with the GALL report with enhancements.

Issue:

For Element 5, “Monitoring and Trending,” GALL recommends Regulatory Position 1.5 in Regulatory Guide 1.160, Rev 2, as an acceptable basis for meeting the element. However, the CNS program basis document does not discuss it for this element.

Request:

Please discuss whether CNS uses the above Regulatory Position for its Structures Monitoring Program. If not please justify why the CNS program is consistent with GALL.

RAI B.1.36-4

Background:

For Element 4, “Detection of Aging Effects,” the GALL report recommends that the inspection schedule is selected to ensure that aging degradation will be detected and quantified before there is loss of intended functions.

Issue:

CNS states that inspections of accessible plant structures are performed at five-year intervals. There is no basis provided for this inspection frequency.

Request:

Please justify the proposed inspection frequency. In addition, please discuss and justify the inspection frequency for inaccessible areas.

RAI B.1.37-1

Background:

LRA AMP B.1.37, “Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel,” manages the reduction of fracture toughness due to thermal aging and reduction of fracture toughness due to radiation embrittlement on the intended function of CASS components. The AMP includes screening criteria to identify susceptible components and for each potentially susceptible component aging management is accomplished by either a supplemental examination or component-specific evaluation of susceptibility. The applicant claims that AMP B.1.37 is consistent with GALL AMP XI.M13.

Issue:

The GALL report states, "The screening criteria for susceptibility to thermal aging embrittlement are not applicable to niobium-containing steels; such steels require evaluation on a case-by-case basis." The staff's review of AMP B.1.37 showed that the applicant did not discuss whether any CASS materials were niobium bearing.

Request:

Please identify if niobium-bearing CASS material is used for any vessel internal components. If so, please provide a program for staff evaluation.

RAI B.1.37-2

Background:

LRA AMP B.1.37, "Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel," manages the reduction of fracture toughness due to thermal aging and reduction of fracture toughness due to radiation embrittlement on the intended function of CASS components. The AMP includes screening criteria to identify susceptible components and for each potentially susceptible component aging management is accomplished by either a supplemental examination or component-specific evaluation of susceptibility. The applicant claims that AMP B.1.37 is consistent with GALL AMP XI.M13.

Issue:

The GALL report states, "Flaw tolerance evaluation for components with ferrite content up to 25% is performed according to the principles associated with IWB-3640 procedures for submerged arc welds (SAW), disregarding the Code restriction of 20% ferrite in IWB-3641(b)(1). … Flaw evaluation of CASS components with 25% ferrite is performed on a case-by-case basis by using fracture toughness data provided by the applicant." In CNS-RPT-07-LRD02 Revision 1, the applicant stated: "Flaw evaluation for CASS components with >25% ferrite content will be developed on a case-by-case basis using fracture toughness data. The applicable BWRVIP guidelines will be used for flaw evaluation of internal components for which IWB-3500 and IWB-3640 are not applicable." It is not clear what the applicant means by "applicable BWRVIP guidelines" because none of the BWRVIP documents address the reduction of fracture toughness due to thermal aging embrittlement and radiation embrittlement.

Request:

Please clarify what is meant by applicable BWRVIP guidelines will be used for components for which IWB-3500 and IWB-3640 are not applicable. Unless it can be confirmed that there is no CASS with >25% ferrite, please provide a flaw evaluation methodology for CASS internal components with >25% ferrite for staff review.

RAI B.1.38-1

Background:

LRA Section B.1.38, "Water Chemistry Control – Auxiliary Systems" description states in part: "Program activities include sampling and analysis of water in auxiliary condensate drain system components, auxiliary steam system components, and heating and ventilation system components to minimize component exposure to aggressive environments."

Under "3. Parameters Monitored/Inspected," it states in part: "In accordance with industry recommendations, auxiliary condensate drain system and auxiliary steam system water parameters monitored are pH, conductivity, phosphate, sulfite, and iron." Furthermore, it also states that "In accordance with industry recommendations, heating and ventilation systems parameter monitored is sodium nitrite ($NaNO_2$)."

Issues:

- It is not clear to the reviewer the reason(s) why a plant-specific water chemistry control program is necessary for the auxiliary systems.
- The LRA did not include a reference to the aforementioned industry recommendations.

Request:

Please provide:

(a) a comparison between the plant-specific water chemistry control program and the closed-cycle cooling water system and the water chemistry program in NUREG-1801 volume 2 and a justification as to why the GALL programs are not suitable for the auxiliary systems

(b) Any applicable reference(s) to the industry recommendations.

RAI B.1.39-1

Background:

LRA Section B.1.39, "Water Chemistry Control-BWR," references CNS Operations Manual Chemistry Procedures 8.3 and 8.3VIP requirements for water chemistry parameters for three operating conditions, namely cold shutdown, startup/hot standby, and power operation. For startup/hot standby conditions, Procedure 8.3 specifies that an Action Level 3 condition is reached when the reactor water conductivity exceeds 2.0 µmho/cm. This is consistent with and, in fact, more conservative than the corresponding value of 5.0 µmho/cm given in EPRI Report 1008192 (BWRVIP-130), which supersedes EPRI Report TR-103515 (BWRVIP-29) and forms the basis for the GALL BWR water chemistry requirements. The applicant's Procedure 8.3 also specifies that an alternative Action Level 3 value of 20 µmho/cm applies during noble metal application, but does not indicate a time duration for this increased conductivity transient.

Issue:

Footnote b to Table 6.3.2 of BWRVIP-130 likewise allows for unspecified increased conductivity above its stated Action Level 2 value of 1.0 µmho/cm during the application of noble metals, but it specifies a time duration of approximately 48 hours for this conductivity transient.

Request:

Please define the time duration for the conductivity transient following noble metal application for which the applicant's Action Level 3 value of 20 µmho/cm applies.

RAI B.1.39-2

Background:

For power operating conditions, CNS Operations Manual Chemistry Procedure 8.3 specifies that an Action Level 1 condition is reached when the reactor water conductivity reaches or exceeds 0.18 μmho/cm, with certain exceptions noted for transient conditions. This is more conservative than the corresponding value of 0.30 μmho/cm given in EPRI BWRVIP-130 (BWRVIP-130). The applicant's Procedure 8.3 also allows a higher limit value of 0.5 μmho/cm when the conductivity is increased "due to soluble iron concentration."

Issue:

No exception is noted in EPRI BWRVIP-130 for higher conductivity limits associated with soluble iron.

Request:

Please provide a justification for the higher conductivity limit and a discussion of the procedure for determining the relative contributions of soluble iron versus more aggressive species to the total conductivity.

RAI B.1.40-1

Background:

In LRA Section B.1.40, "Water Chemistry Control-Closed Cooling Water," the applicant proposed an exception to GALL program elements Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria, that excludes performance and functional testing of closed cooling water systems from the program. This proposed exclusion is based upon EPRI Report 1007820 ("Closed Cooling Water Chemistry Guideline, Revision 1"), which supersedes EPRI Report TR-107396 and forms the basis for the GALL closed cooling water chemistry requirements. In this report, the applicant cites Section 8.4.4 stating that "performance monitoring is typically part of the engineering program." The applicant infers from this statement that performance monitoring can therefore be excluded from the closed cooling water chemistry program.

Issue:

If performance monitoring and functional testing of closed water system components such as heat exchangers is not included under the present program, it is not clear whether, how, and under what AMP this evaluation will be carried out.

Request:

Please indicate how and under what AMP the monitoring and functional testing of the closed water system components is to be carried out. If monitoring and functional testing is not carried out, please justify why it is not considered necessary.

RAI B.1.40-2

Background:

LRA Section B.1.40, "Water Chemistry Control-Closed Cooling Water," references CNS Operations Manual Chemistry Procedure 8.3 requirements for water chemistry parameters for the closed water system. In particular, Procedure 8.3 Sections 8.1 and 8.2 specify allowable limits on conductivity, pH, and concentrations of selected chemical species for the Turbine Equipment Cooling (TEC), Reactor Equipment Cooling (REC), and diesel generator jacket cooling water systems. These limits define chemistry warning limit (CWL) and selected Action Levels 1 and 2 conditions.

Issue:

In comparing these limits to the corresponding values in EPRI Report 1007820 Tables 5.1 and 5.7, it is noted that they are in compliance in all cases where the applicant provides values. However, a number of EPRI 1007820 limit values are omitted from the applicant's Procedure 8.3 tables. For the TEC and REC water systems, Procedure 8.3 does not specify Action Level 2 limits for conductivity, chloride, or sulfate, levels, nor does it state fluoride levels for either Action Levels 1 and 2. For the diesel generator jacket water chemistry, Procedure 8.3 does not specify Action Level 2 limits for nitrite concentrations, nor does it mentions limits on chlorides and fluorides.

Request:

Please clarify the reason for these apparent inconsistencies between Procedure 8.3 and EPRI Report 1007820 Tables 5.1 and 5.7.

RAI B.1.40-3

Background:

The applicant's condition report CNS-CR-2004-3119 describes an occurrence in which the dissolved oxygen level in the Turbine Equipment Cooling (TEC) and Reactor Equipment Cooling (REC) water systems averaged 6 ppm (saturation) for at least one year and probably longer. This compares with a maximum level of 50 ppb specified in the applicants Procedure 8.3, Rev. 51 and 200 ppb specified in EPRI Report 1007820 ("Closed Cooling Water Chemistry Guideline, Revision 1"), which supersedes EPRI Report TR-107396 and forms the basis for the GALL closed cooling water chemistry requirements. The condition report stated that the cause of the high oxygen level was under investigation, and it noted that oxygen monitoring in this system had been suspended from July of 2003 through July 7, 2004, the date of the report. Another dissolved oxygen excursion in the REC cooling water system was reported in 2006 (CNS-SR-2006-6741 CA-01), but the magnitude and duration of this excursion were not described.

Issue:

CNS-CR-2004-3119 and CNS-SR-2006-6741 CA-01 do not describe the long-term resolution of this problem, nor does they discuss possible degradation of the TEC and REC water systems.

Request:

Please describe the long-term resolution of this dissolved oxygen control problem and provide a discussion of any resulting potential degradation of the TEC and REC water systems. In addition, please discuss operating experience since these occurrences.