U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Meeting Between the U.S. Nuclear Regulatory Commission Staff and the Nuclear Energy Institute to Discuss Current License Renewal Topics

September 15, 2016

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Opening Remarks

Agenda

Time	Topic	Presenter
09:00AM	Opening Remarks	Jane Marshall Steve Bloom
09:15AM	Brief Status of Action Items	Heather Jones
09:25AM	Status of Interim Staff Guidance LR-ISG-2016-01	Seung Min
09:30AM	AMP XI.M31, Reactor Vessel Material Surveillance – staff to discuss the disposition of comments	Carolyn Fairbanks Allen Hiser
09:50AM	AMP X.M1, Fatigue Monitoring, and SRP 4.3, Metal Fatigue – staff to provide its final disposition	Jim Medoff
10:10AM	AMP XI.M12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel – staff to provide its final disposition	Jeff Poehler
10:40AM	AMP XI.S1, ASME Section XI, Subsection IWE – staff to provide its final disposition on containment liner bulges	Bryce Lehman George Thomas
11:00AM	International-IGALL	Allen Hiser
11:30AM	Questions from the Public	
11:45AM	Review Action Items, Closing Remarks	Evelyn Gettys Jane Marshall
12:00PM	Adjourn	

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Brief Status of Action Items

Closed Action Items

NRC: Consider rewording AMP XI.M11B to state that volumetric examinations are completed on a sample of the accessible and most susceptible bottom mounted instrumentation (BMI) nozzles

- Staff removed baseline inspections of BMI nozzles from AMP XI.M11B

NEI: Provide their feedback on the proposed changes to AMP XI.M16A and the corresponding SRP-SLR sections

- Staff reviewed industry's feedback and partially accepted the recommendations

NRC: Review recently issued EPRI report, consider whether modifications needed to further evaluation on irradiated concrete for BWR reactor pedestal supports

- During the 8/22 bi-weekly call with NEI, NRC staff stated that we won't modify the further evaluation for irradiated concrete for SLR based on the EPRI report. The report will be reviewed by RES, then dispositioned as appropriate.

NEI: Provide additional information for NRC to consider related to additional definition for the reactor coolant pressure boundary function

- After further internal NRC discussions, it was concluded that the additional definition for the reactor coolant pressure boundary is not needed

Open Action Items

NRC: Agreed to evaluate and consider potentially issuing interim staff guidance (ISG) or a generic communication to eliminate the recommendation to fulfill the actions in AMP XI.M5 from all license renewal guidance documents since it is being deleted from the SLR guidance documents.

Staff Response: The staff will not issue an ISG or a generic communication. There is only one BWR remaining to submit a first license renewal application that is impacted by AMP XI.M5.

Staff Recommendation: This action item is closed.

Open Action Items

NRC: Agreed to review the acceptance criteria program element for all AMPs to clarify what would be accepted as a reasonable level of degradation.

Staff Response: Below are examples of AMPs that will be clarified.

AMP	Wording for GALL-SLR Report	Revision
XI.M20	Fouling deposits are removed to determine if loss of material has occurred and to prevent further degradation in the system.	~~Fouling deposits are removed to determine if loss of material has occurred and to prevent further degradation in the system.~~ Friction (or roughness) factors are trended to confirm design flow rates can be achieved in the portions of the OCCW system where flow monitoring is not performed. Evidence of corrosion is evaluated for its potential impact on the integrity of the piping.
XI.M27	Draft GALL-SLR When fouling is identified, deposits are removed to determine if loss of material has occurred and to prevent further degradation in the system	Where such irregularities are detected, follow-up volumetric examinations are performed~~. When fouling is identified, deposits are removed to determine if loss of material has occurred and to prevent further degradation in the system.~~

Staff Recommendation: This action item is closed.

Open Action Items

NRC: Agreed to review AMP XI.M18 to determine whether it is clear in the AMP that 100 percent of all closure bolting is inspected for leakage on an “as practical” or “as accessible” basis.

Staff Response: We clarified the AMP to state:

> Bolted joints that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the components’ intended functions are maintained.

Staff Recommendation: This action item is closed.

Open Action Items

NRC: Agreed to consider rewording AMP X.M1 and SRP-SLR Section 4.3 to address the industry's concerns with NUREG/CR-6260 locations and bounding location guidance.

Staff Response: There is a presentation as part of this agenda to further discuss this action item.

Open Action Items

NRC: Agreed to review Westinghouse Topical Report WCAP-13045 and WCAP-15555 and consider whether modifications are needed to AMP XI.M12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel, for Westinghouse pump casings.

Staff Response: There is a presentation as part of this agenda to further discuss this action item.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

QUESTIONS

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Status of LR-ISG-2016-01

"Changes to Aging Management Guidance for Various Steam Generator Components"

Seung Min
Division of License Renewal

Interim Staff Guidance

- Draft LR-ISG-2016-01, “Changes to Aging Management Guidance for Various Steam Generator Components”
- Issued: June 07, 2016
- Staff is currently dispositioning 22 public comments on draft LR-ISG-2016-01.
- The staff expects the final LR-ISG to be issued by the end of this year.

Interim Staff Guidance

Frequency of Visual Inspections

- Draft LR-ISG-2016-01: Visual inspections of steam generator head internal areas performed when accessed for tube inspections.

- Comment 12: The frequency of visual inspections should not be specified
  - Suggest: once per the tube inspection period identified in Technical Specifications

- Staff's Response: Consistent frequency would be
  - Every 72 EFPM or every three outages, whichever most frequent

References to Latest EPRI Guidelines

- Comment 13: No need to reference specific report numbers of latest EPRI guidelines.

- Staff's Response: Identification of specific revisions of guidelines is necessary to clearly define program elements and attributes.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

QUESTIONS

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

AMP XI.M31, Reactor Vessel Material Surveillance

Carolyn Fairbanks
Division of Engineering
Allen Hiser
Division of License Renewal

Issues for AMP XI.M31

- Withdrawal and testing of an additional capsule
- Recommendation for capsule fluence
- Elimination of HAZ specimens from newly constructed capsules

Additional Capsule

Issue

Industry Comment: If a capsule has been examined in the prior 60 years of operation with a capsule fluence between 1-2 times the maximum ID fluence projected for the RPV for 80 years of operation, then withdrawal and testing of additional surveillance capsules during the subsequent period of extended operation should not be required.

Staff Response

The status of plant surveillance programs at the start of SLR vary significantly, primarily due to differing:

- program design requirements at time of vessel purchase;
- operating periods/neutron fluences/lead factors;
- plant-specific program or participation in integrated surveillance program;
- number of capsules/withdrawn and tested capsules/capsules placed in storage/in-vessel capsules; etc.

Additional Capsule

"One size fits all" AMP addressing all existing programs not possible.

Staff concern for plant circumstances:

- Long periods of time and large range of neutron fluence values between capsule data.
- Compounded by "double counting" of "40-year (EOL original program)" and "60-year (LR)" capsules.
- Not bounded by data for the current operations/P-T limits.
- Some occurrences of capsule test results led to changes in P/T limits.
- 60-year (LR) and 80-year (SLR) capsules are to be tested according to the Reporting Requirements of 10 CFR Part 50, Appendix H.

Additional Capsule

Staff Recommendation

This program includes removal and testing of at least one capsule ~~during~~ addressing the subsequent period of extended operation, with a neutron fluence of the capsule between one and ~~one and one quarter (1.25)~~ two times the projected peak vessel neutron fluence at the end of the subsequent period of extended operation.

If a capsule meeting this criterion has not been tested previously, then the program includes removal and testing of at least one capsule during the subsequent period of extended operation (or earlier) to meet this criterion. Note that it is not acceptable to redirect or postpone an existing license renewal capsule to achieve a higher fluence that meets the subsequent license renewal fluence criterion.

Capsule Fluence

Industry Comment

Peak wall fluence is not relevant for BWRs since they do not need to comply with the PTS Rule. The 1/4T fluence is the location of concern for BWRs.

- The SLR capsule fluence specification for BWRs should be based on 1/4T fluence, not peak RPV wall fluence.

Staff Response

- The “fluence of interest” should be that needed to demonstrate a regulatory provision is satisfied
- The 1/4T fluence is used for pressure-temperature (P-T) limits
- For TLAAs related to elimination of inspections for RPV circumferential welds and analyses for axial welds (SRP-LR, Rev. 2, Sections 4.2.3.1.4 and 4.2.3.1.5):
  - The “fluence of interest” is the peak surface fluence for the material of interest

Capsule Fluence

Staff Response – Partially accepted

Staff Recommendation

- The “fluence of interest” should be the fluence needed to demonstrate a regulatory provision is satisfied
- The 1/4T fluence is used for pressure-temperature (P-T) limits
- For TLAAs related to elimination of inspections for RPV circumferential welds and analyses for axial welds (SRP-LR, Rev. 2, Sections 4.2.3.1.4 and 4.2.3.1.5):
  - The “fluence of interest” is the peak surface fluence for the material of interest

Wording will indicate that the relevant fluence for each material is the material’s “fluence of interest” (e.g., peak surface fluence for PWRs and axial/circumferential weld TLAAs for BWRs, and 1/4T fluence for P-T limits)

HAZ Specimens

Industry Comment

Many plants will need to build reconstituted capsules for SLR to conform to GALL-SLR. **The draft GALL-SLR provides no guidance for the material specimen contents of the reconstituted capsules.**

- It is recommended that the reconstituted capsules include base metal and weld materials and that HAZ specimens should not be required.

Current Staff Response – Not accepted

Current Summary of Staff Recommendations

- The GALL-SLR does not provide a description of the number/type of reconstituted specimens in an additional capsule.
- Absent a change to Appendix H to 10 CFR Part 50 that would eliminate HAZ specimens, an Exemption to Appendix H may be warranted.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

QUESTIONS

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

AMP X.M1, Fatigue Monitoring, and SRP 4.3, Metal Fatigue

Jim Medoff

Division of License Renewal

AMP X.M1 and SRP 4.3

Issue: Comment 9, Attachment 3 of NEI February 29 comments:

"Some locations in NUREG/CR-6260 may have projected CUF/CUFen << 0.5. If this is the case, a plant should not have to monitor an SC with projected 80-year CUF/ CUF_{en} < 0.5."

Staff Response: Rejected

Staff Revision (GALL-SRP X.M1 and SRP-SLR 4.3) :

"Plant-specific justification can be provided to demonstrate that calculations for the NUREG/CR-6260 locations do not need to be included. ~~Alternatively, the sample set is limited to those locations which previously have been identified as the most limiting locations for the plant in the initial approved license renewal application.~~"

AMP X.M1 and SRP 4.3

Issue: Comment 10, Attachment 3 of NEI February 29 comments:

"The program monitors all applicable plant transients that cause cyclic strains and *are significant contributors* ~~contribute~~ to fatigue, as specified in the fatigue analyses, and *monitors or validates* appropriate environmental parameters that contribute to F_{en} values."

Staff Response: Partially accepted

Staff Revision:

"The program monitors all applicable plant transients that cause cyclic strains and contribute to fatigue, as specified in the fatigue analyses and monitors or validates appropriate environmental parameters that contribute to F_{en} values."

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

QUESTIONS

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

AMP XI.M12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

Jeff Poehler
Division of Engineering

XI.M12, Background

Scope of Program: Manages loss of fracture toughness due to thermal embrittlement (TE) in reactor coolant pressure boundary components fabricated from Cast Austenitic Stainless Steel (CASS).

Changes to Program Description, Scope of Program, and Detection of Aging Effects:

- Pump casings are no longer exempt from AMP requirements.
- Formerly exempted pump casings assuming licensees implemented Code Case N-481 alternative.
- In lieu of ASME Code, Sec. XI volumetric exam requirement, N-481 allowed:
  - VT-1 visual examination of the external surfaces of the weld;
  - VT-2 visual examination
  - VT-3 visual examination of internal surfaces whenever a pump is disassembled,
  - Flaw tolerance evaluation
- N-481 has been withdrawn, and not all provisions have been incorporated into the ASME Code, Section XI.
- Current ASME Code, Section XI requires VT-2 and VT-3 examination when disassembled but does not include VT-1 and flaw tolerance evaluation requirement of N-481.

XI.M12, Industry Position

Industry presented case for maintaining exemption for pump casings at 7/28/16 meeting.

- Multiple successful flaw tolerance evaluations have been performed for pump casings, resulting in ASME Code dropping this requirement
- These evaluations used saturated fracture toughness (fully aged), so should remain bounding for 80 years.
- ASME Code VT-1, VT-2, and VT-3 inspections are adequate for pumps with flaw tolerance evaluations
- Pump casings are not susceptible to TE and screening not required per NUREG-1801, Rev. 2, AMP XI.M12
- Industry provided WCAP-13045, a generic flaw tolerance evaluation for RCP casings covering all Westinghouse units.

XI.M12, WCAP-13045

- Appears to include all Westinghouse plants
- Determined bounding or “screening” loading levels
- Uses a conservative fracture toughness model for thermal embrittlement of the cast base metal. Assumes the cast base metal bounds weld metal.
- Flaws are postulated in or near welds.
- Includes the chemical composition and ferrite content of all RCP castings used in Westinghouse-design PWRs
- Pump castings are mainly CF8 (low molybdenum) with some CF8M (high molybdenum), some CF8M have ferrite ≥ 14%.
- NRC did not issue a safety evaluation of WCAP-13045, but approved Code Case N-481 via incorporation into RG 1.147.

XI.M12, Plant-Specific Code Case N-481 Implementation

- Licensees submitted plant-specific reports referencing the generic report.
- Plant-specific reports verified that plant-specific loads were below the WCAP-13045 screening levels.
- Some applicants for LR submitted updated flaw tolerance evaluations for 60 years.
  - Some of these used the NUREG/CR-4513 Rev. 1 model for CASS toughness
- Some plants for initial LR identified the N-481 evaluation as a TLAA. These TLAAs would need to be dispositioned for SLR.

XI.M12, Issues with Industry Position

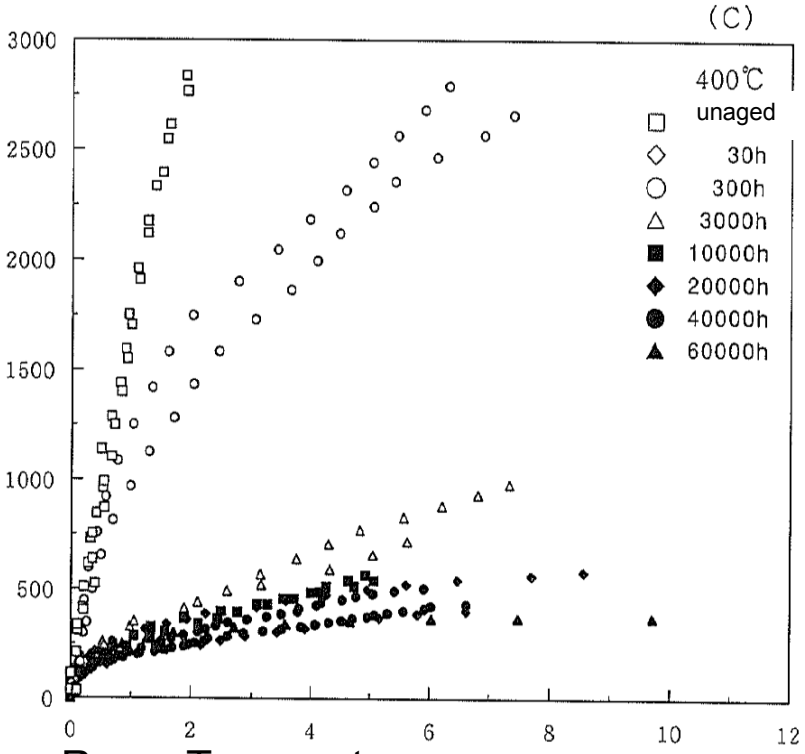
- Although the flaw tolerance evaluation was dropped by ASME Code, it was part of NRC's basis for exempting pump casings in AMP XI.M12.
- Industry provided some information on flaw tolerance evaluations, but the information is only applicable to Westinghouse-design PWRs.
- Industry has not comprehensively demonstrated that all pump casing flaw tolerance evaluations would remain applicable for 80 years.
  - Main issue is whether "saturated" properties for 40 years are really saturated for 80 years.
  - Do generic or plant-specific flaw tolerance evaluations for other vendors (CE, B&W) have similar results and large margins?
- Some pump casings are high molybdenum and ferrite 14% or greater CASS thus TE could be significant, would not meet screening criteria
- ASME Code requirements alone are not always considered sufficient for aging management.

XI.M12, NRC Resolution

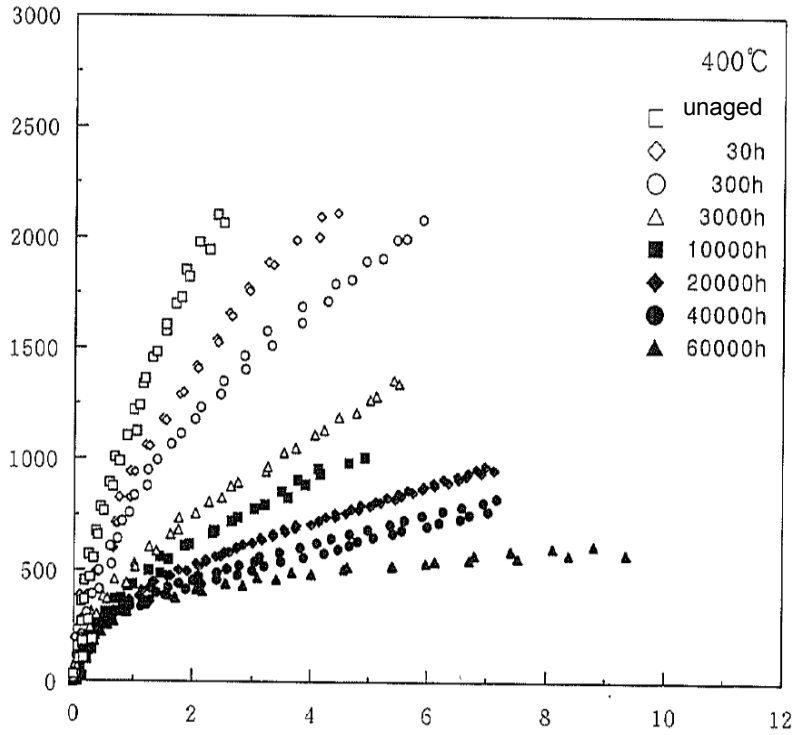
- NRC proposed modification is:
  - For pump casings, as an alternative to the screening and other actions [recommended by AMP XI.M12], no further actions are needed if applicants demonstrate that the original flaw tolerance evaluation performed as part of Code Case N-481 implementation remains bounding and applicable for the SLR period, or this evaluation is revised to be applicable to 80 years.
- In lieu of the above, applicants may choose to perform the screening process for significance of thermal aging embrittlement.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Change in J-R Curves with Different Time at Temperature for CF8M with 23% Ferrite



Room Temperature



325 C

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

QUESTIONS

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

AMP XI.S1, ASME Section XI, Subsection IWE

Bryce Lehman
Division of Engineering
George Thomas
Division of License Renewal

Proposed GALL-SLR Guidance

- Element 3: *"… Noncoated surfaces are examined for evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents, and other signs of surface irregularities including discernible liner plate bulges. Painted or coated surfaces, including those inside BWR suppression chambers, are examined for evidence of flaking, blistering, peeling, discoloration, and other signs of potential distress of the underlying metal shell or liner system, including discernible liner plate bulges. …"*

Proposed GALL-SLR Guidance

- Element 4: *"Regarding the extent of examination, all accessible surfaces receive at least a general visual examination as specific in Table IWE-2500-1 and the requirement of 10 CFR 50.55a. Bounding liner plate bulges with observed features discernibly larger than previous evaluation or design criteria are evaluated."*

- The proposed guidance is a *clarification* of the staff position on the issue

Staff Position

- IWE-2311 requires general visual of 100% of accessible surface areas to “determine general condition of containment surfaces and detect evidence of degradation”
- Containment bulges represent “signs of distress” or “surface irregularities” as discussed in IWE-2310
- Bulges should be found acceptable in accordance with IWE-3122 and IWE-3511, which states in part, “Suspect conditions shall be evaluated to the extent necessary to determine that the component function is not impaired.”
- In accordance with IWE-2320, the Responsible Individual should evaluate the bulges to the extent necessary to determine that the component function is not impaired consistent with the CLB

OE & Path Forward

- Operating Experience
  - Staff has OE from inspections and audits of licensees / applicants applying IWE consistent with the staff position
  - Staff has seen indications of bulge growth apparently from aging effects
  - Containment bulging is identified in Fig. 5.3 of the EMDA Report (NUREG/CR-7153) as a degradation mechanism
- Path Forward
  - Finalize GALL-SLR guidance based on discussions today
  - Consider issuing a generic communication to clarify staff position
  - Continue participation in ongoing ASME Code deliberations regarding this issue and existing code language

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

QUESTIONS

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

International GALL (I-GALL) Report

Allen Hiser

Division of License Renewal

Note: no slides for this presentation.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Questions from Members of the Public

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Review Action Items
Closing Remarks

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Adjourn