

WORKSHOP ON THE UPDATED LICENSE RENEWAL GUIDANCE DOCUMENTS

Division of License Renewal, NRR

5/26/10 – 5/28/10

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NRR/DLR/Aging Management Reactor Systems and
Guidance Updates (RARB)

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Purpose of the Workshop



- Opportunity for the staff to provide information about the draft GALL and SRP-LR NUREGs
- Open exchange of information about the draft NUREGs
- Opportunity for stakeholders to ask questions about the draft NUREGs
- Forum for stakeholders to provide informal feedback on the drafts

Workshop Limitations



- Formal comments on the draft NUREGs need to be provided through means identified in Federal Register Notice: written letter; e-mail; fax; and web forms.
- The workshop is NOT intended to be a forum to resolve comments on the draft NUREGs.
- The staff anticipates there will be some topics where we will not have sufficient time to fully discuss all aspects during the workshop. Ensure formal comments are submitted. If necessary, the staff will schedule focused public meetings following the close of the comment period to hold in-depth technical discussions.

Workshop Logistics



- Staff will invite comments/questions at specified times from participants (NEI/industry, in-person attendees, GoToMeeting participants, phone participants).
- Please use microphones and introduce yourself.
- GoToMeeting participants and bridge line participants please mute phones when not talking.
- Handouts: working agenda; a limited number of draft NUREGs; listing of Aging Management Programs; draft replacement SRP-LR Table 3.0-1, Federal Register Notice, List of Acronyms.
- Escort needed to leave this floor.

License Renewal Guidance Update: Capture Lessons Learned



- Domestic and foreign operating experience (2004-2009)
- Lessons learned from recent LR applications/SERs
- NEI and industry comments on GALL Report and SRP-LR
- Interim Staff Guidance
- New industry guidance and change of regulations

Differences between 2005 and draft 2010 SRP-LR

Generic revisions made to SRP-LR

- FSAR Supplement for all AMPs now included as new Table 3.0-1 in Section 3.0 (Old Table 3.X-2)
- Table 3.X-2 now lists the AMPs applicable to that Section
- Added extra column in Table 3.X-1 to identify the GALL Report 2005 and 2010 line item numbers (Rev2 Item and Rev1 Item)
- Clarified Tables 4.1-2 and 4.1-3 to distinguish between generic TLAAs and potential plant-specific TLAAs
- Revised Appendix A, Section A.1.2.3, AMP Elements, to clarify the information in each element

Differences between 2005 and draft 2010 GALL Reports



- Moved Volume 1 information into SRP-LR and GALL Report and eliminated Volume 1
- Revised Chapter I for application of the ASME Code
 - 2004 Edition applicable or
 - Other editions and addenda allowed as per footnote in GALL Report Chapter 1
- Revised line numbering system to include subchapter, e.g., II.A1.CP-33
- Revised Chapters II and III to split up lines for accessible and inaccessible concrete, where applicable
- Revised Chapters IV.B2, B3, and B4 to incorporate aspects of MRP-227, Materials Reliability Program, PWR Internals Inspection and Evaluation Guidelines

Differences between 2005 and draft 2010 GALL Reports

- Number of lines revised from Further Evaluation recommended “Yes” to “No”
 - Combination of Water Chemistry & One-Time Inspection
 - Combination of Lube Oil Analysis & One-Time Inspection
 - Combination of Fuel Oil Chemistry & One-Time Inspection
 - Buried Piping and tanks now addressed by new AMP XI.M41
 - Lines where F/E recommended ground water chemistry – now included in the structural AMPs
 - Where GALL 2005 recommended a license commitment for PWR Internals, now managed by the new AMP XI.M16A
 - Where GALL 2005 recommended a license commitment for nickel alloy components, now managed by the new AMP XI.M11B
 - Where GALL 2005 recommended a plant-specific program and the draft 2010 recommends a GALL AMP

Differences between 2005 and draft 2010 GALL Reports

- Number of lines revised from plant-specific AMP to a GALL AMP
 - Stainless steel components exposed to condensation, diesel exhaust or outdoor-air now managed by AMPs XI.M36 or XI.M38
 - Aluminum and copper alloy components exposed to condensation now managed by AMP XI.M38
 - Elastomeric components in all environments now managed by AMPs XI.M36, XI.M38, XI.M26, XI.S1, XI.S4, or XI.E4, depending upon components
 - Neutron absorbing materials other than Boraflex now managed by AMP XI.M40
 - Piping and tanks exposed to soil now managed by AMP XI.M41

Differences between 2005 and draft 2010 GALL AMPs

- Added 2 new AMPs
 - XI.M16A – PWR Vessel Internals
 - XI.M40 - Monitoring of Neutron-Absorbing Materials Other than Boraflex
- Deleted 2 AMPs
 - XI.M14 – Loose Part Monitoring
 - XI.M15 – Neutron Noise Monitoring
- Re-numbered AMP XI.M21, Closed-Cycle Cooling Water Systems as XI.M21A, Closed Treated Water Systems

Differences between 2005 and draft 2010 GALL AMPs

- Combined XI.M11, Nickel-Alloy Nozzles and Penetrations and XI.M11A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of PWRs, into a new AMP XI.11B, Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)
- Subsumed AMP XI.M13, Thermal Aging and Neutron Irradiation Embrittlement of CASS into AMP XI.M9, BWR Vessel Internals
- PWR internals XI.M16A also addresses Thermal Aging and Neutron Irradiation Embrittlement of CASS
- Combined AMPs XI.M28, Buried Piping and Tank Surveillance, and XI.M34, Buried Piping and Tanks inspection, into a new AMP XI.M41, Buried, Underground, and Limited-Access Piping and Tanks

Differences between 2005 and draft 2010 GALL AMPs



- Added relevant Operational Experience post-GALL 2005
- Updated References to reflect changes post-GALL 2005
- Conformed AMP content to align with 10 element template for AMPs in the SRP-LR Appendix A.1
- Added relevant information from recent license renewal applications and precedents
- Updated to ASME Code 2004 Edition and added a footnote

Differences between 2005 and draft 2010 GALL AMPs

- Generic changes for Structural AMPs
 - Structural and high-strength structural bolting removed from scope of AMP XI.M18, Bolting Integrity program and included in the scope of structural AMPs XI.S1, XI.S3, XI.S6 and XI.S7, along with the appropriate recommendations from preventive actions, and detection of aging elements
 - Included AMR lines for structural and high-strength structural bolting associated with AMPs XI.S1, XI.S3, XI.S6, and XI.S7, similar to pressure retaining bolting associated with AMP XI.M18

Differences between 2005 and draft 2010 GALL AMPs



XI.S8 Protective Coating Monitoring and Maintenance

- Updated ASTM Standards
- Clarified importance of coating assessments for ECCS performance
- *Scope of Program* clarified to include coatings on concrete so that all coatings in containment are addressed
- New AMR line added in Chapters II and III for loss of coating integrity due to blistering, cracking, flaking, peeling, physical damage

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.S4, 10 CFR 50, Appendix J

- *Detection of Aging Effects* clarified that detection of aging would be achieved with the additional implementation of an acceptable containment inservice inspection program as described in ASME Section XI, Subsection IWE (XI.S1) and ASME Section XI, Subsection IWL (XI.S2)
- Updates the references to NEI 94-01 Rev 2-A (and associated EPRI Report).
- Revised lines to separate those components where AMP XI.S4 by itself is applicable (such as gaskets, which are not in scope of XI.S1), and components where AMPs XI.S1 and XI.S4 are both applicable

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.S1, ASME Section XI, Subsection IWE

- *Parameters Monitored, Monitoring and Trending, and Corrective Actions* revised AMP to incorporate interim staff guidance (LR-ISG-2006-01) related to monitoring the MK1 drywell corrosion
- *Detection of Aging Effects* revised to augment IWE requirement to include surface examination to detect cracking in SS penetration sleeves, dissimilar metal welds consistent with AMR line item of 2005 GALL Report

Differences between 2005 and draft 2010 GALL Report

AMP XI.S1, associated AMR line items

- Revised lines to separate those components where AMP XI.S1 by itself is applicable (such as vent header and downcomers, which are not in scope of XI.S4), and components where AMPs XI.S1 and XI.S4 are both applicable
- New line added as a result of operating experience for torus shell exposed to air-indoor uncontrolled or treated water with loss of material due to corrosion

Differences between 2005 and draft 2010 GALL AMPs

XI.S2, ASME Section XI, Subsection IWL

- *Preventive Actions* clarified for monitoring of prestressing tendon corrosion protection medium so that its chemistry stays within the limits established in IWL
- *Parameters Monitored* revised to include additional monitoring of tendons, when removed when containment cutout is needed to facilitate replacement of steam generator or reactor vessel head consistent with 2004 edition of the Code
- *Acceptance Criteria* is added to monitor free water in the prestressing tendon anchorage areas consistent with 2004 edition of the Code

Differences between 2005 and draft 2010 GALL AMPs

XI.S3, ASME Section XI, Subsection IWF

- *Parameters Monitored* clarified for supports, sliding supports, spring and constant load supports and structural bolting
- *Detection of aging effects* clarified to address aging effects for structural bolting, sliding surfaces, elastomeric vibration isolator elements, and recommends volumetric examination to detect cracking in certain cases, consistent with ASME Code Section XI, Table IWB-2500-1

Differences between 2005 and draft 2010 GALL AMPs

XI.S5, Masonry Walls

- Clarified fire barrier masonry walls covered by fire protection (M26)
- Clarified associated steel supports covered by structures monitoring (S6)
- Revised to add inspection frequency of once every 5 years or more frequently in areas where cracking is observed consistent with ACI-349-3R, edition 1996
- Clarified parameters monitored (cracking, separation, shrinkage)
- Added new AMR line for masonry walls exposed to air-outdoor, similar to line item for concrete in air-outdoor

Differences between 2005 and draft 2010 GALL AMPs

XI.S6, Structures Monitoring

- *Scope of Program* revised to:
 - clarify when the applicant may include AMP XI.S5, “Masonry Walls,” and XI.S.7, “Water Control Structures,” within the scope of XI.S6
 - include periodic ground water monitoring (removed from AMR line item AMP column and included in this AMP)
- *Parameters Monitored* revised to clarify parameters to be monitored for concrete, steel, structural bolting, structural sealants, elastomeric vibration isolators, ground water chemistry, settlement monitoring, etc.

Differences between 2005 and draft 2010 GALL AMPs

XI.S6 – contd.

- *Detection of Aging Effects* revised to include recommended frequency not to exceed five years inspection for the in-scope structures, settlement monitoring, and monitoring of ground water chemistry
- *Acceptance Criteria* clarified the use of relevant codes and standards, and incorporated monitoring criteria for structural bolting, and elastomeric vibration isolation elements to be consistent with SRP-LR, Appendix A

Differences between 2005 and draft 2010 GALL AMPs

XI.S6 associated AMR line items

- Based on inclusion of groundwater chemistry in this AMP,
 - Changed lines from Further Evaluation (F/E) recommended “Yes“ to “No“ for aging effects of increase in porosity & permeability, cracking, and loss of material due to aggressive chemical attack for inaccessible concrete
 - Changed lines from F/E recommended “Yes“ to “No“ for aging effects of cracking, loss of bond and loss of material due to corrosion of embedded steel

Differences between 2005 and draft 2010 GALL AMPs

XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

- *Program Description* clarified that dam inspection is not in scope
- *Scope of Program* clarified to include
 - sluice gates, and trash racks
 - ground water monitoring (removed from AMR line item AMP column and included in this AMP)
- *Detection of Aging Effects* added provisions for detection of
 - aging effects based on ground water chemistry

Differences between 2005 and draft 2010 GALL AMPs



XI.S7, RG 1.127, associated AMR line items

- Added new line for wooden piles in air-outdoor or water flowing or standing, or groundwater/soil

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M41, Buried, Underground and Limited Access Piping and Tank

- New AMP
- Replaces Existing AMPs
 - XI.M28 Buried Piping and Tanks Surveillance
 - XI.M34 Buried Piping and Tanks Inspection
- Incorporates aspects of both programs
- Adds additional features
- Considers Industry Initiative

Differences between 2005 and draft 2010 GALL AMPs

Why a new AMP?

- Recent operating experience
 - To date no loss of safety function
 - Most due to external corrosion
 - Most due to localized coating failure
 - Limits size of leak and probability to affect safety function
 - Some due to absence of coating or larger coating failure
 - Lack of effect on safety function cannot be assumed
 - Some indicates significant difference between “as buried” pipe and records
- Conclusions
 - Additional direct assessment of piping necessary

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Environments
 - Buried – in contact with soil or concrete
 - Underground – below grade, in contact with air, limited access
 - Piping in chases, vaults or trenches
 - Limited access – above grade, in contact with air, limited access
 - Piping in confined spaces
- Materials
 - All metallic
 - All polymeric
 - All cementitious

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Preventive actions
 - Depend on material/environment
 - Inherently resistant materials (Ti, super austenitic)
 - None required
 - Not resistant (steel)
 - Coatings
 - Type varies with environment
 - High quality backfill for buried
 - Resistant in some environments (stainless steels and others)
 - Coat as appropriate
 - Buried steel, copper, aluminum
 - Coatings
 - Cathodic protection

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Inspections (pipe and tanks)
 - Opportunistic visual
 - Inherently resistant materials (Ti, super austenitic)
 - None required
 - Directed inspections (pipe)
 - Not inherently resistant and not cathodically protected
 - Visually inspect
 - 5% of linear length
 - One inspection per material type
 - Each inspection is minimum 10'
 - Inspect all surfaces
 - Highest risk areas selected
 - UT from inside may be substituted

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Inspections (continued)
 - Directed (pipe)(continued)
 - Cathodically protected (90% prior availability)
 - Pipe to soil potential and current as in NACE
 - 2 visual inspections required
 - Minimum 10' per excavation
 - Visual inspections at highest risk areas
 - UT from inside may be substituted
 - Cathodically protected (low availability)
 - Pipe to soil potential and current as in NACE
 - Inspections as for non cathodically protected pipe

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Inspections (continued)
 - Directed (Tanks)
 - Not inherently resistant and not cathodically protected
 - Visually inspect from outside or UT from inside
 - Each tank examined
 - Cathodically protected
 - Pipe to soil potential and current as in NACE
 - Visually inspect from outside or UT from inside
 - Each tank examined

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Inspections intervals
 - Opportunistic
 - Whenever pipe is exposed
 - Directed
 - Pipes, not inherently resistant and not cathodically protected
 - Once in 10 years prior to PEO
 - Once in 10 years after entering PEO
 - Pipes, cathodically protected
 - Electrical measurements start 10 years prior to PEO and continue through PEO
 - Inspections
 - Once in 10 years prior to PEO
 - Once in 10 years after entering PEO

Differences between 2005 and draft 2010 GALL AMPs

Focus of XI.M41, Buried, Underground, and Limited Access Piping and Tanks

- Inspections intervals(continued)
 - Directed (continued)
 - Tanks, not inherently resistant and not cathodically protected
 - Once in 10 years prior to PEO
 - Once in 10 years after entering PEO
 - Tanks, cathodically protected
 - Electrical measurements start 10 years prior to PEO and continue through PEO
 - Inspections
 - Once in 10 years prior to PEO
 - Once in 10 years after entering PEO

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M41 AMR line item changes

- Added AMR line items
 - Reinforced concrete or asbestos cement exposed to soil
 - Cracking, settling, loss of material, changes in properties
 - Titanium, stainless steel, super austenitic stainless steel, copper or aluminum exposed to soil
 - Loss of material due to pitting and crevice corrosion
 - HDPE or fiberglass exposed to soil
 - Cracking, blistering, change in color
 - Concrete cylinder pipe, concrete pipe exposed to soil
 - Cracking, spalling, corrosion of rebar, exposure of rebar
- Revised AMR line item
 - Deleted - Steel (with or without coating or wrapping)
 - Added - Steel (with coating or wrapping)

Differences between 2005 and draft 2010 GALL AMPs



XI.M17, Flow-Accelerated Corrosion

- *Program Description* updated to include NSAC-202 revision 3
- *Scope of Program* Removed non-scope related material
- Monitoring and Trending clarified that wear rates need to be evaluated with respect to power uprate effects

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M18, Bolting Integrity

- *Scope of Program* was refocused on closure bolting, and structural bolting was moved to appropriate structural AMPs
- *Preventive Actions* was revised to include recommendations regarding avoidance of MoS₂ and bolting material with yield strength greater than 150 ksi, consistent with NUREG-1339
- *Detection of Aging Effects* was refocused on examination requirements in ASME Section XI, and on recommendations in NUREG-1339, EPRI NP-5769, and EPRI TR-104213
- *Monitoring and Trending* was revised to provide greater latitude in determining the inspection frequency using the licensee's corrective action program

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M18, associated AMR line items

- Revised *Material* to include stainless steel bolting in a number of AMR lines. (Reduces need to cite Note F.)
- Revised *Environment* in a few places. (Reduces need to cite Note G.)
- Revised or augmented *Aging Effect/Mechanism* in a few places. (Reduces need to cite Note H.)

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M22, Boraflex Monitoring

- No changes in technical intent

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M30, Fuel Oil Chemistry

- AMP content was refocused on license renewal considerations by deleting recommendations not related to aging management
- *Detection of Aging Effects* was revised to be more prescriptive for draining and cleaning of each tank
- *Acceptance Criteria* was revised to tie more closely with Technical Specifications and to recommend more appropriate ASTM standards

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M39, Lubricating Oil Analyses

- AMP content was refocused on license renewal considerations by deleting recommendations not related to aging management
- *Acceptance Criteria* was revised to focus more clearly on aging management and to remove standards not related to management of aging effects

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M40, Monitoring Neutron Absorbers Other Than Boraflex

- New AMP
- Based on and replaces License Renewal Interim Staff Guidance LR-ISG-2009-01
- Monitoring program for each credited neutron absorbing material in the spent fuel pool aside from Boraflex
- Loss of material and neutron attenuation monitored

Differences between 2005 and draft 2010 GALL AMPs

XI.M26, Fire Protection

- *Scope of Program* deleted diesel driven fire pump performance test and inspection of the fuel oil supply line, now managed by Fuel Oil Chemistry and One-Time Inspection programs
- *Scope of Program* added other fire barrier material such as flamastic, 3M fire wrapping, spray-on fire proofing material, intumescent coating, etc.
- *Detection of Aging Effects* changed frequency of Halon/carbon dioxide testing and inspection to state 6 months or on a schedule in accordance with an NRC-approved fire protection program

Differences between 2005 and draft 2010 GALL AMPs

XI.M27, Fire Water System

- *Scope of Program* clarified that hoses and gaskets can be excluded from scope based on prescribed replacement
- *Acceptance Criteria* clarified that minimum wall thickness should be maintained
- Associated AMR lines
 - Added new line for steel fire hydrants exposed to air-outdoor with an aging effect of loss of material consistent with 2005 AMP

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M32, One-Time Inspection

- *Program Description and Scope of Program* were revised to clarify recommended scope and to list related AMPs for which OTI confirms effectiveness
- *Detection of Aging Effects* was revised to address representative sample sizes and refine the examples of parameters monitored or inspected
- *Program Description, Scope of Program, Detection of Aging Effects, and Monitoring and Trending* were revised to emphasize situations where periodic inspections may be more appropriate

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M33, Selective Leaching of Materials

- *Scope of Program* more clearly identifies the materials susceptible to selective leaching (i.e., uninhibited brass containing greater than 15 percent zinc)
- *Scope of Program* added additional environments that could cause selective leaching (water contaminated fuel oil, and water contaminated lube oil)
- *Detection of Aging Effects* revised to include other mechanical examination techniques such as destructive testing, chipping, or scraping

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M33, contd.

- *Detection of Aging Effects* establishes sample size of 20 percent of the population with a max sample size of 25 or other technically justified methodology and sample size
- *Acceptance Criteria* clarified that no visible evidence of selective leaching or no more than a 20 percent decrease in hardness and no noticeable change in color for copper alloys containing more than 15 percent zinc

Differences between 2005 and draft 2010 GALL AMPs



- **AMP XI.M33 associated AMR line items**
 - Added line items for:
 - Steel exposed to soil or concrete causing loss of material due to general, pitting, and crevice corrosion (Condensate System and Auxiliary Feedwater System)

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M21A, Closed Treated Water Systems

- Expanded from Closed Cycle Cooling Water Systems (GL 89-13)
 - Includes HVAC, Aux Boilers Etc.
- Avoids misapplication of this AMP to non-GL 89-13 systems
- Recognizes water chemistry standards are application specific
- Definition of “treated water” in chapter IX has changed

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M21A associated AMR line items

- Added line item for copper alloy exposed to closed-cycle cooling water causing loss of material due to general, pitting, crevice, and galvanic corrosion

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M20, Open-Cycle Cooling Water System

- Additional materials commonly used in Open-Cycle Cooling Water Systems were added (i.e., stainless steel, aluminum, copper alloy, polymeric linings, and concrete)
- Placed more emphasis on following GL 89-13 (i.e., *Parameters Monitored, Monitoring and Trending, and Acceptance Criteria*)
- Added additional operating experience with emphasis on recent occurrences of MIC

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M20 associated AMR line items

- Added new lines for:
 - Titanium exposed to raw water causing reduction in heat transfer due to fouling
 - Reinforced concrete or asbestos cement exposed to raw water causing cracking, settling, loss of material

Differences between 2005 and draft 2010 GALL AMPs

XI.M23, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

- Updated AMP to endorse industry standard ASME B30.2 - 2005, "Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," for inspection of overhead cranes and light load handling systems used for refueling
- *Scope of Program* revised to include managing loss of preload of bolted connections consistent with AMP XI.M18
- *Detection of Aging Effects* clarified to recommend inspection frequency in accordance with ASME B30.2 or other appropriate standard in ASME B30 series

Differences between 2005 and draft 2010 GALL AMPs

XI.M24, Compressed Air Monitoring

- Refocused AMP content on license renewal considerations by deleting operational program testing that is not relevant to age related degradation and focusing on environments that are relevant for age related degradation
- Clarified each element to state that guidance is based on industry standards such as ASME OM-S/G 1998 or ISA-S7.0.01

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M25, BWR Reactor Water Cleanup

- *Program Description* was revised to augment the regulatory background information
- No changes in technical intent

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M29, Aboveground Metallic Tanks

- Title was changed from Above Ground Steel Tanks to Above Ground Metallic Tanks
- Removed the requirement for coatings, this is a design issue
- Specified UT for thickness measurements
- *Corrective Actions* revised to state that flaws in the caulking or sealant are repaired
- No new AMR line items were added

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M36, External Surfaces Monitoring of Mechanical Components

- Scope expanded to include external surfaces of all metallic and polymeric materials
 - Old scope just steel
- Scope expanded to include additional aging effects
 - Loss of material (metallic materials)
 - Cracking (metallic and polymeric materials)
 - Change in material properties (polymeric materials)
- Addresses manual manipulation of polymeric materials
- Includes acceptance criteria for non-metallic materials
- Better defines acceptance criteria for metallic materials

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M36 associated AMR line items

- Added line items for:
 - Reinforced concrete, asbestos cement exposed to outdoor air causing cracking, settling, loss of material, aggressive chemical attack and leaching
 - Stainless steel and copper alloy exposed to outdoor air causing loss of material due to pitting and crevice corrosion
- Revised existing lines for:
 - Copper alloy exposed to external condensation causing loss of material changed from plant specific with Further Evaluation (F/E) yes to XI.M36 and F/E no

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

- *Program Description* revised to clarify that if operating experience indicates that there have been on-going failures caused by loss of material due to corrosion, a plant-specific program will be required.
- *Scope of Program* expanded to include polymeric materials (rigid and elastomers) and additional metallic materials (old scope was steel only)
- *Parameters Monitored* revised to add examples of inspection parameters for metallic and polymeric components
- Revised to provide inspection methods and acceptance criteria for each type of material

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M38, associated AMR line items

- Revised existing line items for:
 - Elastomers exposed to borated water causing hardening and loss of strength due to elastomer degradation changed from plant specific with Further Evaluation (F/E) yes to XI.M38 and F/E no
 - Stainless steel or aluminum or copper alloy exposed to condensation causing loss of material due to pitting and crevice corrosion changed from plant specific with F/E yes to XI.M38 and F/E no
 - Elastomers exposed to uncontrolled indoor air causing loss of material due to wear changed from plant specific with F/E yes to XI.M38 and F/E no
 - Stainless steel exposed to diesel exhaust causing cracking due to stress corrosion cracking changed from plant specific with F/E yes to XI.M38 and F/E no
 - Steel or stainless steel exposed to diesel exhaust causing loss of material due to general corrosion (steel only), pitting and crevice corrosion changed from plant specific with F/E yes to XI.M38 and F/E no

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

- Updated to reference use of ASME Code Section XI, 2004 edition and clarifies use of alternative editions and addenda
- *Detection of Aging Effects* was revised to refer to ASME Section XI Examination Categories and not repeat detailed information contained in the code

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M35, One-time Inspection of ASME Code Class 1 Small Bore Piping

- *Program Description:*
 - explicitly identify that socket welds are included
 - clarified program applicability to plants that have not experienced cracking or have effectively mitigated cracking from vibratory loading through design changes – otherwise a plant specific program is needed
- *Detection of Aging Effects:*
 - revised for socket welds to perform an opportunistic destructive examination as an alternative to volumetric examinations.
 - clarified for full penetration welds that only volumetric examination is recommended
 - clarified that volumetric examinations are performed using demonstrated techniques

Differences between 2005 and draft 2010 GALL AMPs

XI.M4, BWR Vessel ID Attachment Welds

- *Scope of Program* clarified that program is an augmented inservice inspection program and identified the component to which this program applies
- *Acceptance Criteria* and Corrective Actions clarified that these are based on ASME Code and BWRVIP-48A guidelines

Differences between 2005 and draft 2010 GALL AMPs



XI.M5, BWR Feedwater Nozzle

- *Program Description* clarified that system modifications were instituted for many BWRs during their initial 40-year operating period
- Explicitly identified NUREG-0619, BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking recommendations in several elements

Differences between 2005 and draft 2010 GALL AMPs

XI.M6, BWR Control Rod Drive Return Line (CRDRL) Nozzle

- Clarified regulatory framework including NUREG-0619
- *Scope of Work* clarified the different configurations of CRDRL nozzles in the scope of program
- *Preventive Actions* revised to include water chemistry controls
- *Monitoring and Trending* clarified that trending is in accordance with ASME Code, Section XI

Differences between 2005 and draft 2010 GALL AMPs



XI.M7, BWR Stress Corrosion Cracking

- *Preventive Actions* clarified that preventive measures are primarily related to water chemistry program
- *Monitoring and Trending* specified ASME Code Section XI be used for trending and identified the BWRVIP documents that could be used as applicable acceptance standards
- *Acceptance Criteria and Corrective Actions* clarified that these are based on ASME Code provisions

Differences between 2005 and draft 2010 GALL AMPs

XI.M8, BWR Penetrations

- *Scope of Program* revised to clarify the components within the scope of the program
- *Detection of Aging Effects* clarified to address examination categories and type of examinations
- *Acceptance Criteria* clarified that criteria are given in BWRVIP documents

Differences between 2005 and draft 2010 GALL AMPs

XI.M9, BWR Vessel Internals

- Program Description:
 - revised to include AMP XI.M13, Thermal Aging and Neutron Irradiation Embrittlement of CASS
 - also added Alloy X-750, Precipitation Hardened Martensitic and Martensitic Stainless Steel materials used in BWR vessel internals
- *Scope of Program, Parameters Monitored and Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria* revised to include information as appropriate for the added materials
- *Scope of Program* added steam dryers and BWRVIP-139

Differences between 2005 and draft 2010 GALL AMPs

XI.M9, contd.

- *Detection of Aging Effects* clarified that for non-ASME Code internals, cracking is detected by using enhanced visual VT-1 (EVT-1), VT-1 or VT-3 consistent with the approved BWRVIP reports
- *Corrective Actions* added that for top guides where cracking is observed, sample size and inspection frequencies are increased

Differences between 2005 and draft 2010 GALL AMPs

XI.M9 associated AMR line items

- Revised line for steam dryers with aging effect of cracking due to flow-induced vibration change from plant-specific program to XI.M9
- Added new lines for X-750, PH martensitic, and martensitic stainless steel reactor vessel internals with an aging effect of loss of fracture toughness

Differences between 2005 and draft 2010 GALL AMPs

X.M1, Metal Fatigue of Reactor Coolant Pressure Boundary

- *Program Description:*
 - updated relative to background basis, assumptions, background information on how the program is applied, and basis for environmental fatigue calculations
 - now specifies use of NUREG/CR-6909 for environmental fatigue calculations
- *Preventive Actions* clarified that tracking of design basis transients are considered to be preventive activities for the AMP
- *Detection of Aging Effects* clarified to provide a clear basis on how the tracking of the cycles (the preventive parameter) would be used to ensure the validity of current design basis CUF fatigue analysis values.

Differences between 2005 and draft 2010 GALL AMPs



X.M1, contd.

- *Monitoring and Trending* clarifies how the program trends the CUF values for ASME Code Class 1 reactor coolant pressure boundary components
- *Operating Experience* updated the criteria to include recommendations for fatigue analyses in NRC RIS 2008-30

Differences between 2005 and draft 2010 GALL AMPs

TLAAs, SRP-LR Section 4.3, Metal Fatigue Analysis

- Reformatted section to make it consistent with formatting for all other SRP-LR TLAA Sections
- Clarified 10 CFR 54.21(c)(1)(i), (ii), and (iii) acceptance criteria and review procedure criteria for all Section 4.3 subsections
- Consolidated recommendations for implicit fatigue analyses that are applicable to ANSI B31.1 components and ASME Code Class 2 and 3 components designed to Section III requirements

Differences between 2005 and draft 2010 GALL AMPs

TLAAs, SRP-LR Section 4.3, contd.

- Added sections for SRP review acceptance criteria and review procedures for metal fatigue TLAAs that may be applicable to BWR vessel internal components and for potential fatigue flaw growth analyses.
- Updated UFSAR supplement criteria

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M2, Water Chemistry

- Updated the referenced versions of EPRI Water Chemistry Guidelines – later versions will require further NRC evaluation

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M3, Reactor Head Closure Stud Bolting

- *Preventive Actions* was revised to include recommendations regarding avoidance of MoS₂ and bolting material with yield strength greater than 150 ksi, consistent with NUREG-1339
- *Detection of Aging Effects* clarified to refer to ASME Section XI Examination Categories and not repeat detailed information contained in the code
- AMR changes: Existing line for PWRs revised to include corrosion as an aging mechanism causing loss of material. Added line for loss of material in BWR head closure stud assembly. (Reduces need to cite Note H.)

Differences between 2005 and draft 2010 GALL AMPs



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

- *Scope of Program* clarified that applies only to Class 1 piping components
- *Detection of Aging Effects* clarified that current UT methodology cannot detect and size cracks; therefore, EVT-1 is used until qualified UT methodology for CASS can be established
- *Program Description* clarified that aging management for BWR and PWR CASS internals covered in AMPs XI.M9 and XI.M16A respectively

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M31, Reactor Vessel Surveillance

- Contains 10 elements described in Appendix A.1 of the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants; GALL 2005 did not contain the 10 elements described in Appendix A.1

Technical Content Changes

- *Parameters Monitored/Inspected* identifies that cold leg operating temperature is the preferred method for monitoring irradiation temperature

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M31, contd.

Technical Content Changes, contd.

- *Detection of Aging Effects:*
 - provides additional recommendations for discarding surveillance material that have been pulled and tested
 - provides applicants greater latitude in retaining capsules within the reactor vessel
 - requires the withdrawal schedule to be submitted as part of the license renewal application
 - provides greater latitude for removing a surveillance capsule representing the license renewal period

Differences between 2005 and draft 2010 SRP-LR

TLAAs, SRP-LR Section 4.2, Reactor Vessel Neutron Embrittlement Analysis

- Subsections 4.2.2.1.4, 4.2.2.1.4.1 and 4.2.3.1.4, "Elimination of Circumferential Weld Inspection (for BWRs)"
 - In lieu of analysis, applicants may manage this TLAA in accordance with 10 CFR 54.21(c)(1)(iii), if relief from the inspection will be made under 10 CFR 50.55a(a)(3)
- Added section 4.2.3.1.3.3 to clarify that Pressure-Temperature limits can be managed in accordance with 10 CFR 54.21(c)(1)(iii)
- Clarified that neutron fluence must be calculated using a staff approved methodology which is in accordance with the guidelines in RG 1.190

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M16A, PWR Vessel Internals

- AMP is based on guidelines for examination of vessel internals in EPRI report, “Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev. 0)”
- MRP-227-Rev.0 is currently being reviewed by the NRC staff
- GALL 2005 did not contain a generic AMP for PWR vessel internals:
 - GALL 2005 recommended applicants to commit to participate, evaluate and implement an industry program for vessel internals and to provide an inspection plan no less than 24 months before entering the period of extended operation

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M16A, contd.

- MRP submitted proposed AMR line items for Westinghouse, Combustion Engineering, and Babcock and Wilcox designed vessel internals, based on MRP-227-Rev.0

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M16A, contd.

- NRC staff modifications to the proposed MRP AMR line items:
 - Require cracking to be managed by AMPs XI.M2, "Water Chemistry," and XI.M16A, "PWR Vessel Internals"
 - Require all other aging effects to be managed by AMP XI.M16A, "PWR Vessel Internals"
 - Require each component that is classified as a primary component, expansion component, or an existing program component in accordance with MRP-227-Rev.0 to be included in GALL
 - Cross reference primary and expansion component in accordance with MRP-227-Rev.0

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M16A, contd.

- NRC staff modifications to the proposed MRP AMR line items (contd.):
 - All aging effects and components identified as primary, expansion, or existing program components in Table 3-1 through 3-3 of MRP-227-Rev.0 are identified as AMR line items in GALL – staff observed discrepancies between tables in section 3 and section 4
 - Further evaluation of inaccessible locations if cross referenced accessible primary, expansion or existing program components have aging effects that need aging management
 - Components that are identified as “no additional measures” components (no significant aging effects) in MRP-227-Rev.0 are not uniquely identified in the GALL tables

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M11B, Cracking of Ni-Alloy Components and Loss of Material Due to Boric Acid-Induced corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)

- Combined lessons learned from and key strengths of:
 - XI.M11, “Nickel-Alloy Nozzles and Penetrations” (Rev.0)
 - XI.M11A, “Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of PWRs” (Rev.1)
 - 2005 GALL Report recommended a license commitment for nickel alloy components
- AMP also manages effects of boric acid corrosion on reactor coolant pressure boundary materials in the vicinity of nickel alloy components (complements XI.M10)

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M11B, Cracking of Ni-Alloy Components...

- Revised program provides:
 - inspection requirements for the PWR vessel, steam generator, pressurizer components and piping if they contain the primary water stress corrosion cracking (PWSCC) susceptible materials designated alloys 600/82/182
 - inspection requirements for reactor pressure vessel upper heads

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M11B -contd

- *Scope of Program* revised beyond Ni-alloy vessel head penetrations
 - Cracking of susceptible Ni-alloy RCPB components (incl welds).
 - Loss of material due to BAC in susceptible components in the vicinity of Ni-alloy components.
 - (such as reactor vessel components (reactor pressure vessel upper head), steam generator components (nozzle-to-pipe connections, instrument connections, and drain tube penetrations), pressurizer components (nozzle-to-pipe connections, instrument connections, and heater penetrations), and reactor coolant system piping (instrument connections and full penetration welds).
- *Detection of Aging Effects* revised to stipulate that inspection methods, schedules, and frequencies for the susceptible components are implemented in accordance with 10 CFR 50.55a and industry guidelines (e.g., MRP-139).

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M11B –contd

- *Acceptance Criteria* clarified the use of relevant codes and standards
 - 1) Includes Industry program MRP-139 for the inspection of Dissimilar Metal Welds in Primary Circuit
 - 2) Updated to reflect changes in Code of Federal Regulations
 - Mandated ASME Code Case N-729-1 replaces NRC Order EA-03-009 for upper head inspection
 - Mandated ASME Code Case N-722 (visual inspections of Ni-base components)
 - Upcoming ASME Code Case N-770 (inspections for dissimilar metal welds)

Differences between 2005 and draft 2010 GALL AMPs

XI.M11B associated AMR line items

- New AMP replaced guidance to “comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.”
- Changed lines from F/E recommended “No, but licensee commitment needs to be confirmed” to “No” for aging effects of cracking due to PWSCC or SCC in Ni-alloy components, welds, or cladding.
- Revised AMP of much greater utility. 2005 GALL Report had two AMR line-items referencing XI.M11A; draft 2010 GALL Report has eleven line items referencing XI.M11B

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.M10, Boric Acid Corrosion

- Clarified that the effects of boric acid corrosion on reactor coolant pressure boundary materials in the vicinity of nickel alloy components are managed by the AMP XI.M11B
- *Detection of Aging Effects* added recommendations for detection of leakage for components with external insulation surfaces and joints under insulation or not visible for direct visual examination

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M19, Steam Generators

- Scope of the program was expanded to include additional components and modeled on NEI 97-06, Revision 2
- AMR changes: Added or revised lines consistent with expanded scope of the AMP

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.M37, Flux Thimble Tube Inspection

- No changes in technical intent

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.E3, Inaccessible Power Cables not Subject to 10 CFR 50.49 Environmental Qualification Requirements

- Revised AMP Title (changed from medium-voltage to power cables)
- *Scope of Work*
 - revised to include all inaccessible or underground cables up to and including 480 Volts within the scope of license renewal subjected to significant moisture
 - revised to include energized and de-energized cables

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.E3, contd.

- *Detection of Aging Effects*
 - revised cable testing frequency not to exceed 3 refueling cycles
 - revised inspection frequency of water collection is based on plant-specific operating experience, but not to exceed one year
- Changes to the AMP are based on operating experience, responses to the GL 2007-01, and LR inspections and audits.
- *Operating Experience*
 - IN 2002-12, “Submerged Safety-Related Cables,”
 - GL2007-01, “Inaccessible or Underground Power Cable Failures That Disable Accident Mitigation Systems or Cause Plant Transients”

Differences between 2005 and draft 2010 GALL AMPs



AMP X.E1, Environmental Qualification (EQ) of Electric Components

- *Program Description* revised to clarify that the 60-year EQ reanalysis is performed prior to entering the period of extended operation and 10 CFR 50.49(i) criteria on how the qualification records are maintained for audit purposes and verified accordingly

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.E1, Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

- Added “Insulation Material for” to title of AMP to differentiate it from XI.E6, Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- *Program Description* clarified definition for “adverse localized environment”
- Removed references to sampling - all accessible cables in adverse localized environments will be inspected
- Clarified definitions/terminology for consistency within AMP and with other electrical AMPs

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.E2, Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

- Added “Insulation Material for” to title of AMP
- *Program Description* consolidated and rearranged the “adverse localized environment” discussion
- Clarified definitions/terminology for consistency within AMP and with other electrical AMPs

Differences between 2005 and draft 2010 GALL AMPs

MP XI.E4, Metal Enclosed Bus

- *Program Description and Scope of Program* revised to include external surfaces and elastomers with options to inspect, as applicable, under XI.S6 or XI.M38 as applicable
- *Parameters Monitored/Inspected and Detection of Aging Effects* revised for consistency within AMP and with GALL Chapter VI
- *Detection of Aging Effects* revised sampling criteria
- Clarified definitions/terminology for consistency within AMP and with other electrical AMPs

Differences between 2005 and draft 2010 GALL Report

AMP XI.E4 associated AMR line items

- Deleted line item for external surfaces of enclosure assemblies:
 - Steel and galvanized steel exposed to air – indoor and outdoor causing a loss of material due to general corrosion
- Replaced with line items for external surfaces of enclosure assemblies as follows:
 - Galvanized steel and aluminum exposed to air - indoor, controlled or uncontrolled with no aging effect
 - Galvanized steel and aluminum exposed to air - outdoor causing a loss of material due to pitting and crevice corrosion
 - Steel exposed to air - indoor, uncontrolled or air - outdoor causing a loss of material due to general, pitting and crevice corrosion
 - Steel exposed to air – indoor, controlled with no aging effect

Differences between 2005 and draft 2010 GALL AMPs

AMP XI.E5, Fuse Holders

- Revised the aging effect and aging mechanisms for consistency within AMP and with other electrical AMPs
- *Parameters Monitored/Inspected and Detection of Aging Effects* revised for consistency within AMP and with GALL Chapter VI
- *Operating Experience* revised to include NUREG -1760 operating experience

Differences between 2005 and draft 2010 GALL Report

AMP XI.E5 associated AMR line items

- Deleted line item for Metallic Clamps
 - Copper alloy exposed to air – indoor caused by Fatigue/ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation
- And replaced with the following:
 - Various metals used for electrical connections exposed to air - indoor uncontrolled caused by Increased resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply) or fatigue/ due to ohmic heating, thermal cycling, electrical transients
 - Various metals used for electrical connections exposed to air - indoor controlled caused by Increased resistance of connection due to fatigue caused by frequent manipulation or vibration

Differences between 2005 and draft 2010 GALL Report

AMP XI.E5 associated AMR line items, contd.

- Moved line item for Insulation to XI.E1:
 - Insulation material – bakelite, phenolic melamine or ceramic, molded polycarbonate and other exposed to adverse localized environment caused by Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation (Thermal/ thermoxidative) of organics/thermoplastics, radiation induced oxidation, moisture intrusion and ohmic heating

Differences between 2005 and draft 2010 GALL AMPs



AMP XI.E6, Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

- Incorporated Final License Renewal Interim Staff Guidance LR-ISG-2007-02, which provides for one-time testing
- *Detection of Aging Effects* added sampling criteria (consistent with XI.E4)
Clarified definitions/terminology for consistency within AMP and with other electrical AMPs

Follow-on Activities



- Formal public comment period closes on July 2, 2010
- Schedule focused technical meeting(s) if needed
- Staff evaluation of formal comments and revision of draft NUREGs as necessary
- Generation of Technical Bases NUREG that incorporates public comment resolution
- Internal NRC reviews of NUREGs
- ACRS subcommittee meeting on October 22, 2010 and ACRS full committee meeting on November 4, 2010
- Issue GALL and SRP-LR NUREGs for use by December 31, 2010