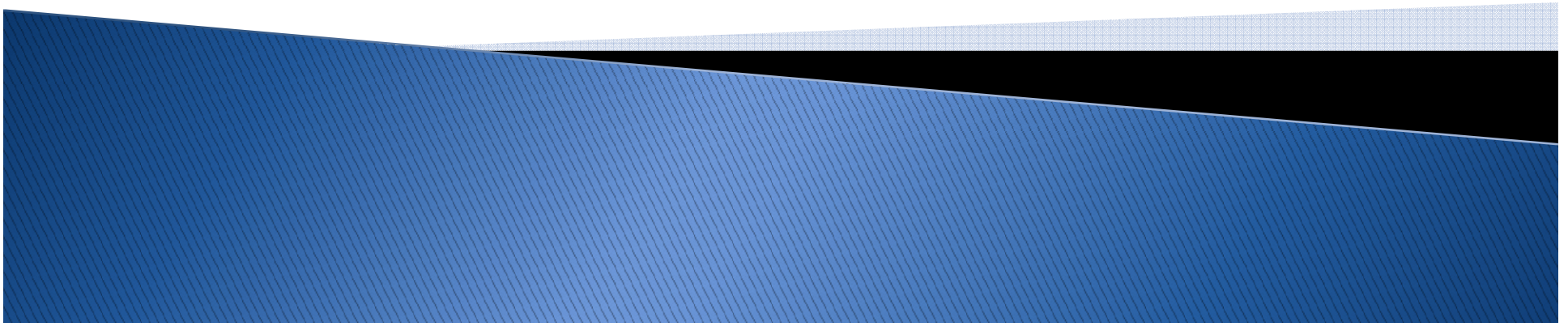


# NRC/NEI Quarterly Meeting

## **CHANGES TO THE GENERIC AGING LESSONS LEARNED (GALL) REPORT RELATED TO INTERNAL SURFACES AGING EFFECTS REQUIRING MANAGEMENT**

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# Topics for Discussion

Purpose of the Interim Staff Guidance (ISG) is to address:

- Pervasive internal corrosion
- Sampling quantities for AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"
- Fouling/Flow Blockage
- Fire Sprinklers Flow Blockage
- Miscellaneous Changes

# Pervasive Internal Corrosion Aging Effects Operating Experience (OE)

- Selective leaching of aluminum bronze in castings
- MIC in service water systems, multiple plants
- MIC in fire water system piping

# Pervasive Internal Corrosion Aging Effects Path Forward

Include new further evaluation AMR<sup>1</sup> items in Sections 3.2 – 3.4 of the GALL Report and SRP-LR<sup>2</sup>, including consideration of:

- augmented OE review, understanding of current progression of degradation
- analytical basis demonstrates that intended function will be met during PEO (e.g., material properties, multiple adjacent corrosion sites)
- flooding, spray, loss of inventory, reduction in flow addressed.
- appropriate examination methods (e.g., volumetric versus external visual)
- augmented inspections – number, location (based on risk insights), frequency, acceptance criteria
- inspections of inaccessible components (i.e., buried, underground)
- detectability of leaks in buried, underground components

<sup>1</sup> Aging Management Review item

<sup>2</sup> Standard Review Plan- License Renewal

## Basis for Including Sampling in AMP XI.M38

Some applicants have proposed a periodic check to ensure each material, environment, and aging effect has been inspected

Staff believes that in order to credit an AMP for aging management there needs to be some assurance that a representative sample will be inspected

Recent IP 71003, “Post-Approval Site Inspection For License Renewal,” inspection noted that an applicant was going to perform an excessive number of inspections due to not availing themselves of the opportunity to combine environments

## Sampling Path Forward

Include a periodic representative minimum sample size review for each material, environment, and aging effect combination

Similar to XI.M32, “One-Time Inspection,” 20% or a maximum of 25 components is recommended

Provide recommendations on combining similar environments

# Fouling/Flow Blockage – What It Is

- Source – internal coatings
  - paint
  - elastomeric linings (e.g., rubber)
  - polymeric linings
- Elastomer/Polymer Aging Effect
  - internal lining degradation
    - small pieces
    - sheets or large flakes of material
  - adhesive bond degrades as the material ages if manufacturer recommendations were not followed during installation
  - aging could occur if environmental conditions change from original design (e.g., zinc oxide interface with ultra low sulfur fuels)
  - impingement damage
- Consequential Aging Effects
  - downstream flow blockage from sheets or large flakes
    - reduction in flow
    - reduction in heat transfer
  - unanticipated degradation rate of base metal

# Operating Experience - Liner Degradation

- Degradation of internal linings resulted in wall thinning and leaks requiring increased inspections of piping system
- A portion of the PVC liner of piping replaced in 1994 delaminated in 2011 and clogged a downstream orifice in a safety related piping system
- Polymeric liner degradation resulting in debris found downstream in heat exchanger tubes
- Rubber detached from valve resulting in reduced flow and inoperability of a room cooler
- Cavitation damaged lining which subsequently resulted in corrosion through pipe wall.



## Fouling/Flow Blockage Path Forward

Applicable to linings that can impact a SR or (a)(2) function only (e.g., flow blockage of a drain line)

Revise SRP-LR and GALL Report to include new items for elastomer degradation

Revise existing GALL Report AMR items related to elastomer lined piping to reflect potential for accelerated degradation of base material

# Fouling/Flow Blockage Implementation Options

New further evaluation item that will recommend inspections using existing AMPs or plant-specific AMP

- Visual inspection every 5 or 10 years depending on degree of certainty related to life of liner
- Demonstrate that material manufacturer installation specifications (e.g., surface prep, cure time, temperature, humidity, product selection) met or:
  - conduct destructive or non-destructive adhesion test,
  - restricted access, hammer tap test
- Inspector qualifications

Develop new AMP for Service Level III coatings

# Fire Sprinkler Piping

Revise AMP XI.M27, “Fire Water System,” to reflect recent industry OE related to sprinkler piping.

Current wording requires enhancement: “Periodic flow testing of the fire water system is performed using the guidelines of NFPA 25<sup>1</sup>, or wall thickness evaluations may be performed to ensure that the system maintains its intended function.”

Revise AMP to include previously deleted wording in GALL Revision 0: “Sprinkler systems are inspected once every refueling outage to ensure that signs of degradation, such as corrosion, are detected in a timely manner.”

- Add an emphasis on flow blockage
- Inspections based on risk of water entrainment that could cause accelerated corrosion.

<sup>1</sup> *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*

# Miscellaneous Changes to AMP XI.M38

- Need to define what is meant by pressurization - “For certain materials, such as polymers, physical manipulation or pressurization (e.g., hydrotesting) to detect hardening or loss of strength should be used to augment the visual examinations conducted under this program.”
- Better align definitions of elastomer degradation (mechanism) and hardening and loss of strength (effect) with wording in “detection of aging effects” program element.
- Include external volumetric examination of internal piping surfaces of underground piping, removed from AMP XI.M41