



**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# **North Anna Units 1 and 2 SLRA**

## **RAI Response Discussion**

**May 13, 2021**

## Agenda

- Introduction
- Ground Rules
- RAI Response Discussion
  - B2.1.35-1, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
  - B2.1.7-1, PWR Reactor Vessel Internals
  - B2.1.15-1 Basis for 20-Year Replacement Frequency for Diesel Engine Heat Exchanger
  - B2.1.27-1 Cyclic Fatigue of Buried Gray Cast Iron Using Jockey Pump Monitoring
  - B2.1.21-1 Basis for Extent of Inspections for Selective Leaching
  - B2.1.21-2 Basis for Single 10-Foot Sample for Selective Leaching
- Public Comment
- Wrap-up

## Ground Rules

- **Observational Meeting**
  - Technical Discussion between NRC and Dominion regarding request for additional information (RAI) responses
  - The public will have an opportunity at the end of the meeting to make comments or ask the NRC staff questions.
- **RAI Response Discussion**
  - Dominion will explain what current situation for each item
  - NRC staff will ask questions and seek information and understanding
  - Each item has been allotted 25 minutes
- **Public Comment**
  - One member of the public will speak at a time.
  - If you want to speak, raise your hand in Teams
  - Each member will have three minutes. After which, the individual will be muted

## **B2.1.35-1, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants**

- RAI B2.1.35-1 was issued on April 1, 2021
  - Explain how the longer interval will continue to provide adequate aging management of settlement for structures within the scope of subsequent license renewal, especially structures which may be close to the settlement action limits identified in the TRM (i.e., data trends indicate limits would be reached within one or two inspection intervals).
- RAI response was issued on April 29, 2021
- The Resident Inspectors noted that an incident report/condition report was written on April 21, 2021, regarding the settlement of Service Water Pump House SM28
- Information/Discussion:
  - Please discuss how, if at all, the April 21<sup>st</sup> incident report/condition report impacts the April 29<sup>th</sup> RAI response

## **B2.1.7-1, PWR Reactor Vessel Internals**

- **RAI B2.1.7-1 was issued on April 1, 2021**
  - Address whether a revision to SLRA Table 1, Item 3.1.1-087 and an addition to SLRA Table 2 AMR results are needed to address the management of loss of material due to pitting and crevice corrosion in PWRVI components.
- **RAI response was issued on April 29, 2021**
- **History:**
  - AMP XI.M16A, PWR internals relies, in part, on PWR water chemistry control to prevent or mitigate aging effects that associated with loss of material induced by general pitting corrosion, crevice corrosion, or stress corrosion cracking or any of its forms. Reactor coolant water chemistry is monitored and maintained in accordance with AMP XI.M2, “Water Chemistry,” which prevents general pitting corrosion, crevice corrosion, or stress corrosion cracking.
  - North Anna PWR Internals program is consistent with this GALL-SLR Report statement
- **Information/Discussion:**
  - Since SLRA Table 1, Item 3.1.1-087, falls under AMP XI.M16A, shouldn’t it be listed as consistent with GALL-SLR Report rather than not applicable?

## **B2.1.7-1, PWR Reactor Vessel Internals**

- **RAI B2.1.7-1 was issued on April 1, 2021**
  - Address whether a revision to SLRA Table 1, Item 3.1.1-087 and an addition to SLRA Table 2 AMR results are needed to address the management of loss of material due to pitting and crevice corrosion in PWRVI components.
- **RAI response was issued on April 29, 2021**
- **History:**
  - AMP XI.M16A, PWR Internals (Element 2) relies on PWR water chemistry control to prevent loss of material induced by pitting and crevice corrosion. Reactor coolant water chemistry is monitored and controlled using AMP XI.M2, “Water Chemistry,” which prevents pitting and crevice corrosion.
  - The North Anna PWR Internals program is consistent with this GALL-SLR Report element.
- **Information/Discussion:**
  - Since Row 087 of SRP-SLR Table 3.1-1 cites “Water Chemistry” (AMP XI.M2) as a preventive measure to preclude pitting & crevice corrosion (consistent with AMP XI.M16A, Element 2), shouldn’t SLRA Table 1 Item 3.1.1-087 be listed as consistent with the SRP-SLR line item rather than not applicable?

## **B2.1.15-1 Basis for 20-Year Replacement Frequency for Diesel Engine Heat Exchanger**

- RAI B2.1.15-1 was issued on March 3, 2021
  - Asked about changes to be made for testing and monitoring of the diesel engine to address past failure of the heat exchanger
- RAI response was issued on April 1, 2021
  - small tube size makes heat exchanger inspection impractical
  - approach changed to 20-year replacement frequency
  - replacement frequency based on site operating experience
  - heat exchanger now not subject to aging management review

## **B2.1.15-1 Basis for 20-Year Replacement Frequency for Diesel Engine Heat Exchanger - cont.**

- History:
  - Staff's understanding of original diesel engine operating experience:
    - Engine replaced in 1987
    - Engine refurbished and placed into storage
    - Engine returned to service in 2013
    - Engine heat exchanger leaks in 2017
    - Engine replaced with refurbished engine in 2019
- Information/Discussion:
  - Given the maintenance history of the engine and the water treatment program for the service water reservoir, what is the basis for choosing 20 years. Keeping in mind the following...
    - Maintenance histories of original and current installed engine
    - Water treatment history of service water reservoir to show previous longevity of the heat exchanger can be used if cooling water environment is different than in past



## **RAI B2.1.27-1 Buried and Underground Piping and Tanks**

- RAI B2.1.27-1 was issued on March 3, 2021
  - Provide additional information describing how the Buried and Underground Piping and Tanks program will manage cracking due to cyclic fatigue for internally-lined gray cast iron piping and piping components exposed to soil.
- RAI response was issued on April 1, 2021
- History:
  - North Anna SLRA discusses plant-specific operating experience for ruptures of buried gray cast iron piping from low-cycle fatigue
  - The buried piping program GALL-SLR AMP XI.M41 was developed based on no operating experience of cracking from cyclic fatigue. Recent operating experience has identified cracking from cyclic fatigue of buried gray cast iron pipe
  - Cracking due to cyclic fatigue of gray cast iron exposed to soil is not a material/environment/aging effect previously evaluated in GALL-SLR
  - GALL-SLR notes applicants are to ensure that plant conditions and operating experience are bounded by those for which the GALL program were evaluated, and if not bounded, the applicant addresses the additional aging effects and augments the program

## **RAI B2.1.27-1 Buried and Underground Piping and Tanks - cont.**

- History:
  - SLRA Supplement 1 added a new aging management review item to address cracking of buried gray cast iron piping with the Buried and Underground Piping and Tanks program with a generic note H, indicating the aging effect is not in GALL-SLR for this component, material, and environment combination
  - RAI B2.1.27-1 asked how the Buried and Underground Piping and Tanks program will manage cracking of the buried gray cast iron piping
  - Responses to RAIs note that GALL-SLR AMP XI.M41 allows monitoring jockey pump activity in lieu of visual inspections and discuss “enhanced jockey pump” monitoring on a 30-day frequency

## **RAI B2.1.27-1 Buried and Underground Piping and Tanks - cont.**

- **Information/Discussion:**
  - Additional details are needed to demonstrate that cracking due to cyclic fatigue for buried gray cast iron exposed to soil will be adequately managed so that intended functions of the pipe will be maintained consistent with the licensing basis.
    - Current system performance information
      - Existing crack(s) contribution to current leak rate
    - Enhanced jockey pump monitoring
      - Unexpected jockey pump operation and determination
      - Action levels, actions, and bases of both
    - Relation between leak rate and crack size
    - Previous fracture mechanics calculations
    - Pressure surge values used in crack calculations
    - Materials properties used in crack calculations
    - Change to crack calculations based on ongoing degradation

## **RAI B2.1.21-1 Selective Leaching**

- RAI B2.1.21-1 was issued on March 3, 2021
  - Requested a technical justification for using the extent of inspections in GALL-SLR AMP XI.M33 for gray cast iron piping and piping components exposed to soil.
- RAI response was issued on April 1, 2021
- History:
  - NUREG-2222, “Disposition of Public Comments on the Draft Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192,” (12-2017) provides the basis for the reduced inspection population size for selective leaching inspections when compared to other mechanical aging management programs (AMPs).
    - For a two-unit site, GALL-SLR Report AMP XI.M33, “Selective Leaching” recommends a sample size of 3 percent or 8 components.
    - Most mechanical AMPs cite a sample size of 20 percent or 25 components.
    - Part of the basis for the reduction is industry operating experience (OE) has not detected any instances of loss of material due to selective leaching which resulted in a loss of intended function for the component.

## **RAI B2.1.21-1 Selective Leaching - cont.**

- History - cont.:
  - The NRC issued Information Notice (IN) 2020-04, “Operating Experience Regarding Failure of Buried Fire Protection Main Yard Piping,” to inform the industry of OE involving the loss of function of buried gray cast iron fire water main yard piping due to multiple factors, including external graphitic corrosion (i.e., selective leaching).
  - Based on this industry OE, the staff requested additional information (RAI B2.1.21-1) for using the inspection population size in GALL-SLR for the following material/environment combination: gray cast iron exposed to soil.
  - Dominion’s response to RAI B2.1.21-1 addressed the staff’s request in four different technical areas: (1) selection of leading sample location; (2) enhanced fire water jockey pump monitoring; (3) aging management effectiveness; and (4) elimination of fire protection over pressure events.

## **RAI B2.1.21-1 Selective Leaching - cont.**

- **Information/Discuss:**
  - Selection of leading sample locations is already factored-in to XI.M33
  - Enhanced jockey pump is focused on Fire Water System leakage, which is a short term concern mainly associated with leak-before-rupture for the cyclic fatigue issue. Selective leaching on the external surfaces of buried pipe can occur with or without ongoing pipe leakage.
  - Aging management effectiveness discusses enhanced inspection guidance to the existing Underground Piping and Tank Integrity program, which now include selective leaching considerations. However, these changes were made after the inspections of buried gray cast iron piping were done.
  - Eliminating over-pressure events by corrective actions to the Fire Water System mainly pertains to the cyclic fatigue issue. Unless the prior cracking of the gray cast iron pipe also involved selective leaching aspects, the lack of cracking since 2003 does not pertain to selective leaching sample size.

## **RAI B2.1.21-2 Selective Leaching**

- RAI B2.1.21-2 was issued on March 3, 2021
  - Requested criteria and approach for showing one 10-foot excavation would meet guidance for a representative sample for this material and environment combination
- RAI response was issued on April 1, 2021
  - Criteria provided in RAI response:
    - Older piping segments
    - Piping not cathodically protected
    - Piping continuously wetted or in high corrosivity soil
    - Piping with significant coating degradation or adverse backfill
    - Consequence of failure (i.e. proximity to safety-related piping)
    - Piping with high stress and/or cyclic loading conditions

## **RAI B2.1.21-2 Selective Leaching - cont.**

- History:
  - Guidance in GALL-SLR AMP XI.M33:
    - Inspections are conducted on a representative sample of each material and environment combination
    - Eight visual/mechanical inspections and two destructive inspections are conducted for each unit of a 2-unit site
- Information/Discussion:
  - Although criteria are valid for sample selection, discuss how they provide sufficient bases for limiting the sample size to one 10-foot location as being a representative sample.



## **RAI B2.1.21-2 Selective Leaching - cont.**

- History:
  - Guidance in GALL-SLR AMP XI.M33:
    - Inspections are conducted on a representative sample of each material and environment combination
    - Eight visual/mechanical inspections and two destructive inspections are conducted for each unit of a 2-unit site
- Information/Discussion:
  - Although criteria are valid for sample selection, discuss how they provide sufficient bases for limiting the sample size to one 10-foot location as being a representative sample.

## Public Comment

- Comments should be associated with the safety review of the North Anna Subsequent License Renewal Application
- The staff cannot address questions associated with the pending litigation
- Ground Rules
  - Comments/questions should be directed to the NRC staff
  - One member of the public will speak at a time.
  - If you want to speak, raise your hand in Teams
  - Each member will have three minutes. After which, the individual will be muted

## Wrap

- Thank you to all who participated and listened in