

REQUEST FOR ADDITIONAL INFORMATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
MONTICELLO SLRA SAFETY REVIEW
NORTHERN STATES POWER COMPANY
MONTICELLO, UNIT 1
DOCKET NO. 05000263
ISSUE DATE: 08/25/2023

RAI B.2.3.27-3

Regulatory Basis

10 CFR 54.21(a)(3) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

Background:

DRAFT NRC Regulatory Issue Summary (RIS) 2014-06, "Consideration of Current Operating Issues and Licensing Actions in License Renewal," Revision 1, (ML22024A172; issuance of final version pending) notes that the NRC staff needs to receive information about recent and late-breaking operating experience to have sufficient technical bases to evaluate the adequacy of an applicant's aging management activities.

As discussed in NRC Inspection Report 05000263/2023001 (ML23124A108), the source of a recent radioactive leak into groundwater was determined to be from a below grade portion of the control rod drive piping that runs between the reactor building and the turbine building. By design, there is a gap between these buildings to eliminate seismic interactions, and the leak occurred in that gap. The inspection report notes that the leaking carbon steel piping was replaced with stainless steel, and the pipe penetration was modified to allow periodic inspections. The report also identifies a performance deficiency for the licensee's failure to include the below grade portion of the control rod drive piping within the scope of the site's existing Underground Piping and Tank Integrity program.

SLRA Supplement 4 (ML23199A154), Enclosure 6b adds aging management review items to the Buried and Underground Piping and Tanks program and states that the supplement addresses the control rod drive piping between the reactor and turbine buildings that is potentially subject to wetting from groundwater due to its elevation. The staff notes that changes to the SLRA included the addition of underground environment to the associated system table with aging management review items for managing loss of material and cracking of the new

stainless steel piping exposed to an underground environment. These new items use the Buried and Underground Piping and Tanks program to manage the associated aging effects. The supplement also added steel piping items located in a vault to the off-gas system that were inadvertently omitted from the SLRA.

SLRA Section B.2.3.27, "Buried and Underground Piping and Tanks," includes a discussion in the plant-specific operating experience about an increasing trend of chloride concentrations in groundwater samples between 2011 and 2015. The SLRA states that the increase in chloride concentration was likely due to salt treatment during the winter months.

Monticello Updated Safety Analysis Report (USAR), Section 12.2.2.1.1, "Structure Description," Revision 36 (ML23006A146) states that a 1-inch seismic gap separates the reactor and turbine buildings and notes that the 1-inch separation is filled with pre-molded filler up to the 951-foot elevation.

GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," recommends external visual inspections of underground steel and stainless steel piping in each 10-year inspection interval. It also recommends inspections for cracking, using a method that has been determined to be capable of detecting cracking. In addition, while the AMP does not recommend coatings for underground stainless steel piping (coatings are recommended for underground steel piping), it does recommend coatings for stainless steel piping in chloride containing environments.

NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," states "[i]f an applicant does take credit for a program in the GALL-SLR Report, it is incumbent on the applicant to ensure that the conditions and operating experience (OE) at the plant is bounded by the conditions and OE for which the GALL-SLR Report program was evaluated."

Issue:

1. Due to the timing of the recent discovery of leaking underground Control Rod Drive (CRD) piping, operating experience documentation was not available to the staff during its audit of the Buried and Underground Piping and Tanks program. Although SLRA Supplement 4 added aging management review items resulting from consequent modifications, it did not include any discussion or specific operating experience information concerning the degradation of the CRD piping (e.g., internal or external corrosion, depth and area of wall loss, results of any causal determinations).
2. GALL-SLR Report AMP XI.M41 recommends external visual inspections of underground piping, where underground components are described as being contained within a tunnel or vault. Given the potentially limited access to the underground CRD piping (e.g., small gap between the reactor and turbine buildings with pre-molded filler material), it is unclear how the inspections will be performed.
3. Given the inadvertent omission of underground CRD and off-gas system piping from the SLRA, it is unclear whether additional actions have been taken and, if so, whether they have been completed to identify any other in-scope underground piping that was inadvertently omitted from the SLRA.

4. Based on groundwater samples containing elevated levels of chlorides, it is unclear whether in-scope underground steel and stainless steel piping are externally coated in accordance with the “preventive actions” program element of GALL-SLR Report AMP XI.M41.

Request:

1. Provide operating experience information regarding the degraded CRD piping (e.g., internal or external corrosion, depth and area of wall loss (if applicable), causal determinations) as needed to ensure that the conditions and operating experience at the plant are bounded by the Buried and Underground Piping and Tanks program.
2. Provide additional information with respect to how inspections of underground CRD piping will be conducted given the potentially limited access (e.g., small gap between the reactor and turbine buildings, presence of filler material).
3. Provide information regarding actions that have been or will be taken to identify any other in scope underground piping that may have been inadvertently omitted from the SLRA.
4. Provide clarification with respect to whether in-scope underground steel and stainless steel piping are externally coated in accordance with the “preventive actions” program element of GALL-SLR Report AMP XI.M41. If the subject components are not externally coated, state the basis for why external coatings are not provided.

RAI B.2.3.16-1

Regulatory Basis:

Section 54.21(a)(3) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the U.S. Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described in the requests for additional information.

Background:

The implementation schedule for the Fire Water System program in Table XI-01 of NUREG-2191, Volume 2, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17187A204), states, “Program is implemented and inspections or tests begin 5 years before the subsequent period of extended operation [SPEO]. Inspections or tests that are to be completed prior to the subsequent period of extended operation are completed 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation.”

The Implementation Schedule for the Fire Water System (No. 19) in Table A-3, "List of SLR Commitments and Implementation Schedule," in Appendix A of the Subsequent License Renewal Application (SLRA) states the following:

No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO

Implement the AMP [aging management program] and start the pre SPEO inspections and tests no earlier than 5 years prior to the SPEO.

Section B.2.3.16, "Fire Water System," in SLRA Appendix B states, "The enhancements are to be implemented no later than 6 months prior to entering the SPEO. This AMP is to be implemented and its pre-SPEO inspections and tests begin no earlier than 5 years prior to the SPEO. The pre-SPEO inspections and tests are to be completed no later than six months prior to entering the SPEO or no later than the last refueling outage prior to the SPEO."

During the audit of the Fire Water System AMP, the applicant stated that the program enhancements will be implemented no later than 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO, and that pre-SPEO inspections and tests will begin no earlier than 5 years prior to the SPEO and will be completed no later than 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO.

Issue:

The SLRA does not appear to clearly reflect the intended implementation schedule. Also, the Fire Water System AMP implementation schedule in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B appear to be inconsistent. Table A-3 in SLRA Appendix A doesn't state that the pre-SPEO inspections and tests are to be completed no later than 6 months prior to the SPEO or no later than the last refueling outage. Section B.2.3.16 in SLRA Appendix B does not include "or no later than the last refueling outage to the SPEO" for the implementation of the enhancements.

In addition, it is unclear whether the program will be implemented no later than 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO, or 5 years prior to the SPEO consistent with the implementation schedule in the GALL-SLR Report. Implementing the program 6 months prior to the SPEO or no later than the last refueling outage prior to the SPEO is not consistent with the implementation schedule in the GALL-SLR Report, which states that the program is implemented 5 years before the SPEO. In addition, beginning inspections before implementing the program is not consistent with the implementation schedule in the GALL-SLR Report, which states the program be implemented and inspections or tests begin 5 years before the SPEO. It is unclear to the NRC staff how inspections and tests will be adequately managed (i.e., performance, acceptance criteria, corrective actions, etc.) as part of the Fire Water System program without the inspection and test requirements being incorporated into the Fire Water System program documentation.

Request:

Please discuss the differences in the implementation schedule for the Fire Water System program stated in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B. In addition, discuss the basis for the implementation schedule, including how inspections and tests would be adequately managed prior to the Fire Water System program being implemented.

Alternatively, revise the implementation schedule for the Fire Water System AMP in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B to be consistent and to be consistent with the implementation schedule in the GALL-SLR Report.

RAI B.2.3.16-2

Regulatory Basis:

Section 54.21(a)(3) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the U.S. Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described in the requests for additional information.

Background:

The second table in the Enhancements subsection in Section B.2.3.16 in SLRA Appendix B provides additional detail on the required enhancements based on Table XI.M27-1, "Fire Water System Inspection and Testing Recommendations," in the Fire Water System AMP (XI.M27) in Volume 2 of NUREG-2191. However, the associated enhancement to the Detection of Aging Effects program element in Table A-3, "List of SLR Commitments and Implementation Schedule," in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B do not refer to the table for additional detail on the required enhancements.

In addition, it is unclear why some enhancements are identified as an enhancement to a particular program element in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B while other required enhancements are identified in the table that provides additional detail on the required enhancements based on Table XI.M27-1 in GALL-SLR Report AMP XI.M27 in Section B.2.3.16 in SLRA Appendix B. For example, the GALL-SLR Report AMP XI.M27, states that portions of water-based fire protection system components that have been wetted but are normally dry are subject to augmented testing and inspection beyond Table XI.M27-1. The augmented tests and inspections include:

- "In each 5-year interval, beginning 5 years prior to the subsequent period of extended operation, either conduct a flow test or flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or piping segments that allow water to collect."
- "In each 5-year interval of the subsequent period of extended operation, 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect is subject to volumetric wall thickness inspections. Measurement points are obtained to the extent that each potential degraded condition can be identified (e.g., general

corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval is in different locations than previously inspected piping.”

- “If the results of a 100-percent internal visual inspection are acceptable, and the segment is not subsequently wetted, no further augmented tests or inspections are necessary.”

Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B include 2) and 3) above but do not include 1) above. However, the table in Section B.2.3.16 of SLRA Appendix B that provides additional detail on the required enhancements based on GALL-SLR Report AMP XI.M27, Table XI.M27-1, includes 1), 2), and 3) above.

Issue:

Because the table in Section B.2.3.16 of SLRA Appendix B that provides additional detail on the required enhancements based on Table XI.M27-1 in GALL-SLR Report AMP XI.M27 is not referenced in the associated enhancement to the Detection of Aging Effects program element in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B, it may be hard to verify implementation of all of the required enhancements.

Request:

Please discuss why some enhancements are identified as an enhancement to a particular program element in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B while other required enhancements are identified in the table that provides additional detail on the required enhancements based on Table XI.M27-1 in GALL-SLR Report AMP XI.M27 in Section B.2.3.16 in SLRA Appendix B. Alternatively, revise the associated enhancement to the Detection of Aging Effects program element in Table A-3 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B to clearly reference the table that provides additional detail on the required enhancements.

RAI B.2.3.16-3

Regulatory Basis:

Section 54.21(a)(3) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the U.S. Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described in the requests for additional information.

Background:

SLRA Supplement 2 dated June 26, 2023 (ML23177A218), revised Section A.2.2.16 in SLRA Appendix A and Section B.2.3.16 in SLRA Appendix B to address Footnote 7 to Table XI.M27-1

in GALL-SLR Report AMP XI.M27 associated with sprinkler testing. Specifically, the SLRA sections were revised to indicate that the wet pipe sprinklers are not exposed to harsh environments.

Issue:

SLRA Supplement 2 did not revise the table that provides additional detail on the required enhancements based on Table XI.M27-1 in GALL-SLR Report AMP XI.M27 in Section B.2.3.16 in SLRA Appendix B. This table includes a required enhancement related to Section 5.3.1.1.2 of NFPA Standard 25 concerning sprinklers subject to harsh environments.

Request:

Please discuss whether an enhancement related to Section 5.3.1.1.2 of NFPA Standard 25 is needed given that the SLRA was revised in Supplement 2 to indicate that wet pipe sprinklers are not exposed to harsh environments.

RAI B.2.3.17-1

Regulatory Basis:

Section 54.21(a)(3) of Title 10 of the Code of Federal Regulations (10 CFR) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the U.S. Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information regarding the matters described in the requests for additional information.

Background:

Subsequent License Renewal Application (SLRA) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23009A354) Section 3.3.2.2.9 addresses loss of material and cracking of stainless-steel components exposed to concrete. The discussion notes that the stainless-steel standby liquid control tank is the only component where this issue applies and states that past operating experience identified cracking of the tank bottom. The discussion also notes that the issue has been corrected and that the One-Time Inspection program will be used to confirm that the tank bottom has not experienced further cracking. SLRA Table 3.3.2-17 includes a corresponding discussion for item 3.3.1-230 that cites generic Note E and plant-specific note 3, stating that, although the GALL-SLR Report recommends XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks" program for this item, the One-Time Inspection program will be used instead. The plant-specific note also states that the tank's bottom plate has been replaced, and an epoxy coating was applied to the concrete tank pedestal to prevent future cracking due to chloride exposure from the concrete. The associated discussion in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR) (ML17188A158) Section 3.3.2.2.9

notes that for stainless-steel components, stress corrosion cracking is not considered to be an applicable aging effect as long as the components are not potentially exposed to groundwater.

For cracking of stainless-steel tanks exposed to concrete, GALL-SLR Report Table XI.M29-1, "Tank Inspection Recommendations" prescribes volumetric inspections during each 10-year period, starting 10 years prior to the subsequent period of extended operation. In addition, as it relates to the use of a coating to prevent exposure of the stainless-steel tank to chlorides from the concrete, Table XI.M29-1 refers to SRP-SLR Section 3.3.2.2.3, "Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys." The associated discussion in SRP-SLR Section 3.3.3.2.3 addresses the use of a barrier coating to isolate components from an aggressive environment by stating, "the reviewer verifies that the barrier coating is impermeable to the applicable environment and verifies that loss of coating integrity is being managed for the associated components with a program equivalent to the GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks."

With respect to the proposal for using the One-Time Inspection program, the GALL-SLR Report (XI.M32) states that the program cannot be used for components subjected to known age-related degradation mechanisms based on a review of plant-specific operating experience for the prior operating period. In those cases, periodic inspections are proposed. In addition, the One-Time Inspection program notes that the inspected components need to attain sufficient age such that the aging effects with long incubation periods can be identified by the inspection.

The apparent cause evaluation, performed as part of the associated corrective action document (AR 01223696), states that the insulation and the grout are possible sources of the chlorides that caused the stress corrosion cracking of the stainless-steel standby liquid control tank. It also states that chlorides were present on the aluminum lagging on the tank and in the grout on which the tank rests. In addition, it states that water spillage would transport chlorides from the lagging, tank insulation, or grout to the surface of the stainless-steel tank. The extent of condition evaluation for AR 01223696 notes that high chloride concentrations can be due to the combined effects of moisture wicking under the bottom of the tank from spillage or condensation and repeated wet/dry conditions.

Issue:

Based on previous plant-specific operating experience, sufficient bases have not been provided to demonstrate that the One-Time Inspection program can be substituted for the periodic inspections prescribed by the Outdoor and Large Atmospheric Metallic Storage Tanks program. Although the source of chlorides from the concrete or grout has been addressed, it is not clear whether there are other sources of chlorides (e.g., tank insulation) that could lead to future stress corrosion cracking of the stainless-steel tank base.

In addition, the use of a barrier coating to isolate a component from an aggressive environment includes aspects that do not appear to be addressed in the SLRA. As discussed in the background, the impermeability of the coating to the applicable environment and the associated aging management activities to address loss of coating integrity are to be addressed. The staff notes that Monticello's new (currently proposed) Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program is consistent with the GALL-SLR Report XI.M42, as modified by SLR-ISG-2021-02-Mechanical. The proposed program addresses internal coatings exposed only to water environments and does not include coatings

exposed to air or condensation. The associated aging management review items in the SLRA only address internal coatings on carbon steel or gray cast iron components and do not include concrete with an external coating.

Although the guidance in SRP-SLR Section 3.3.2.2.9 states that stress corrosion cracking of stainless-steel components is not an applicable aging effect, as long as the components are not potentially exposed to groundwater, the operating experience at Monticello indicates otherwise. The application included a discussion about the standby liquid control tank when addressing this item even though the associated stainless-steel to concrete interface would not be considered exposed to groundwater. Based on the plant-specific operating experience, stress corrosion cracking of stainless steel exposed to concrete may be an applicable aging effect in locations where the interface is exposed to operational leakage.

Request:

For the aging management of the stainless-steel standby liquid control tank proposed in SLRA Table 3.3.1-17, item 3.3.1-230, provide information to justify the substitution of the One-Time Inspection program for the Outdoor and Large Atmospheric Metallic Storage Tanks program. Specifically address whether all of the potential sources of the chlorides attributed to the cause of the observed stress corrosion cracking have been eliminated through the use of an epoxy coating on the tank's concrete pad. Include information about statements in corrective action documents that note water spillage can transport chlorides from the lagging and tank insulation to the surface of the stainless-steel tanks. Provided that the source of the chlorides has been eliminated, also include information concerning the proposed timing of the one-time inspection, given that the tank bottom has been replaced sometime in the past.

In addition, provide information about how the loss of coating integrity for the previously applied epoxy coating on the concrete pedestal of the standby liquid control tank will be managed during the subsequent period of extended operation. Include any changes to the currently proposed Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program along with appropriate aging management review items. Specifically address whether loss of coating integrity needs to be considered for the inaccessible portions of the coating underneath the tank.

Regarding SLRA Section 3.3.2.2.9, provide information to confirm that the extent of condition reviews conducted for the standby liquid control tank provide reasonable assurance that stress corrosion cracking is not an applicable aging effect for other stainless steel components exposed to concrete with similar operational leakage.