

NEI 03-08

October 25, 2021

LTR: Byron 2021-0071

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Byron Station, Unit 1
Renewed Facility Operating License No. NPF-37
NRC Docket No. STN 50-454

Subject: Notification of Deviation from Electric Power Research Institute (EPRI) Materials Reliability Program (MRP) 2019-008, "Materials Reliability Program: Interim Guidance for NEI 03-08 Needed Requirements for US PWR Plants for Management of Thermal Fatigue in Non-Isolable Reactor Coolant System Branch Lines (MRP 19-008)"

In accordance with Appendix B, Section 8.1.c of Nuclear Energy Institute (NEI) 03-08, "Guideline for the Management of Materials Issues," Revision 4, Exelon Generation Company, LLC (EGC) is notifying the U.S. Nuclear Regulatory Commission (NRC) that Byron Station, Unit 1 has processed a deviation from "Needed" interim guidance (IG)#2 and IG#3 in EPRI MRP 2019-008, "Interim Guidance for NEI 03-08 Needed Requirements for US PWR Plants for Management of Thermal Fatigue in Non-Isolable Reactor Coolant System Branch Lines," with appropriate justification and documentation.

MRP 19-008 "Needed" requirements IG#2 and IG#3 for a one-time examination of Reactor Reheat Recirculation (RHR) suction lines off the Reactor Coolant System (RCS) hot legs and Emergency Core Cooling System (ECCS) high-head safety injection lines at the RCS cold legs will not be performed by the required time frame of within two refueling outages after August 1, 2019. The examinations have been deferred to refueling outage B1R25 (Spring 2023).

NEI 03-08 allows deviation from "Needed" elements with the appropriate justification and documentation. The deviation was documented in accordance with EGC's corrective action program and approved by the appropriate levels of EGC management. The Attachment provides the EGC Byron Unit 1 technical justification for the deviation from MRP 2019-008.

In accordance with NEI 03-08, this letter is being transmitted for information only. EGC is not requesting any action from the NRC.

This letter contains no new regulatory commitments.

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If you have any questions concerning this letter, please contact Zoe Cox, Regulatory Assurance Manager, at (815) 406-2800.

Respectfully,



John J. Kowalski
Site Vice President
Byron Nuclear Generating Station

JJK/ZLC/mf

Attachment: Byron Unit 1 Justification for the Deviation from MRP 2019-008, Technical Evaluation 635157

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector- Byron Station
NRC Project Manager – Byron Station
Illinois Emergency Management Agency- Division of Nuclear Safety

ATTACHMENT

**Byron Unit 1 Justification for the Deviation from MRP 2019-008,
Technical Evaluation 635157**

Reason for Evaluation/Scope:

This deviation is for the "needed" Interim Guidance in Materials Reliability Program (MRP) 2019-008. This evaluation is prepared in accordance with ER-AA-4003.

Materials Reliability Program (MRP) 2019-008, "Interim Guidance for NEI 03-08 Needed Requirements for US PWR Plants for Management of Thermal Fatigue in Non-Isolable Reactor Coolant System Branch Lines", was issued April 1, 2019 (Reference 1). The requirements of MRP 2019-008 shall be implemented within two refueling outages after August 1, 2019.

There are four "Needed" requirements (Interim Guidance, "IG") in MRP 2019-008. These requirements are:

1. DH [Down Horizontal] lines previously exempted by the Generic Analysis option (i.e., R-Strat) described in MRP-146 (Reference 2), paragraph 2.1.5.4 shall be inspected every other [Refueling Outage] RFO if all the following conditions are true:
 - Cracking has been identified
 - The cause of the cracking could not be identified and mitigated / eliminated.
2. For those large bore (> 4") DH lines that previously screened-out as "HOT" (per MRP-146) a one-time examination of the piping at the first 45-degree (or 90-degree) elbow is required (as represented on Figure 1A [of MRP 2019-008]). As a minimum, the inspection volume shall include the base metal and welds represented in Figure 1B [of MRP 2019-008].

Note: credit may be taken for previous exam if:

 - Previous exam volume requirements bound those of this IG.
3. Sites shall review MRP-146 "screened" out UH/H [Up Horizontal/Horizontal] lines to determine susceptibility to in-leakage from cross-flow. To perform this determination, interconnected lines, or lines sharing a common header, with only check-valve isolation between [Reactor Coolant System] RCS loops, shall be "screened in" as potentially susceptible to in-leakage / cross-flow. For the new "screened-in" lines a one-time inspection shall be performed using the volumetric requirements of MRP-146 Rev. 2 Figure 2-11 through Figure 2-14, as applicable, and as amended by IG #4 below.

Note: credit may be taken for previous exam if:

 - Previous exam volume requirements bound those of this IG.
4. Future fatigue examinations of the bottom inner third thickness of base metal as indicated in Figure 2-20 of MRP-146, Rev. 2 shall be 1" wide.

The operating experience (OE) from the MRP 2019-008 is based on Westinghouse designed plants. Both units at another site experienced rejectable weld indications at the upstream elbow weld at the first elbow off the Residual Heat Removal (RHR) suction line. Subsequent thermocouple measurements at that site indicated thermal cycling in the horizontal piping downstream of the elbow. However, this line had screened out of MRP-146 because the MRP-170 (Reference 3) analytical software predicted the horizontal portion of the piping stays hot (no stratification/de-stratification cycling expected). This OE was the basis for IG 2.

Per MRP 2019-008, another site provided OE where leakage from cracking in the safety injection (SI) piping caused a forced plant shutdown. The cause of the cracking was determined to be thermal fatigue caused by cross-flow of reactor coolant in the affected SI train from the other three trains. This was itself caused by leaking check valves in these lines and a slight variance in pressure in each loop of the RCS. This OE was the basis for IG 3.

Detailed Evaluation:

This notification was issued late into the window for scoping for the Byron Generating Station (BGS), Unit 1 Spring 2020 outage. The Spring 2020 refueling outage was the first refueling outage within the timeframe of MRP 2019-008.

Interim Guidance (IG) Items 1 and 4 have been satisfied or determined to be not applicable for BGS Unit 1 and require no additional inspections (Reference 4). For Byron Unit 1, IG 2 is applicable to two lines (the RHR suction off the RCS hot legs) that screened-in and require a one-time examination of the piping at the first 45-degree (or 90-degree) elbow. For Byron Unit 1, IG 3 is applicable to four lines (the ECCS high-head injection to the RCS cold legs) that screened in and require a one-time examination of the first weld connecting the injection line to the RCS cold leg.

Exelon has elected to defer all six of these examinations to B1R25 (Spring 2023). This is necessary because additional time is needed to plan and implement the inspections safely and with minimal dose impact. Four factors support this deferral:

- 1) BGS Unit 1 has enhanced detection capabilities for RCS leakage, as discussed in BGS Updated Final Safety Analysis Report (UFSAR) Section 3.6.2.1.1 (Reference 5). These capabilities are credited to detect a one gallon per minute leak in one hour to support use of Leak Before Break (LBB) per UFSAR Sections 5.2.5.1 and 5.2.5.2 (Reference 5). The subject lines are not specifically within the scope of the LBB analyses, but the detection methods still provide the capability to detect RCS leakage. Additionally, Operators perform a daily RCS leakrate calculation per (Reference 6). Thus, the overall risk to the station is mitigated such that a leak will be detected, and plant shutdown commenced prior to a gross structural failure.
- 2) The subject elbow welds on the RHR suction lines were inspected during the B1R24 refuel outage as part of the ISI scope for the outage (Reference 7). The examinations did not identify any flaws in the welds. These examinations could not be credited for MRP 2019-008, IG 2

requirements because they did not include the elbow base metal as shown in Figure 1B. Since the OE that was part of the basis for IG 2 identified flaws in the welds only (Reference 11), the ISI exams performed in B1R24 provide confidence that BGS Unit 1 is not incurring similar degradation.

- 3) The check valves in the ECCS high-head injection lines at BGS Unit 1 are tested for leakage when the unit reaches normal operating pressure and temperature during each startup following refueling (Reference 8). This ensures that there is no significant leakage past the valves which prevents the cross-flow phenomena OE that was the basis for IG 3.
- 4) Braidwood Generating Station (BWGS) Unit 1 piping configurations and operating parameters are nearly identical to BGS Unit 1. Examinations were performed on the subject four locations per MRP 2019-008, IG 3 at BWGS Unit 1 in A1R22 (April 2021) per Reference 9. These examinations did not identify any flaws. In addition, examinations were performed on one of the two subject locations per MRP 2019-008, IG 2. This examination did not identify any flaws. This provides a level of confidence that BGS Unit 1 is not incurring degradation similar to that which formed the basis for the MRP 2019-008, IG 2 and 3.

Conclusion:

The MRP 2019-008 interim guidance recommendations to complete the one-time inspections is based on recent OE with similar configurations. The interim guidance is designed to minimize the probability of thermal fatigue cracks that exceed allowable flaw dimensions or result in forced or extended outages. Per the factors discussed above, deferring the examination of the six lines by one cycle to B1R25 is not expected to pose significant risk to BGS Unit 1. No adverse flaws have been reported by US plants that have performed these inspections and reported them to EPRI MRP, as required by MRP 2019-008. Therefore, the deferral at BGS Unit 1 is acceptable.

References:

1. MRP 2019-008 "Interim Guidance for NEI 03-08 Needed Requirements for US PWR Plants for Management of Thermal Fatigue in Non-Isolable Reactor Coolant System Branch Lines", Electric Power Research Institute, April 2019
2. MRP-146 Revision 002 "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines", Revision 2, Electric Power Research Institute, September 2016
3. MRP-170 "Thermal Fatigue Evaluation per MRP-146, Version 1.0, "Electric Power Research Institute," April 2006
4. Exelon CAP Action Tracking Item 04236453-04
5. Byron/Braidwood Updated Final Safety Analysis Report, Revision 18
6. Byron Operations Surveillance 1BOSR 4.13.1-1 Revision 035 "Unit One Reactor Coolant System Water Inventory Balance Surveillance Computer Calculation"
7. Byron Station B1R24 ISI Non-Destructive Examination Reports for RH Suction Lines
 - A. B1R24-UT-029 (1RC04AA-12)
 - B. B1R24-UT-030 (1RC04AA-12)

- C. B1R24-UT-024 (1RC04AB-12)
 - D. B1R24-UT-026 (1RC04AB-12)
8. Byron Operations Surveillance 1BOSR 4.14.1-1C Revision 002 "Unit One Reactor Coolant System Pressure Isolation Valve and Cold Leg Injection Isolation Valve Leakage Greater than 2000 PSIG Surveillance"
9. Braidwood Station A1R22 MRP 2019-008, IG 3 Non-Destructive Examinations Reports:
- A. 2021-UT-034 (1RC30AC-1.5)
 - B. 2021-VT-006 (1RC30AC-1.5)
 - C. 2021-UT-035 (1RC30AD-1.5)
 - D. 2021-VT-007 (1RC30AD-1.5)
 - E. 2021-UT-032 (1RC30AA-1.5)
 - F. 2021-VT-004 (1RC30AA-1.5)
 - G. 2021-UT-033 (1RC30AB-1.5)
 - H. 2021-VT-005 (1RC30AB-1.5)
10. Braidwood Station A1R22 MRP 2019-008, IG 2 Non-Destructive Examination Reports:
- A. A1R22-UT-032 (1RC04AB-12)
 - B. A1R22-UT-033 (1RC04AB-12)
 - C. 2021-VT-009 (1RC04AB-12)
 - D. 2021-VT-010 (1RC04AB-12)
11. ML17338A131, "Diablo Canyon Power Plant, Units 1 and 2 – Relief Request REP-RHR-SWOL, Request for Approval of Alternate for Application for Full Structural Weld Overlay"
12. Braidwood IR 04450126, "MRP 2019-008 Inspection Discrepancy for 1A RH Suction Welds," dated 10/01/2021