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October 13, 2022

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File: 1D.101

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

Byron Station, Unit 2
Renewed Facility Operating License No. NPF-66
NRC Docket No. STN 50-455

Subject: Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-335, Revision 3-A) Final Causal Report and Description of Corrective Action Assignment

- References:
- 1) Event Notification 55857: Ultrasonic Examination Results – Reactor Vessel Head Penetration, Event Date April 23, 2022
 - 2) Byron Letter 2022-0030 to NRC, "Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-335, Revision 3-A) Report," dated May 3, 2022

In accordance with MRP-335, Revision 3-A, "Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement," section 5.2 (c), Constellation Energy Generation, LLC (CEG) is providing the final causal analysis report consistent with the CEG corrective action program including a description of corrective action assignment for Byron Station, Unit 2 (Byron).

While performing volumetric inspections required by ASME Code Case N-729-6 during the spring 2022 refueling outage (B2R23), a rejectable indication on Reactor Vessel Head Penetration 75 Core Exit Thermocouple (CETC) was identified. The indication is located inboard of the J-groove weld and is outside diameter-initiated in an area that was not surface stress mitigated (peened) as documented in Reference 1 above. MRP-335, Revision 3-A, section 5.2 (c) requires the following for this indication:

If a wetted surface-connected flaw, an unacceptable flaw based on the ASME Code, Section XI, or unacceptable flaw growth is observed in a peened DMW, RPVHPN, or J-groove weld, (c) A final causal analysis report consistent with the licensee corrective action program including a description of corrective actions taken must be submitted to the NRC within six months of the discovery.

Attachment 1 includes the applicable portions of Byron Action Request (AR) 04495098 that provide the final causal analysis report, a work group evaluation (WGE), completed consistent with Byron's corrective action program, to evaluate the indication on Reactor Vessel Head Penetration 75 CETC identified during the B2R23 outage. Attachment 2 includes a description of corrective action (CA) assignment in the corrective action program under AR 04495098. This satisfies the above requirement.

There are no regulatory commitments contained in this letter.

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

Respectfully,



Harris Welt
Site Vice President Byron Generating Station

HW/ZC/hh

Attachments:

- 1) Work Group Evaluation from Byron Action Request 04495098, "U2 Reactor Head Indication at Pen-75"
- 2) Description of Corrective Action Assignment

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector, Byron Station

ATTACHMENT 1
Work Group Evaluation from Byron Action Request 04495098,
"U2 Reactor Head Indication at Pen-75"

In accordance with MRP-335, Revision 3-A, section 5.2 (c), a final causal analysis report consistent with the Byron corrective action program must be submitted to the NRC to evaluate the indication on Reactor Vessel Head Penetration 75 Core Exit Thermocouple (CETC) identified during the Byron Unit 2 spring 2022 refueling outage (B2R23). Included below are the applicable portions of Byron Action Request 04495098, "U2 Reactor Head Indication at Pen-75." Specifically, this includes the work group evaluation (WGE) completed to document the final cause for AR 04495098, which was completed consistent with Byron's corrective action program.

AR 04495098 Report

Status: APPROVED

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|---------------------------|--------------------------|-----------------------|-----------------------------|--------------------------|-----------------|
| Due Date: | 11/23/2023 | Event Date: | 04/23/2022 | Origination Date: | 04/23/2022 |
| Affected Facility: | BYRON GENERATING STATION | Affected Unit: | UNIT TWO | Affected System: | REACTOR COOLANT |
| AR Type: | CR | Owed To: | ENG - PROGRAMS - EVALUATION | CR Level/Class: | 2 / D |
| How Discovered: | SELF-IDENTIFIED | WR: | --- | | |

ACTION REQUEST DETAILS

Subject: U2 Reactor Head Indication at Pen-75

Department review performed by: JOSEPH M BUCHANAN 05/13/2022 06:59:21 CDT
 Evaluation Comments:
 Condition/Problem Statement:

During the B2R19 and B2R20 refueling outages in spring 2016 and fall 2017, the Reactor Pressure Vessel Closure Head Penetration Nozzles (RPVHPN) were mitigated from Primary Water Stress Corrosion Cracking (PWSCC) using the Ultra-High Pressure Cavitation Peening (UHPCP) process in accordance with the requirements of MRP-335, Revision 3-A. The RPVHPNs were fabricated from Alloy 600 material and j-groove welded with Alloy 82/182 material. Relief requests in accordance with 10 CFR 50.55a were submitted and approved by the Nuclear Regulatory Commission (NRC) to perform the required post-peening ultrasonic inspections per ASME Code Case N-729-6 during B2R23 refueling outage in Spring 2022.

At 08:53 CDT on 04/23/2022, during the B2R23 refueling outage, the RPVHPNs post-peening ultrasonic inspection revealed one indication at Penetration 75 which is a Core Exit Thermocouple (CETC) penetration nozzle. This was found outside the required peening coverage area in accordance with MRP-335, Revision 3-A. Peening was not performed on this area due to geometry limitations where the funnel fillet welds and adjacent areas are shadowed by top of funnel. This indication is located at 184 degrees

ATTACHMENT 1
Work Group Evaluation from Byron Action Request 04495098,
"U2 Reactor Head Indication at Pen-75"

with a length of 0.197" with a depth of 0.141" from the outer diameter (OD) surface of the CETC penetration. The indication extends from 1.498" to 1.695" from the end of the nozzle. The indication is axially oriented and is at the location of one of the funnel fillet welds.

Statement of Cause:

The cause is attributed to PWSCC, based on the volumetric examination characterization of the indication along with industry experience. The CETC tubes are made of Alloy 600 which is a PWSCC susceptible material.

The indication is within the inspection area per ASME Code Case N-729-6 but is approximately 3.5" below the area that is required to be peened per MRP-335, Revision 3-A. Although the fillet welds are outside of the required area to be peened, Framatome extended the OD peening area to include as much of the inspection area as possible during the B2R19 and B2R20 refueling outages. As the guide funnel and anti-rotation fillet welds cover a portion of the inspection area, this area was not peened which made it not mitigated from PWSCC.

Penetration 75 CETC guide funnel is threaded onto the lower portion of the CETC tube and is held in place by the threaded connection and two anti-rotation fillet welds. The fillet welds were added after plant construction to the top edge of the guide funnel to ensure the guide funnel did not unthread during plant operation. Also, these tubes were roll straightened after being annealed, which increased residual stresses in the base material, making these tubes more susceptible to PWSCC.

Extent of Condition:

The RPVHPNs post-peening ultrasonic inspection was consistent with ASME Code Case N-729-6 during the B2R23 refueling outage, no additional indications were found, and the extent of condition was limited to Penetration 75.

Evaluation of any SOC Comments:

Follow up comments to the SOC comments has been reviewed and submitted and contained within IR 04495001. See below for actions completed and created.

Actions Completed/Created:

1) EC 636638, OP EVAL 22-001 - FRAMATOME EVALUATION OF BYRON ACCEPTANCE OF UNIT 2 PEN 75 NOZZLE INDICATION, without a repair was approved on 04/29/2022.

2) Actions under IR 04495098:

ATTACHMENT 1
Work Group Evaluation from Byron Action Request 04495098,
"U2 Reactor Head Indication at Pen-75"

- a) Assignment 03 was created to review for INPO IRIS OE and NEB criteria. Completed 04/29/2022.
- b) Assignment 05 was created to complete an event/issue report per OP-AA-101-113-1004 Attachment 2. Completed on 04/27/2022.
- c) Assignments 06 and 07 was created to perform a prompt investigation per OP-AA-106-101-1001. Completed on 04/26/2022 and 04/25/2022 respectively.
- d) Assignment 10 was created to set up PORC meeting date with PORC Coordinator.
- e) Assignment 22 was created to perform volumetric examinations of Penetration 75 to comply with the successive examination requirements of ASME Code Case N-729-6.
- f) Assignment 24 was created to send CAP product to NRC per the requirements of MRP-335 Rev 3-A section 5.2.c to submit a final causal analysis report consistent with the licensee corrective action program within six months of the discovery.
- g) Assignment 26 has been created to determine if a 10 CFR 50.55a relief request needs to be submitted to perform successive examinations at a 10-year re-inspection interval instead in the next three ISI inspection periods per ASME Code Case N-729-6 until the flaw remains essentially unchanged.
- h) Assignment 27 was created to review additional reportability per MRC comments on 05/02/2022.
- i) Assignments 28, 29, 32, and 33 have been created to develop for the for INPO IRIS tentative report and final report. Assignments 28 and 29 have been completed on 05/06/2022 and 05/09/2022 respectively.

Manager review performed by: PATRICK M MURRAY 05/13/2022 07:01:37 CDT
Manager Comments:
Approved

MRC Reviewed by: MARYE FLEEGER 05/17/2022 14:32:17 CDT
MRC Comments:

Per MRC 5-17-22
WGE Approved

ATTACHMENT 2
Description of Corrective Action Assignment

Included below is a description of the corrective action (CA) assignment in the correction action program under Byron Action Request (AR) 04495098 created in response to the indication on Reactor Vessel Head Penetration 75 Core Exit Thermocouple (CETC) identified during the Byron Unit 2 spring 2022 refueling outage (B2R23).

As indicated in the excerpt from CA 04495098-21 below, this assignment has been created to track the completion of the permanent repair in order to eliminate the indication located on the Reactor Vessel Head Penetration 75 CETC. The due date to complete this CA action item is October 27, 2023, which coincides with the Byron Unit 2 fall 2023 refueling outage (B2R24).

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|--------------------|--|------------------|------------------|--------------------|------------|
| Assignment No. | <u>21</u> | Assigned To | CHESTER S WILSON | Status: | ACC/ASG |
| Affected Facility: | BYRON GENERATING STATION | Primary Group: | WRK MGMT OUTAGE | Due Date: | 10/27/2023 |
| Assignment Type: | CORRECTIVE ACTION (CR PI-AA-125) | Secondary Group: | — | Original Due Date: | 10/27/2023 |
| Priority: | -- | Schedule Ref: | B2R24 | Unit Condition: | — |
| Subject: | Track completion of the permanent repair to eliminate the indication located on CETC penetration nozzle #75 in B2R24 | | | | |
