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U S Nuclear Regulatory Commission  
ATTN: Document Control Desk  
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Prairie Island Nuclear Generating Plant Unit 1  
Docket 50-282  
Renewed License No. DPR-42

Inservice Inspection Summary Report Unit 1, Interval 5, Period 1, Outage 1, Refueling  
Outage Dates: 10/15/2016 to 11/20/2016, Fuel Cycle 29: 11/23/2014 to 11/20/2016

During the 2016 Prairie Island Nuclear Generating Plant (PINGP) Unit 1 refueling outage, an inservice inspection (ISI) examination for the first period of the fifth interval was conducted. Form OAR-1 Owner's Activity Report (Enclosure 1) is being submitted for this time period as required by the American Society of Mechanical Engineers (ASME) Code Section XI, in accordance with the provisions of Code Case N-532-5, and is intended to satisfy the inspection reporting requirements.

The form includes a listing of items with flaws or relevant conditions that required evaluation for continued service (Table 1) and an abstract of repair/replacement activities required for continued service (Table 2).

Also attached is an evaluation of the acceptability of inaccessible areas of the Unit 1 Containment Vessel (Enclosure 2) in accordance with the requirements of 10CFR 50.55a(b)(2)(ix)(A).

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

Scott Northard  
Site Vice President, Prairie Island Nuclear Generating Plant  
Northern States Power Company - Minnesota

Enclosure (2)

cc: Administrator, Region III, USNRC  
Project Manager, Prairie Island, USNRC  
Resident Inspector, Prairie Island, SNRC

## **ENCLOSURE 1**

FORM OAR-1 OWNER'S ACTIVITY REPORT for Unit 1, Interval 5, Period 1,  
Outage 1, Refueling Outage Dates: 10/15/2016 to 11/20/2016,  
Fuel Cycle 29: 11/23/2014 to 11/20/2016

3 pages follow

# FORM OAR-1 OWNER'S ACTIVITY REPORT

## Prairie Island Nuclear Generating Plant

As required by the provisions of ASME Code Case N-532-5

Report Number 1R30  
Plant Prairie Island Nuclear Generating Plant, 1717 Wakonade Drive East, Welch, Minnesota, 55089  
Unit No. 1 Commercial service date 12/16/1973 Refueling outage no. 1R30  
Current inspection interval 5<sup>th</sup> ISI Inspection Interval for class 1, 2, and 3. 2<sup>nd</sup> IWE Inspection Interval for class MC  
Current inspection period 1<sup>st</sup> ISI Inspection Period for class 1, 2, and 3. 3<sup>rd</sup> IWE Inspection period for class MC  
Edition and Addenda of Section XI applicable to the inspection plans 2007 Edition - 2008 Addenda for class 1, 2, and 3. 2001 Edition - 2003 Addenda for class MC  
Date and revision of inspection plans 6/22/16 Rev. 1 for class 1, 2, and 3. 10/26/12 Rev. 9 for class MC  
Edition and Addenda of Section XI applicable to repair/replacement activities, if different than the inspection plans  
Same as Inspection Plan for class 1, 2, and 3. 2007 Edition - 2008 Addenda for class MC  
Code Cases used for inspection and evaluation: N-532-5, N-661-2, N-716-1, N-776, N-722-1

### CERTIFICATE OF CONFORMANCE

I certify that (a) the statements made in this Owner's Activity Report are correct; (b) the examinations and tests meet the Inspection Plan as required by the ASME Code, Section XI; and (c) the repair/replacement activities and evaluations supporting the completion of refueling outage number 1R30 conform to the requirements of Section XI.

Signed Thomas Downing ISI Engineer Date 1-24-2017  
Owner or Owner's Designee, Title

### CERTIFICATE OF INSERVICE INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by The Hartford Steam Boiler Inspection and Insurance Company of Connecticut have inspected the items described in this Owner's Activity Report, and state that, to the best of my knowledge and belief, the Owner has performed all activities represented by this report in accordance with the requirements of Section XI.

By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the repair/replacement activities and evaluation described in this report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Debra R. Ruff Commissions NB 12085 N.I.R.  
Inspector's Signature (National Board Number and Endorsement)

Date February 02, 2017

TABLE 1  
ITEMS WITH FLAWS OR RELEVANT CONDITIONS THAT REQUIRED  
EVALUATION FOR CONTINUED SERVICE

Examination Category and Item Number	Item Description	Evaluation Description
B-L-2, B12.20	12 RCP Pump Internals	Two indications of minor gouges determined to be non-relevant AR 1539956.
B-P, B15.80	Reactor Vessel Bottom Head per Code Case N-722-1	Non-relevant indications of light translucent streaks AR 1541635.
B-P, B15.10	SP 1168.1 RCS Pressure Test	Non-relevant packing and fitting indications ARs: 1542388, 1542377.
B-P, B15.10 C-H, C7.10	SP 1392 Bolted Connections Borated Systems Pressure Test	Dry white boric acid indications at bolted conn. accepted by evaluation AR 1538861.
C-H, C7.10	SP 1168.12 SI Accumulator Pressure test	Non-relevant packing indication AR 1542409.
C-H, C7.10	SP 1168.13 Safety Injection Pressure test	Non-relevant packing and fitting indications ARs: 1540887, 1540890, 1540893, 1540891.
C-H, C7.10	SP 1168.13 Safety Injection Pressure test	Dry white boric acid indication at bolted conn. accepted by evaluation AR 1541176.
C-H, C7.10	SP 1168.14 Containment Spray Pressure Test	Dry white boric acid indication at packing. Non-relevant packing indication AR 1514520.
C-H, C7.10	SP 1168.16 CVCS Pressure Test	Non-relevant packing indication AR 1447393.
C-H, C7.10	SP 1168.17 Feedwater Pressure Test	Non-relevant indication outside code boundary AR 1542651.
C-H, C7.10 D-B, D2.10	SP 1168.6 Aux Feed Pressure test	Non-relevant packing indication AR 1542522.
D-B, D2.10	SP 1168.4 Component Cooling Pressure Test	Non-relevant bolted connection and fitting indications AR 1538737.
D-B, D2.10	SP 1168.8 Cooling Water Pressure Test	Non-relevant mechanical connection indications AR 1518348.
E-A, E1.11	Containment Accessible Areas	3 indications of gouges accepted by evaluation AR 1540848.
E-A, E1.30	Moisture Barrier	3 indications of lack of adhesion and 1 tear accepted by corrective measures AR 1541212 and WO 478898.
F-A, F1.10b	Rupture Restraint	9-RHR-3A Residual Heat Removal Restraint with indication of lack of thread engagement. Accepted by evaluation EC 27737 and AR 1539806.
F-A, F1.20a	Rod/Clamp	1-SIRH-15 Safety Injection hanger with indication of misalignment. Accepted by evaluation EC 27737 and AR 1539778.
F-A, F1.20a	Rod/Clamp	1-RSH-3 Safety Injection small bore support rod has slight bend non-relevant EC 27737 and AR 1538986.
F-A, F1.20b	Constant Support	1-MSDH-24 Main Steam large bore support missing scale and rod in contact with conduit non-relevant EC 27737 and AR 1538356.
F-A, F1.30a	Rod/Clamp	1-CWH-188 Cooling Water hanger with indication of bent rod at top of hanger top. Accepted by evaluation EC 27737 and AR 1539147.
F-A, F1.30b	Pipe Rack Support	1-CWH-261 Cooling Water multiple support assembly with indications of bolt not fully engaged and bent column. Accepted by evaluation EC 27737 and AR 1539153.
F-A, F1.30c	Spring Hanger	1-CWH-218 Cooling Water hanger with indication of skewed anchor bolt in baseplate. Accepted by evaluation EC 27737 and AR 1539844.
F-A, F1.40	12 RCP Support Column H-2	Hairline crack in grout. Non-relevant indication outside the scope of ASME XI AR 1540224.

TABLE 2  
ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE

Code Class	Plant ID #	Item Description	Description of Work Completed	Date Completed	R/R Plan #
3	035-072	D2 DSL GEN Lube Oil Cooler	Performed weld build of eroded areas of the channel ends and covers as needed to restore sealing surfaces.	3/13/2015	1-29-002
	035-062	D2 DSL GEN Jacket Water Cooler			
	035-052	D2 DSL GEN Air Cooler			
3	3-CL-88	Cooling Water Pipe Segment	Replaced segment of pipe due to MIC.	3/9/2016	1-29-003
2	174-011	11 FCU Coils	Replaced the containment fan coil unit coils.	1/4/2017	1-29-026
3	4-CL-11	Cooling Water system pipe spool	Replaced a section of Cooling Water pipe due to MIC.	4/12/2016	1-29-012
2	162-393	13 CHG PMP Hyd Desurger	Replaced Cap Screw on Desurger.	8/3/2016	1-29-032
2	174-014	14 FCU Coils	Replaced the containment fan coil unit coils.	1/4/2017	1-29-034
2	174-012	12 FCU Coils	Replaced the containment fan coil unit coils.	1/4/2017	1-29-035
2	174-013	13 FCU Coils	Replaced the containment fan coil unit coils.	1/4/2017	1-29-036
3	035-052	D2 Air Cooler	Replaced the D2 Diesel Generator air cooler tube bundle.	1/3/2017	1-29-043
3	10-ZX-75	ZX Piping Segment (located in the E1 elbow)	Installed Code Case N-661-2 weld overlay on area of thinning due to MIC.	12/16/2016	1-29-060

## **ENCLOSURE 2**

Evaluation of the Acceptability of the Inaccessible Areas of the Unit 1 Containment Vessel in Accordance with the requirements of 10CFR 50.55a(b)(2)(ix)(A)

# Condition Evaluation

NUMBER: 01538143-03

SHEET NO: 1 OF 5

TITLE: EVALUATION OF INACCESSIBLE CONTAINMENT AREAS

DATE: 10/22/2016

COMP. BY: TRD

## 1.0 Purpose and Summary Result

The purpose of this evaluation is to evaluate the acceptability of inaccessible areas of the Unit 1 Containment vessel in accordance with the requirements of 10CFR 50.55a(b)(2)(ix)(A).

The containment vessel is determined to be acceptable for continued service with no corrective actions.

## 2.0 Background

AR 01538143 "identified that there was numerous excessive deposits of boric acid around the 695 elevation of containment that were due to water migration through the concrete originating from the flooded Sump B." The flooding was the result of leaking RHR suction valves which allowed water from the Refueling Water Storage Tank to leak into the containment RHR sump and overflow into the surrounding areas. Increasing sump level was identified in June of 2015 with potential exposure of the containment vessel to borated water conservatively estimated at 18 months [4.1].

Migration of borated water through the containment concrete (as identified in the AR) indicates borated water may have come in contact with the containment vessel. Borated water in contact with the containment vessel is a condition that could indicate the presence of or could result in degradation of inaccessible areas.

As required by 10CFR 50.55a(b)(2)(ix)(A):

(A) Metal containment examinations: First provision. For Class MC applications, the following apply to inaccessible areas.

(1) The applicant or licensee must evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or could result in degradation to such inaccessible areas.

(2) For each inaccessible area identified for evaluation, the applicant or licensee must provide the following in the ISI Summary Report as required by IWA-6000:

(i) A description of the type and estimated extent of degradation, and the conditions that led to the degradation;

(ii) An evaluation of each area, and the result of the evaluation; and

(iii) A description of necessary corrective actions.

## Condition Evaluation

NUMBER: 01538143-03

SHEET NO: 2 OF 5

TITLE: EVALUATION OF INACCESSIBLE CONTAINMENT AREAS

DATE: 10/22/2016

COMP. BY: TRD

### 3.0 Evaluation

- 3.1 A description of the type and estimated extent of degradation, and the conditions that led to the degradation;

Based on a long history of borated water exposure with no measureable degradation and evaluation of potential corrosion rates, there is a high level of confidence there is no significant degradation of the containment vessel.

Refueling cavity leakage has been experienced in various areas of containment of both units dating back to approximately 1988. The most prominent and consistent leakage was through the grout in Sump B [4.2]. Cavity leakage has been mitigated in recent years after cavity liner modifications were performed in 1R27 (2011) and 2R27 (2012) [4.3].

In order to access the potential degradation to the containment vessels, the site performed several excavations of areas known and suspected of repeated or long term exposure to borated water as summarized in the below table.

Excavation Location	When/Reference	Results
Unit 2 Containment RHR Sump B	1998 (2R19) [4.2]	During the 1998 Unit 2 refueling outage (2R19) water was found entering sump B from the area outside the RHR suction penetration sleeve. Leakage was measured at 0.5 gph. The water was sampled and determined to be at refueling water boron concentration, approximately 2700 ppm. The water also contained short lived nuclides. The pH of the water was 7.8, slightly alkaline. The grout around the penetration was partially removed to determine the condition of the containment vessel wall. The vessel showed no signs of degradation.
Unit 1 Containment RHR Sump B	2002 (1R22) [4.2]	Removed grout unit 1 sump B for visual inspection of containment vessel.
Unit 2 Containment RHR Sump B	2008 (2R25) [4.2]	The grout was removed from sump B to allow visual and UT inspection of the containment vessel. There was no indication of degradation. The leakage in sump B was reported to well up from the bottom of the removed grout at a rate of



## Condition Evaluation

NUMBER: 01538143-03

SHEET NO: 3 OF 5

TITLE: EVALUATION OF INACCESSIBLE CONTAINMENT AREAS

DATE: 10/22/2016

COMP. BY: TRD

		approximately 1gph.
Unit 1 Containment RHR Sump B	2009(1R26) WO372531	Removed grout and took UT readings (BOP-UT-09-012). All readings above 3.56" thickness. No degradation.
Unit 1 RV Sump C	2011 (1R27) [4.3]	Concrete was removed from sump C. VT examination of exposed rebar and containment vessel, and UT thickness readings of containment vessel showed no indication of degradation (reference VT report BOP-VT-11-032 and BOP-UT-11-010). The containment vessel showed no rust, pitting or other degradation. Ten thickness readings were taken with a lowest reading of 1.561 inch as compared to the nominal/design shell thickness of 1.5 inch.
Unit 2 RV Sump C	2012 (2R27) [4.3]	Concrete was excavated from the unit 2 reactor vessel sump C in 2R27 (spring 2012) to allow for direct visual examination and UT thickness measurement of the containment vessel. Water seeped into the excavation at approximately 8 cubic inches in 15 minutes (AR01337188). The pH of the water was not tested. Boron concentration was less than 10 ppm and reactivity was 2.0 1E-05 uCi/ml Co-58. The containment vessel was found to be in good condition with no degradation. UT thickness readings were above 1.6" as compared to a design thickness of 1.5" (NDE report BOP-VT-12-055). The exposed rebar was also in good condition with no significant degradation

The above summary shows six excavations performed over a period of approximately 14 years. The excavations included areas known to be periodically wetted (RHR Sumps) and areas thought to be continually wetted (RV Sumps as they are near the low point of the containment vessel).

None of the excavations showed detectable degradation either visually or with ultrasonic thickness measurement.

## Condition Evaluation

NUMBER: 01538143-03

SHEET NO: 4 OF 5

TITLE: EVALUATION OF INACCESSIBLE CONTAINMENT AREAS

DATE: 10/22/2016

COMP. BY: TRD

A Root Cause Evaluation (RCE) of refueling cavity leakage assessed potential corrosion rates of the containment vessels with the following results [4.2]:

Tests at ambient temperature indicate that the rates of corrosion of steel in aerated concentrated boric acid solutions range between 0.002 to 0.007 inches (Section 4.4.1 of the Boric Acid Corrosion Guidebook, Rev. 1 [29]). These rates are probably conservative for the current application since the pH of solution in contact with the steel containment vessel will be buffered by alkalinity from the cement in the concrete.

A test in 1998 of leaking water at the RHR penetration in Sump B where grout had been removed indicated that the pH was 7.8 [30]. Another test in 1998 of water collected on the floor of the RCDT room indicated a pH of 7.0 [30]. The water had high concentrations of boron which, if it had not been buffered, would have resulted in pH values of 5 or less. This indicates that the boric acid had been buffered by alkalinity from the cement in the concrete. Corrosion rates in near neutral water at ambient temperatures are about 0.2 mm/year (0.008 in./year) (Figure 3 on Page 536 of [28]).

A long term test was performed by Florida Power and Light to determine the corrosion rate of carbon steel rebar in contact with concentrated boron solution (2370 ppm) at pH 7.4 at ambient temperature [31]. This test measured a corrosion rate after 8 years of test of 0.005 inches/year.

Research performed as part of the RCE indicates potential corrosion rates of approximately 0.008 in / year. A potential exposure of 18 months would not result in significant degradation of the containment vessel.

Based on six excavations over a period of 14 years with no degradation and an expected corrosion rate of approximately 0.008 in./year, there is a high level of confidence that the potential borated water exposure during Unit 1 cycle 29 did not result in any significant degradation.

### 3.2 An evaluation of each area, and the result of the evaluation.

All areas of potential degradation as a result of RHR Sump B flooding are discussed above. The evaluation has determined a high level of confidence there is no significant degradation of the containment vessel.

## Condition Evaluation

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NUMBER: 01538143-03

SHEET NO: 5 OF 5

TITLE: EVALUATION OF INACCESSIBLE CONTAINMENT AREAS

DATE: 10/22/2016

COMP. BY: TRD

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3.3 A description of necessary corrective actions.

As there is no indication of degradation, no corrective actions are necessary.

### 4.0 References

4.1 AR 01484218 Unit 1 Sump B level increasing.

4.2 RCE 01160372-01 Refueling Cavity Leakage Event Date: 1988-2008.

4.3 AR 01160372 Refueling Cavity Leakage Corrective Actions and the LRA

### 5.0 Attachments

None.