



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE N.E., SUITE 1200
ATLANTA, GEORGIA 30303-1200

May 13, 2019

Mr. William R. Gideon
Site Vice President
Duke Energy Progress, Inc.
Brunswick Steam Electric Plant
8470 River Rd. SE (M/C BNP001)
Southport, NC 28461

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT UNITS 1 AND 2 – NUCLEAR
REGULATORY COMMISSION INTEGRATED INSPECTION REPORT
05000325/2019001 AND 05000324/2019001

Dear Mr. Gideon:

On March 31, 2019, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Brunswick Steam Electric Plant, Units 1 and 2, and discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented two findings of very low safety significance (Green) in this report. These findings involved violations of NRC requirements. We are treating these violations as non-cited violations consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or significance or severity of the violations documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement; and the NRC resident inspector at Brunswick.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; and the NRC resident inspector at Brunswick.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Lundy F. Pressley, Acting Chief
Reactor Projects Branch 4
Division of Reactor Projects

Docket Nos.: 05000325 and 05000324
License Nos.: DPR-71 and DPR-62

Enclosure:
Inspection Report 05000325/2019001 and 05000324/2019001

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SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 – NUCLEAR
 REGULATORY COMMISSION INTEGRATED INSPECTION REPORT
 05000325/2019001 AND 05000324/2019001 May 13, 2019

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DATE	5/8/2019	5/8/2019	5/8/2019	5/8/2019	5/8/2019	5/9/2019
OFFICE	RII: DRP	RII: DRP	RII: DRP	RII: DRP		
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DATE	5/9/2019	5/9/2019	5/9/2019	5/13/19		

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Numbers: 05000325 and 05000324

License Numbers: DPR-71 and DPR-62

Report Numbers: 05000325/2019001 and 05000324/2019001

Enterprise Identifier: I-2019-001-0023

Licensee: Duke Energy Progress, LLC

Facility: Brunswick, Units 1 and 2

Location: Southport, NC

Inspection Dates: January 01, 2019 to March 31, 2019

Inspectors: G. Smith, Senior Resident Inspector
J. Steward, Resident Inspector
S. Downey, Senior Reactor Inspector
R. Kellner, Senior Health Physicist
W. Loo, Senior Health Physicist
M. Riley, Reactor Inspector

Approved By: Lundy F. Pressley, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a Quarterly inspection at Brunswick Units 1 and 2 in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information. Findings and violations being considered in the NRC's assessment are summarized in the table below.

List of Findings and Violations

Inadequate Instruction Used to Perform Vessel Nozzle Flushing			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Initiating Events	Green NCV 05000324/2019001-01 Open/Closed	[H.5] - Work Management	71111.20
A self-revealing Green NCV of TS 5.4.1a, Procedures, was identified for the licensee's failure to implement adequate work instructions for flushing the reactor pressure vessel (RPV) nozzles on Unit 2, which resulted in a temporary loss of shutdown cooling.			

Loss of Spent Fuel Pool Cooling Due to the Failure to Evaluate Risk of a Maintenance Activity			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Barrier Integrity	Green NCV 05000325/2019001-02 Open/Closed	[H.12] - Avoid Complacency	71111.20
A self-revealed Green NCV of 10 CFR 50.65(a)(4) was identified for the licensee's failure to adequately evaluate the risk of a maintenance activity.			

Additional Tracking Items

Type	Issue number	Title	Report Section	Status
URI	05000325,05000324 /2018011-03	Potential Unjustified Activation Energy for Rosemont Transmitters	71111.21N	Closed

PLANT STATUS

Unit 1 began the inspection period at 100 percent rated thermal power (RTP) and operated there until February 22, 2019, when power was reduced to 60 percent RTP to perform a control rod sequence exchange, feed pump maintenance, scram time testing, and turbine valve testing. The unit was restored to 100 percent RTP on February 23, 2019, where it continued to operate until February 24, 2019, when power was reduced to 85 percent RTP for a control rod improvement. The unit was restored to 100 percent RTP on February 25, until March 10, 2019, when power was reduced to 82 percent RTP as a result of a recirculation pump runback caused by a loss of the Unit 1 uninterruptible power supply (UPS) bus. Power was restored to 100 percent on the same day following restoration of the UPS bus and the unit continued to operate at 100 percent RTP until March 28 2019, when the unit was taken offline for a reactor coolant system leak in the 'B' train reference leg. The unit remained offline and in mode 4 for the remainder of the inspection period.

Unit 2 began the inspection period at 60 percent RTP as a result of a trip of the 'A' reactor feed pump (RFP) on December 31, 2018. Following repairs to the 'A' RFP, the unit was returned to 100 percent RTP January 9, 2019. Between January 9 and February 8, 2019, the unit operated between 95 percent and 100 percent RTP due to power to flow limitations. Following several rod improvements during this period, the unit reached 100 percent on February 8 2019, and continued to operate there until February 25 when a power coast down was commenced. On March 2, 2019, with the unit at 97 percent RTP, Unit 2 was shut down for a refueling outage and remained shut down until March 29, 2019, when the unit entered mode 2 and the reactor was taken critical. On March 30 2019, with the turbine generator still disconnected from the grid and the reactor at approximately 20 percent RTP (mode 1), the reactor was manually tripped due high bearing vibrations (No. 9 bearing). The operators subsequently placed the unit in mode 4 on March 31 2019, in order to effect repairs to the No. 9 main turbine bearing.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors performed plant status activities described in IMC 2515 Appendix D, "Plant Status" and conducted routine reviews using IP 71152, "Problem Identification and Resolution." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.04 - Equipment Alignment

Partial Walkdown (IP Section 02.01) (2 Samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

- (1) 2A nuclear service water (NSW) and all conventional service water (CSW) pumps while 2B NSW was out-of-service (OOS) for planned maintenance on January 16, 2019
- (2) 1A, 1B, and 2B DC bus/battery while 2A2 battery OOS for test discharge on March 12, 2019

71111.04S - Equipment Alignment

Complete Walkdown (IP Section 02.02) (1 Sample)

The inspectors evaluated system configurations during a complete walkdown of the service water system on March 31, 2019.

71111.05A - Fire Protection (Annual)

Annual Inspection (IP Section 03.02) (1 Sample)

The inspectors evaluated the fire brigade performance during a Unit 2 remote shutdown panel fire drill on January 4, 2019.

71111.05Q - Fire Protection

Quarterly Inspection (IP Section 03.01) (5 Samples)

The inspectors evaluated fire protection program implementation in the following selected areas:

- (1) Unit 2 reactor building (RB) South, 20' elevation on January 4, 2019
- (2) Unit 2 RB -17' elevation, North and South on February 13, 2019
- (3) Unit 1 cable spreading room, 23' elevation on February 27, 2019
- (4) Unit 2 cable spreading room, 23' elevation on February 27, 2019
- (5) Battery rooms (1A, 2A, 1B, and 2B) 23' elevation on February 27, 2019

71111.07A - Heat Sink Performance

Annual Review (IP Section 02.01) (1 Sample)

The inspectors evaluated readiness and performance of the 2A turbine closed cooling heat exchanger (TBCCHX) on February 7, 2019.

71111.08 - Inservice Inspection Activities (BWR)

BWR Inservice Inspection Activities Sample - Nondestructive Examination and Welding Activities (IP Section 03.01) (1 Sample)

The inspectors evaluated boiling water reactor non-destructive testing by reviewing the following examinations from March 11, 2019 to March 15, 2019:

1. Magnetic Particle Examination
 - a. 2-E11-95PG24-ATT, Welded Attachment, Class 2
 - b. 2-E21-40PG1-ATT, Welded Attachment, Class 2

2. Radiographic Examination
 - a. 2-E51-448, Pipe to Valve Weld, Class 2. This included a review of associated welding activities.
 - b. 2-E51-449, Pipe to Valve Weld, Class 2. This included a review of associated welding activities.
3. Ultrasonic Examination
 - a. 2B2PS1D5-24-FWD5, Elbow to Pipe Weld, ASME Class 1
 - b. 2B32RECIRC-28-A-10, Elbow to Pipe Weld, ASME Class 1
 - c. 2E1189-18-SWA, Elbow to Pipe Weld, ASME Class 2. This included the review of a relevant indication that the licensee analytically evaluated and accepted for continued service.
4. General Visual Examination
 - a. 2-DW-C10, Primary Containment Concrete (50' & 60' elevations), ASME Class CC
 - b. 2-DW-C11, Primary Containment Concrete (50' & 60' elevations), ASME Class CC

71111.11Q - Licensed Operator Requalification Program and Licensed Operator Performance

Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (3 Samples)

- (1) The inspectors observed and evaluated licensed operator performance in the control room during Unit 2 control room downpower to 93 percent for final feedwater temperature reduction on February 14, 2019.
- (2) The inspectors observed and evaluated licensed operator performance in the control room during Unit 1 control room downpower to 60 percent for control rod sequence exchange, and bypass valve testing on February 22, 2019.
- (3) The inspectors observed and evaluated licensed operator performance in the control room during Unit 2 reactor startup and approach to criticality on March 29, 2019.

Licensed Operator Requalification Training/Examinations (IP Section 03.02) (1 Sample)

The inspectors observed and evaluated Cycle 1 requalification exam (No Simulator) on March 14, 2019.

71111.13 - Maintenance Risk Assessments and Emergent Work Control

Risk Assessment and Management Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the risk assessments for the following planned and emergent work activities:

- (1) Unit 2 'A' RFP trip – emergent failure on January 3, 2019
- (2) Unit 2 rod position indication – emergent failure on January 25, 2019
- (3) 1-SW-V3, SW to TBCCHX's Otbd Isol MOV Electrical Full Stroke following maintenance on January 29, 2019
- (4) Yellow shutdown risk due to containment during fuel movement on March 7, 2019
- (5) Yellow shutdown risk due to inventory during drain down on March 21, 2019

71111.15 - Operability Determinations and Functionality Assessments

Operability Determinations and Functionality Assessments Sample (IP Section 02.01) (6 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) CR 2250292, Unit 1 CST Level Instrument OOS on January 3, 2019
- (2) CR 2153982, Unit 2 CS Pump Motor Degraded Repair/Replacement on January 11, 2019
- (3) CR 2252644, Standby Gas Treatment pipe stress analysis used incorrect valve weight (PDO) on January 23, 2019
- (4) CR 2254140, RPI failure on January 25, 2019
- (5) CR 2254440, Broken Lateral Stud Retainer on 2B NSW Pump Motor Lower Bearing (PDO) on February 1, 2019
- (6) CR 2259143, Unit 1 Main turbine bypass valve slow to close on March 31, 2019

71111.18 - Plant Modifications

Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (1 Sample)

The inspectors evaluated the following temporary or permanent modification:

EC 295433, SW Pump Replacement Master and EC 400465, 1-SW-1B-NUC-PMP Replacement on January 17, 2019

71111.19 - Post Maintenance Testing

Post Maintenance Test Sample (IP Section 03.01) (6 Samples)

The inspectors evaluated the following post maintenance tests:

- (1) PMT on 2A Core Spray Pump per OPT-07.2.4.A, Core Spray System Operability Test - Loop A on January 17, 2019
- (2) ERDS Quarterly Test with the NRC, per OPT-96.0 on January 24, 2019
- (3) 1B NSW Pump Motor Megger and Bridge on January 25, 2019
- (4) U2 HPCI Coupled Overspeed Trip Test per OPT-09.8 on February 18, 2019
- (5) U1 Main Turbine Bypass Valve #3 post maintenance test on February 22, 2019
- (6) U2 2A Core Spray Pump PMT following cable replacement on March 28, 2019

71111.20 - Refueling and Other Outage Activities

Refueling/Other Outage Sample (IP Section 03.01) (1 Sample)

The inspectors evaluated refueling outage B2R24 activities from March 2, 2019 through the end of the quarter.

71111.21N - Design Bases Assurance Inspection (Programs)

The inspectors evaluated the environmental qualification program information to facilitate closure of the unresolved item opened on June 22, 2018, in Design Bases Assurance Inspection (Programs) Report 05000325,05000324/2018011 (Agencywide Documents Access and Management System Accession No. ML18176A352).

Select Sample Components to Review - Risk Significant/Low Design (Inside/Outside Containment) (IP Section 02.01) (1 Partial)

1-CAC-LT-2601, Suppression Pool Level Transmitter

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

Containment Isolation Valve (ISO) (IP Section 03.01) (2 Samples)

- (1) LLRT on CAC-SV-1261 on March 19, 2019
- (2) LLRT on CAC-SV-1200B on March 31, 2019

Surveillance Testing (IP Section 03.01) (3 Samples)

- (1) EDG-4 Monthly Load Test, OPT-12.2D (Unit 2) on January 28, 2019
- (2) Train A and Train B Control Room Emergency Ventilation System Thermal Fire Detector Functional Test, OPT-34.13.4.0 (Unit 2) on February 7, 2019
- (3) OPT-10.1.1, RCIC System Operability Test (RS) (Unit 2) on February 15, 2019

71114.06 - Drill Evaluation

Emergency Preparedness (EP) Drill (IP Section 02.01) (1 Sample)

The inspectors evaluated the EP drill on February 13, 2019.

RADIATION SAFETY

71124.01 - Radiological Hazard Assessment and Exposure Controls

Radiological Hazard Assessment (IP Section 02.01) (1 Sample)

The inspectors evaluated radiological hazards assessments and controls. The inspectors reviewed the following:

Radiological surveys

- 2R40_2RB 50' RWCU Heat Exchanger Room.001, Survey No. BNP-M-20190306-5
- 2TB 20' Condenser Bay – 2A Hotwell – Initial Entry – B223R1, Survey No. BNP-M-20190307-2
- B2R24 Grinding in the 'A' and 'B' Recirc Motor Bowls, Survey No. BNP-M-20190306-19

- Independent Spent Fuel Storage Installation Quarterly Radiological Survey, Survey No. 022519-007
- Initial Survey Inside Main Condenser, Survey No. BNP-M-20190307-5

Risk significant radiological work activities

- 2-G31-V114 Weld in the New Valve RWCU Ret Ln G31-50-4-907 Vent Valve
- Disassembly of RPV Head Insulation Package
- Drywell Scaffolding Installation
- Drywell Trolley Installation/Bracket Removal
- Shielding of RWCU HXs

Air sample survey records

- Radiological Airborne Calculation Worksheet, 2 DW DW02, 17', Survey No. 030619-027, Sampler No. 12923
- Radiological Airborne Calculation Worksheet, U2 A Condenser, Survey No. 030619-024, Sampler No. 12495
- Radiological Airborne Calculation Worksheet, U2 DW 'A' Recirc Pumps, Survey No. 030619-027, Sampler No. 11885
- Radiological Airborne Calculation Worksheet, U2 TB B Condenser, Survey No. 030619-024, Sampler No. 12728

During facility tours, the inspectors directly observed radiological posting, dosimetry placement, container labeling and gamma and neutron surveys for areas established with the radiologically controlled area of the Independent Spent Fuel Storage Installation.

Instructions to Workers (IP Section 02.02) (1 Sample)

The inspectors evaluated instructions to workers including radiation work permits used to access high radiation areas:

Radiation work packages

- Radiation work permit (RWP) No. 2513, RB/TB/BOP – 117' – Temporary Shielding Activities Excluding DW (Shield RWCU HXs)
- RWP No. 2522, 117' – RPV Head Insulation Package/Associated Vent Piping/Manway Covers
- RWP No. 2552, RB – RWCU Valve Replacements (Welding Activities)
- RWP No. 2554, RB – RWCU Piping Replacement L86 and Support (V114)

Electronic alarming dosimeter alarms

- No alarms occurred during the period of this inspection

Labeling of containers

- Unit 2 Drywell, Units 1 and 2 Reactor Buildings, Low Level Waste Facility

Contamination and Radioactive Material Control (IP Section 02.03) (1 Sample)

The inspectors evaluated licensee processes for monitoring and controlling contamination and radioactive material. The inspectors verified the following sealed sources are accounted for and are intact:

- J.L. Shepherd and Associates, Model 6810 Calibrator, Serial No. 83Cs-31
- J.L. Shepherd and Associates, Model A-0096-1 Calibrator, Serial No. S-10

Radiological Hazards Control and Work Coverage (IP Section 02.04) (1 Sample)

The inspectors evaluated in-plant radiological conditions during facility walkdowns and observation of radiological work activities.

Radiological work package for areas with airborne radioactivity

- 2-G31-V114 Weld in the New Valve RWCU Ret Ln G31-50-4-907 Vent Valve
- B2R24 Grinding in the 'A' and 'B' Recirc Motor Bowls
- Drywell Trolley Installation/Bracket Removal

High Radiation Area and Very High Radiation Area Controls (IP Section 02.05) (1 Sample)

The inspectors evaluated risk-significant high radiation area and very high radiation area controls.

Radiation Worker Performance and Radiation Protection Technician Proficiency (IP Section 02.06) (1 Sample)

The inspectors evaluated radiation worker performance and radiation protection technician proficiency.

71124.02 - Occupational ALARA Planning and Controls

Radiological Work Planning (IP Section 02.01) (1 Sample)

The inspectors evaluated the licensee's radiological work planning by reviewing the following activities:

- ALARA Plan 2672, Control Rod Drive Exchange and Support activities, RWP No. 2503 and 2500
- ALARA Plan 2689, B2R24 Reactor Disassembly Activities, RWP No. 2522
- ALARA Plan 2691, B2R24 Reactor Reassembly Activities, RWP No. 2500 and 2526
- ALARA Plan 2692, B2R24 In-Vessel Maintenance, RWP No. 2500 and 2523

Verification of Dose Estimates and Exposure Tracking Systems (IP Section 02.02) (1 Sample)

The inspectors evaluated dose estimates and exposure tracking. The inspectors reviewed the following ALARA planning documents:

- ALARA Plan 2693, ALL B2R24 Welding Activities (Except the RWCU HX piping replacement), RWP No. 2552
- ALARA Plan 2694, B2R24 Scaffold Activities, RWP No. 2532

Additionally, the inspectors reviewed the following radiological outcome evaluations:

- Temporary Shielding Request (TSR) TSR # 2-19RF-060, U2 Rx Cavity: Inner & Outer Bellows, Rev. 0
- TSR # 2-19RF-130, U2 CRDM's, Rev. 0
- TSR # 2-19RF-260, Refueling Floor ADHR Piping, Rev. 0

Implementation of ALARA and Radiological Work Controls (IP Section 02.03) (1 Sample)

The inspectors reviewed ALARA practices and radiological work controls by reviewing the following activities:

- B2R24 High Radiological Risk Activities, RWP No. 2500, Revision 8
- Drywell CRD Activities – Including Support Activities (LHRA/HCA), RWP No. 2503, Revision 9
- Reactor Building RWCU Piping Replacement, RWP No. 2554, Revision 1

Radiation Worker Performance (IP Section 02.04) (1 Sample)

The inspectors evaluated radiation worker and radiation protection technician performance regarding conformance with the requirements of RWP Numbers 2523 and 2525 during 117' elevation flood up and refuel floor work (Fuel Handling, In Vessel Maintenance, and In Vessel Inspection Activities), specifically for:

- Fuel handling
- Flushing of nozzles 2N4C and 2N4D

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

IE01: Unplanned Scrams per 7000 Critical Hours Sample (IP Section 02.01) (2 Samples)

- (1) Unit 1: January 1, 2018 - December 31, 2018
- (2) Unit 2: January 1, 2018 - December 31, 2018

IE03: Unplanned Power Changes per 7000 Critical Hours Sample (IP Section 02.02) (2 Samples)

- (1) Unit 1: January 1, 2018 - December 31, 2018
- (2) Unit 2: January 1, 2018 - December 31, 2018

IE04: Unplanned Scrams with Complications (USwC) Sample (IP Section 02.03) (2 Samples)

- (1) Unit 1: January 1, 2018 - December 31, 2018
- (2) Unit 2: January 1, 2018 - December 31, 2018

71153 - Followup of Events and Notices of Enforcement Discretion

Event Followup (IP Section 03.01) (1 Sample)

The inspectors responded to a Unit 1 plant shutdown as a result of a reactor coolant system (RCS) leak in the N12B RCS instrument nozzle reference leg on March 28. The inspectors evaluated the licensee's performance during this event as well as the licensee's actions taken subsequent to this event. This event met the emergency plan classification of Notice

of Unusual Event (NOUE) due to RCS leakage being greater than 10 gallons per minute for greater than 15 minutes (SU5.1). The leak in the reference leg caused the 'B' train RCS level instruments to fail high. The inspectors also independently verified that the licensee had appropriately classified the event in accordance with OPEP-02.1, "Brunswick Nuclear Plant Initial Emergency Actions," revision 54. The inspectors verified that the licensee's event classification of NOUE and notifications to local authorities and NRC were performed and in a timely fashion. The inspectors also reviewed the initial licensee notifications to verify that they met the requirements specified in NUREG-1022, "Event Reporting Guidelines." The event was reported to the NRC as EN 53961, and documented in the licensee's corrective action as condition report (CR) 2265623.

INSPECTION RESULTS

Inadequate Instruction Used to Perform Vessel Nozzle Flushing			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Initiating Events	Green NCV 05000324/2019001-01 Open/Closed	[H.5] - Work Management	71111.20
<p>A self-revealing Green NCV of TS 5.4.1.a, Procedures, was identified for the licensee's failure to implement adequate work instructions for flushing the reactor pressure vessel (RPV) nozzles on Unit 2, which resulted in a temporary loss of shutdown cooling.</p> <p><u>Description:</u> On March 5, 2019, during the Unit 2 refueling outage, the licensee performed a reactor pressure vessel (RPV) nozzle flushing activity. The work activity was being performed under work order (WO) 10037757 and flush plan, 0ENP-35, "RPV Nozzle Flushing and In-vessel Component Cleaning by Hydrolazing, Rev. 12." RHR 'A' loop was operating in shutdown cooling mode at the time, with flow through the RHR 'A' heat exchanger. At approximately 0535, the licensee started to flush the RPV nozzles per the WO and flush plan. Nozzle N011B was flushed first. N011B is the variable leg input to RPV level transmitters N017 C1, C2, D1, and D2, which if tripped would result in a Group 8 isolation signal when the trip logic is satisfied. Immediately upon the work crew lowering the hydrolazing fixture to N011B to begin the vessel nozzle flushing evolution, the control room crew noted reactor cavity level indication had lowered from 618 inches to 612 inches and slowly returned to 618 inches. The control room crew validated no actual level change with personnel located on the refuel floor. The shift manager then authorized the crew to resume work on the refuel floor, including the nozzle flushing activity. This was followed by receipt of the RPV lo level trip annunciator (A-05 2-6,) indicative of reactor vessel less than 166 inches, followed by Group 2, 6, and 8 isolation valve closure. The Group 8 isolation signal automatically closed 2-E11-F015A and B, RHR shutdown cooling inboard injection valves, 2-E11-F008 RHR shutdown cooling outboard isolation valve, and 2-E11-F009 RHR shutdown cooling inboard isolation valve. With either the 2-E11-F008 or the 2-E11-F009 valves not full open, the running RHR pump automatically tripped. Once the licensee recognized the RHR pumps tripped, 0AOP-15," Loss of Shutdown Cooling" was entered and the refuel floor was notified to stop all work.</p> <p><u>Corrective Actions:</u> The immediate corrective action was the reset of the Group 8 isolation signal and restoration of shutdown cooling within 10 minutes. The licensee made a timely required eight-hour event report (Event Number 53911) in accordance with 10 CFR 50.72(b)(3)(iv)(A), "Valid Specific System Actuation". The licensee revised the model WO for the nozzle hydrolase activity for both units to include a precaution to not proceed unless</p>			

Operations has established compensatory actions to prevent possible primary containment isolation system group isolations or other actuations. The licensee added the event to their operating experience database.

Corrective Action Reference: NCR 2260949

Performance Assessment:

Performance Deficiency: The licensee's failure to establish adequate work instructions for flushing the reactor pressure vessel (RPV) nozzles on Unit 2, which resulted in a temporary loss of shutdown cooling, was within the licensee's ability to foresee and correct and was therefore a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Configuration Control attribute of the Initiating Events cornerstone. The performance deficiency was more than minor, and therefore a finding, because it was associated with the configuration control attribute of the Initiating Events cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown operations. Specifically, the failure to implement adequate work instructions appropriate to the circumstances resulted a temporary loss of shutdown cooling. This upset plant stability by causing a temporary loss of reactor core heat removal and challenged the critical safety function of decay heat removal.

Significance: The finding was screened in accordance with IMC 0609, Attachment 4, "Initial Characterization of Findings", dated October 7, 2016, and using Table 3 – SDP Appendix Router it was determined that IMC 0609, Appendix G, Shutdown Operations SDP was the correct screening path given the event occurred during Mode 5 (Refueling). The inspectors were able to screen to Green using Appendix G, Attachment 1, Exhibit 2, – Initiating Events Screening Questions. Specifically, addressing applicable questions 4 and 6, "Did the initiator occur when the refuel canal/cavity was flooded?" This resulted in the inspectors determining that the finding did not require quantitative risk assessment and screened as Green in accordance with IMC 0609, Appendix G, Figure 1.

Cross-cutting Aspect: H.5 - Work Management: The finding had a cross-cutting aspect in the area of human performance associated with work management (H.5) which required that the organization implement a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities. Specifically, the licensee failed to establish an adequate work instruction appropriate to the circumstance to preclude the automatic isolation of RHR shutdown cooling suction and subsequent loss of shutdown cooling.

Enforcement:

Violation: Technical Specification 5.4.1.a, Administrative Control (Procedures), states in part, that written procedures shall be established, implemented, and maintained covering the following activities including the applicable procedures recommended in Regulatory Guide 1.33, Appendix A, November 1972 (Safety Guide 33, November 1972.) Safety Guide 33, Appendix A, Section I.1 states in part, that maintenance that can affect the performance of safety-related equipment should be properly planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Contrary to the above, on March 5, 2019, the licensee failed to establish adequate instructions and appropriate steps in WO 10037757 and 0ENP-35, "RPV Nozzle Flushing and

Invessel Component Cleaning by Hydrolazing” to preclude the temporary loss of shutdown cooling flow.

Enforcement Action: This violation is being treated as an Non-Cited Violation, consistent with Section 2.3.2 of the Enforcement Policy.

Loss of Spent Fuel Pool Cooling Due to the Failure to Evaluate Risk of a Maintenance Activity			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Barrier Integrity	Green NCV 05000325/2019001-02 Open/Closed	[H.12] - Avoid Complacency	71111.20

A self-revealed Green NCV of 10 CFR 50.65(a)(4) was identified for the licensee’s failure to adequately evaluate the risk of a maintenance activity.

Description: On March 10, 2019, with Unit 2 undergoing a refueling outage and Unit 1 operating at 100 percent RTP, both units experienced a loss of spent fuel pool (SFP) cooling. The inspectors noted that Unit 2 never lost cooling to the SFP since the alternate decay heat removal (ADHR) system continued to operate as designed and continued to cool both the reactor and SFP. Due to the loss of SFP cooling on Unit 1, all heat removal from the Unit 1 SFP was lost as ADHR on Unit 1 was not in operation.

At approximately 0320, a plant worker attempted to connect a second power cable at a temporary power skid and accidentally bumped a loose power cable. The affected cable powered a 120 VAC power panel ‘C’ radioactive waste distribution in the radioactive waste building. This power panel supplied 120 VAC power to the SFP filtration system of both units. Loss of power to the SFP filtration system tripped the SFP filters off-line, which resulted in a total loss of SFP flow, and left the operating SFP cooling pumps running in a dead-headed configuration on both units.

Upon loss of the SFP cooling filtration skid, the operators entered procedure 0AOP-38.0, “Loss of Fuel Pool Cooling,” Revision 34. At 0330, the plant worker contacted the control room to inform them that he had inadvertently caused a loss of power due to his actions at the temporary power skid. Operators were dispatched to bypass the filtration skid locally. Refueling personnel began to closely monitor spent fuel levels on Unit 1 and Unit 2 (connected to the RCS due to the outage conditions). At approximately 0403, the bypass valves for SFP cooling on both units were opened and the flow path was re-established. At 0410, procedure 0AOP-38 was exited on both units. Operators noted that SFP temperatures on both units increased less than one degree Fahrenheit and no level change was noted in either unit’s SFP.

Corrective Actions: The immediate corrective action was to bypass around both Unit 1 and Unit 2 SFP filtration skids and restore flow to both systems. The licensee performed an event analysis using a why staircase method to gain insights into this event. As a component of this analysis, the licensee utilized a human performance check list. In addition, the licensee will revise procedure 0MMM-54, “Temporary Power Feed Documentation,” to have cable tags include more detail on the specific loads and highlight any risk sensitive equipment.

Corrective Action Reference: NCR 2261856

Performance Assessment:

Performance Deficiency: The licensee's failure to appropriately manage and assess the risk of the temporary power panel that supplied power to SFP components was a performance deficiency. Specifically, work order (WO) 20308204-05, which provided directions for providing temporary power to a manhole, did not include any specific risk management actions for the plant worker while working in or around the temporary power panel.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Human Performance attribute of the Barrier Integrity cornerstone. The performance deficiency was more than minor because it was associated with the human performance attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. Specifically, the PD resulted in the loss of SFP cooling on Unit 1 for approximately 40 minutes. Additionally, the PD resulted in dead-heading of the SFP cooling pumps which could have led to failure of both pumps if not for prompt operator action taken to bypass around the filter skid and reestablish a flow path.

Significance: The inspectors assessed the significance of the finding using Appendix A, "Significance Determination of Reactor Inspection Findings for At - Power Situations". The finding was screened in accordance with IMC 0609, Appendix A, "The Significance Determination Process (SDP) For Findings At Power" dated June 19, 2012. The finding was screened under Exhibit 3, "Barrier Integrity Screening Questions," Section D, "Spent Fuel Pool (SFP)." Since the event: 1) did not represent an exceedance of the maximum analyzed temperature limit specified in the site-specific licensing basis, 2) did not result from fuel handling errors, dropped fuel assembly, dropped storage cask, or crane operations over the SFP that caused mechanical damage to fuel clad AND a detectible release of radionuclides, 3) did not result in a loss of spent fuel pool water inventory decreasing below the minimum analyzed level limit specified in the site-specific licensing basis, and 4) did not affect the SFP neutron absorber OR fuel bundle misplacement (i.e., fuel loading pattern error); the finding screened to Green (very low safety significance).

Cross-cutting Aspect: H.12 - The finding had a cross-cutting aspect in the area of human performance associated with "avoid complacency," (H.12). This aspect involves individuals who recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Additionally, this aspect assumes individuals implement appropriate error reduction tools. In this particular issue, proper use of error reduction techniques could have prevented the event.

Enforcement:

Violation: 10 CFR 50.65(a)(4) requires, in part, that prior to performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activity.

Contrary to the above, on March 10, 2019, the licensee failed to assess and manage the increase in risk of the temporary power panel that supplied power to SFP components. This activity ultimately resulted in a loss of SFP cooling to the Unit 1 spent fuel pool for approximately 40 minutes.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

Minor Violation	71111.21N
<p>Minor Violation: The purpose of Rosemount transmitter 1-CAC-LT-2601 was to monitor suppression pool level. Licensee calculations determined the qualified life of the transmitter to be 44.9 years. During the review of URI 05000325, 324/2018011-03, "Potential Unjustified Activation Energy for Rosemont Transmitters," the inspectors identified that the licensee did not appropriately determine the qualified life of the Rosemount transmitter because they failed to account for all significant types of degradation as required by 10 CFR 50.49(e)(5). Specifically, the licensee failed to consider the effects of internal heat rise of the metal film resistor (the limiting subcomponent for this transmitter), which could have an effect on the functional capability of the equipment. When taken into account, the internal heat rise would cause a reduction in the overall qualified life of the transmitter.</p> <p>Screening: The inspectors determined the performance deficiency was minor. This performance deficiency was screened in accordance with Inspection Manual Chapter (IMC) 0612 Appendix B, "Issue Screening," dated January 1, 2018, and was determined to be of minor significance because the failure to account for heat rise could not be reasonably be viewed as a precursor to a significant event, would not have the potential to lead to a more significant safety concern if left uncorrected, did not relate to a performance indicator that would have caused the performance indicator to exceed a threshold, and did not adversely affect a cornerstone objective. Specifically, the failure to account for the heat rise would not have caused the transmitter to exceed its qualified life prior to the expiration of the plant's operating license.</p> <p>Enforcement: This failure to comply with 10 CFR 50.49(e)(5) constitutes a minor violation that is not subject to enforcement action in accordance with the NRC's Enforcement Policy. The licensee has taken actions to restore compliance.</p> <p>This violation closes URI 05000325/2018011-03 and 05000324/2018011-03.</p>	

Unresolved Item (Closed)	Potential Unjustified Activation Energy for Rosemont Transmitters 05000325,05000324/2018011-03	71111.21N
<p>Description: Unresolved Item (URI) 05000325,05000324/2018011-03 was opened in inspection report 05000325,05000324/2018011 (Agency-wide Documents Access and Management System Accession No. ML18176A352), to determine whether the activation energy used for the Rosemount 1-CAC-LT-2601 transmitters was appropriate and, if not, whether the licensee had the responsibility to verify the information provided by their vendors and contractors.</p> <p>Inspectors reviewed additional information provided by the licensee, performed further inspection, and held discussions with an NRC environmental qualification panel to resolve this URI. Additionally, the inspectors reviewed the updated guidance in ADAMS Accession Number ML18338A088 and Inspection Manual Chapter Inspection Procedure 71111.21N (Accession No. ML19036A556), which stated that:</p>		

“Beyond ensuring that vendor programs satisfy the 10 CFR Part 50, Appendix B, requirements and confirming that EQ equipment is received as procured, licensees are not required to validate information (e.g., activation energy) contained in the EQ reports provided by Appendix B vendors.”

Based on the additional review and the above-mentioned guidance, the inspectors did not identify a performance deficiency associated with the activation energy used for the Rosemount transmitters.

The inspectors also reviewed the qualified life determination performed by the licensee and determined that the evaluation did not account for the internal heat rise of the metal film resistors in the transmitter. The inspectors determined that, when accounting for the maximum expected heat rise, the transmitters would not have exceeded their qualified life or need replacement prior to expiration of the plant's operating license. Based on this review, the inspectors identified a minor violation of 10 CFR 50.49(e)(5).

Corrective Action References: CRs 2205534 and 2265284

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On March 14, 2019, the inspector presented the ISI Exit Meeting to Mr. William R. Gideon, Site Vice President and other members of the licensee staff.
- On March 28, 2019, the inspector presented the Design Bases Assurance Inspection (programs) URI Closure Exit Meeting to Mr. William R. Gideon, Site Vice President and other members of the licensee staff.
- On May 2, 2019, the resident inspectors presented the quarterly resident inspector inspection results to Mr. William R. Gideon and other members of the licensee staff.

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71111.04 - Equipment Alignment

Procedures

SD-43, Service Water System, Rev. 27
1OP-43, Service Water System Operating Procedure, Rev. 135
2OP-43, Service Water System Operating Procedure, Rev. 168
0AOP-18.0, Nuclear Service Water System Failure, Rev. 34
0AOP-19.0, Conventional Service Water System Failure, Rev. 27
0AOP-39.0, Loss of DC Power, Rev. 47
1OP-51, DC Electrical System Operating Procedure, Rev. 78
2OP-51, DC Electrical System Operating Procedure, Rev. 87

Drawings

BN-43.0.01, Service Water System, Rev. 2

71111.05 - Fire Protection Annual/Quarterly

Procedures

CSD-BNP-PFP-0CB, Control Building Pre-fire Plans, Rev. 5
0PLP-01.2, Fire Protection System Operability, Action, and Surveillance Requirements, Rev. 51
0PFP-013, General Fire Plan, Rev. 54
AD-EG-ALL-1532, NFPA 805 Pre-Fire Plans, Rev.1
AD-EG-ALL-1520, Transient Combustible Control, Rev. 11
0ASSD-00, Users Guide, Rev. 45
0ASSD-01, Alternate Safe Shutdown Procedure Index, Rev. 41
CSD-BNP-PFP-2RB, Reactor Building Prefire Plans, Rev. 0
0FPP-060, Fire Drill Program, Rev. 2

71111.07A - Heat Sink Performance

Procedures

0CM-HX501, Straight Tube Heat Exchangers (Cleaning, Plugging, and Replacement of Tubes)
RBCCW and TBCCW, Rev. 18
Turbine Building Closed Cooling Water Heat Exchangers Preventative Maintenance Procedure,
Rev. 17

71111.08 - Inservice Inspection Activities (BWR)

Procedures

0PT-20.5.1, Primary Containment Inspection, Rev 29
NDE-NE-ALL-3101, Magnetic Particle Examination, Rev 0
NDE-NE-ALL-5101, Radiographic Examination, Rev 2
NDE-NE-ALL-6102, Utilization of PDI-UT-2 Generic Procedure for the Ultrasonic Examination of
Austenitic Pipe Welds, Rev 2
NDE-NE-ALL-6103, Utilization of PDI-UT-3 Generic Procedure for Ultrasonic Through-Wall
Sizing in Pipe Welds, Rev 1
NDE-NE-ALL-6111, Utilization of PDI-UT-1 Generic Procedure for the Ultrasonic Examination of
Ferritic Pipe Welds, Rev 1
NDE-NE-ALL-7401, Visual Examination of IWL Components, Rev 1
NDEP-0437, Manual Ultrasonic Examination Procedure for Ferritic Pipe Welds (PDI), Rev 8

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2-E51-ISO-1, Reactor Core Isolation Cooling System, Rev 3

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Duke Energy Certificate of Method Qualification (Koster), UT-Level II, 09/04/2018
Duke Energy Certificate of Method Qualification (Manley), UT-Level II, 01/24/2018
Duke Energy Certificate of Method Qualification (Polisensky), UT-Level III, 08/18/2016
Duke Energy Certificate of Method Qualification (Ransom), UT-Level II, 08/17/2017
Mistras NDT Certification Record (Lippai), RT – Level III, 02/01/2019
Mistras NDT Certification Record (Matthews), RT – Level II, 02/06/2019
Mistras NDT Certification Record (Urban), RT – Level III, 02/01/2019
Sonic Systems International, Inc Certificate of Qualification (Michels), VT-Level II, 01/13/2019
Sonic Systems International, Inc Certificate of Qualification (Schmalz), MT-Level II, 01/11/2019
Day & Zimmermann Certification Record(Lewis), Visual Weld– Level II, 03/11/2019

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UT-19-002, Ultrasonic Examination Report, 03/08/2019
UT-19-009, Ultrasonic Examination Report, 03/14/2019

71111.11 - Licensed Operator Requalification Program and Licensed Operator Performance

Procedures

0GP-13, Increasing Unit Capacity at End of Core Cycle, Rev. 52
AD-OP-ALL-1000, Conduct of Operations, Rev. 13
AD-OP-ALL-0203, Reactivity Management, Rev. 11
0ENP-24.5, Reactivity Control Planning, Rev. 10
0GP-12, Power Changes, Rev. 84
0GP-01, Prestartup Checklist, Rev. 200
0GP-02, Approach to Criticality and Pressurization of the Reactor, Rev. 115

Other Documents

19-1 Cycle Exam, Version A, Rev. 0
19-1 Cycle Exam, Version A, Rev. 0

71111.12 - Maintenance Effectiveness

Procedures

AD-EG-ALL-1210, Maintenance Rule Program, Rev. 1
SD-21, Reactor Building Closed Cooling Water System, Rev. 11

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Maintenance Rule Database

NUMARC 93-01, Industry Guidelines for monitoring the effectiveness of maintenance at Nuclear Power Plants, Rev. 4A

71111.13 - Maintenance Risk Assessments and Emergent Work Control

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0AP-025, BNP Integrated Scheduling, Rev. 57
AD-OP-ALL-0201, Protected Equipment, Rev. 05
0AP-022, BNP Outage Risk Management, Rev. 59
AD-WC-ALL-0250, Work Implementation and Completion, Rev. 09
AD-WC-ALL-0410, Work Activity Integrated Risk Management, Rev. 07
AD-WC-ALL-0200, Online Work Management, Rev. 13
AD-WC-ALL-0420, Shutdown Risk Management, Rev. 04
AD-WC-ALL-0430, Outage Risk Review, Rev. 04
0AOP-02.0, Control Rod Malfunction/Misposition, Rev. 30
1OP-43, Service Water System Operating Procedure, Rev. 135
OP-31.2 Condensate and Demineralized Water Storage and Transfer System, Rev. 92
AD-EG-ALL-1615, Cable Aging Management Program Implementation, Rev. 1

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71114.06 - Drill Evaluation

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0PEP-02.6.21, Control Room Offsite Communicator, Rev. 81
0PEP-02.1.1, Emergency Control - Unusual Event, Alert, Site Area Emergency and General Emergency, Rev. 31
AD-EP-ALL-0105, Activation and Operation of the Technical Support Center, Rev. 2
AD-EP-ALL-0101, Emergency Classification, Rev.1
0PEP-02.1, Initial Emergency Actions, Rev. 54

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71111.15 - Operability Determinations and Functionality Assessments

Procedures

AD-OP-ALL-0105, Operability Determinations and Functionality Assessments, Rev. 4
AD-PI-ALL-0100, Corrective Action Program, Rev. 21

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71111.18 - Plant Modifications

Procedures

EC 4000465, Rev. 4

EC 295433, Rev. 8

1PT-24.1.1, Service Water Pump and Discharge Valve Operability Test, Rev. 92

ISI Pump and Valve Data, 0ENP-16.1, Rev. 35

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71111.19 - Post Maintenance Testing

Procedures

0PT-96.0, ERDS Quarterly Test with NRC, Rev. 14

0SMP-M002, Meggering and Bridging of Electric Motors, Rev. 6

AD-OP-ALL-0200, Clearance and Tagging, Rev. 18

0PT-09.8, HPCI Coupled Overspeed Trip Test, Rev. 7

1PT-40.2.12, Main Turbine Bypass Valves Operability Test, Rev. 16

Core Spray System Operability Test - Loop A, Rev. 85

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71111.20 - Refueling and Other Outage Activities

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0GP-02, Approach to Criticality and Pressurization of the Reactor, Rev. 115

0OI-50.13, 4160V Bus Common B Electrical Load List, Rev. 77

2MST-BAT11BQ, 125VDC 2B-1 Quarterly Operability Test, Rev. 5

0SMP-RPV502, Reactor Vessel Reassembly, Rev. 41

0AOP-12.0, Loss of Uninterruptible Power Supply (UPS), Rev. 26

0AI-127, Primary Containment Inspection and Closeout, Rev. 45

AD-PI-ALL-0106, Cause Investigation Checklists, Rev. 3

0GP-06, Cold Shutdown to Refueling (Head Unbolted), Rev. 45

0GP-05, Unit Shutdown, Rev. 190

0AP, BNP Outage Risk Management, Rev. 059

2PT-01.7, Heatup/Cooldown Monitoring, Rev. 10

1OP-52, 120 Volt AC UPS, Emergency, and Conventional Electrical Systems Operating Procedure, Rev. 45

0AOP-15.0, Loss of Shutdown Cooling, Rev. 32

2APP-A-05, Annunciator Procedure for Panel A-05, Rev. 74

0ENP-35, RPV Nozzle Flushing and In-vessel Component Cleaning by Hydrolasing, Rev. 12

Definition of Instrument Channels and Trip Systems for Selected Instruments, Rev. 69

0OI-01.07, Notifications, Attachment 3, Event Notification Worksheet, Rev. 41

AD-EG-ALL-1311, Failure Investigation Process, Attachment 2 (Fault Table) Rev. 0

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OPT-12-2D, No.4 Diesel Generator Monthly Load Test, Rev. 120

OPT-10.1.1, RCIC System Operability Test, Rev. 107

OOI-02.3 Drywell Leakage Control, Rev. 7

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71124.01 - Radiological Hazard Assessment and Exposure Controls

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0E&RC-0229, Control and Use HEPA Air Filtration Units, Rev. 11

0E&RC-0242, Radiation Protection Outage Strategic Survey Procedure, Rev. 3

0E&RC-0500, Inventory Control and Leak Testing of Radioactive Sources, Rev. 27

AD-RP-ALL-0002, Radiation and Contamination Surveys, Rev. 1

AD-RP-ALL-0003, Radiological Air Sampling, Rev. 2

AD-RP-ALL-0004, Radiological Posting and Labeling, Rev. 3

AD-RP-ALL-0005, Access Controls for High and Locked High Radiation Areas, Rev. 0

AD-RP-ALL-0006, Personnel Contamination Monitoring, Rev. 0

AD-RP-ALL-0007, Control of Radioactive Material, Rev. 0

AD-RP-ALL-3002, Unconditional Release of Material, Rev. 1

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71124.02 - ALARA Plans

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AP # 2672, Control Rod Drive Exchange and Support activities
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71153 – Event Notification

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