



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II**

245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

January 29, 2018

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

**SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT – NRC INTEGRATED INSPECTION
REPORT 05000325/2017004 AND 05000324/2017004**

Dear Mr. Gideon:

On December 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Brunswick Steam Electric Plant, Units 1 and 2 facilities. On January 23, 2018, the NRC inspectors 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 one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy. Further, inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest these violations or the significance of the violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the 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 the Brunswick Steam Electric Plant.

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 the Brunswick Steam Electric Plant.

W. Gideon

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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/

Steven D. Rose, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Docket Nos.: 50-325, 50-324
License Nos.: DPR-71, DPR-62

Enclosure:
IR 05000325, 324/2017004
w/Attachment: Supplemental Information

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SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT - NRC INTEGRATED INSPECTION
REPORT 05000325/2017004 AND 05000324/2017004 January 29, 2018

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-325, 50-324

License Nos.: DPR-71, DPR-62

Report No.: 05000325/2017004, 05000324/2017004

Licensee: Duke Energy Progress, LLC

Facility: Brunswick Steam Electric Plant, Units 1 and 2

Location: Southport, NC

Dates: October 1, 2017 through December 31, 2017

Inspectors: G. Smith, Senior Resident Inspector
J. Steward, Resident Inspector
M. Schwieg, Resident Inspector
M. Bates, Senior Operations Engineer

Approved by: Steven D. Rose, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Enclosure

SUMMARY

Integrated Inspection Report 05000325/2017004, 05000324/2017004; October 1, 2017, through December 31, 2017; Brunswick Steam Electric Plant, Units 1 and 2; Follow-up of Events.

The report covered a 3-month period of inspection by resident inspectors and regional inspectors. There was one self-revealing violation and one licensee identified violation documented in this report. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. The cross-cutting aspects are determined using IMC 0310, "Aspects within the Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated November 1, 2016. The NRC's program for overseeing the safe operations of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Initiating Events

Green. A self-revealing non-cited violation (NCV) was identified for the licensee's failure to properly transfer power to the E-4 4160 volt emergency bus from the E-4 emergency diesel generator (EDG), to the normal switchgear bus 2C, as required by procedure OOP-50.1 "Diesel Generator Emergency Power System Operating Procedure." This resulted in a momentary under voltage condition followed by a re-energization of the E-4 emergency bus by EDG-4. This was entered into the licensee's corrective action program (CAP) as nuclear condition report (NCR) 2151329.

The licensee's failure to parallel across (i.e., reclose) the normal feeder breakers prior to unloading the EDG-4 and opening the EDG-4 output breaker, which resulted in a valid and automatic actuation of the EDG-4, was a performance deficiency. The finding was determined to be greater than minor because it was associated with the human performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during power operations. Using IMC 0609.04, "Initial Characterization of Findings," Exhibit 1, the issue was classified as a transient initiator contributor because it was associated with a loss of offsite power (LOOP). Finally, using Appendix A of IMC 0609, "SDP for Findings at-Power," the finding was determined to be of very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating systems would not be available. Using Manual Chapter 0310, "Aspects Within the Cross-Cutting Areas," the inspectors identified a cross-cutting aspect in the procedural adherence of the human performance area, because the operators failed to properly utilize an existing procedure pertinent to their particular situation and this directly resulted in the momentary loss of an emergency 4160 volt bus. [H.8] (Section 4OA3)

A violation of very low safety significance which was identified by the licensee was reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program (CAP). That violation and corrective action tracking number are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at essentially 100 percent rated thermal power (RTP) throughout the period. However there were numerous instances where reactor power was limited by the power to flow maps described in the core operating limits report. There were also numerous minor down powers during the period in order to perform control rod adjustments. These adjustments provided adequate margin to increase recirculation flow in order to compensate for fuel burnup. The elevated number of rod pattern adjustments was caused by an ongoing flux suppression activity as a result of a minor fuel cladding leak on one fuel assembly.

Unit 2 operated at essentially 100 percent RTP throughout the period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 1 sample)

a. Inspection Scope

Seasonal Extreme Weather Conditions

The inspectors conducted a detailed review of the station's adverse weather procedures written for extreme low temperatures. The inspectors verified that weather-related equipment deficiencies identified during the previous year had been placed into the work control process and/or corrected before the onset of seasonal extremes. The inspectors evaluated the licensee's implementation of adverse weather preparation procedures and compensatory measures before the onset of and during seasonal extreme weather conditions. Documents reviewed are listed in the Attachment. The inspectors evaluated the following risk-significant systems:

- Diesel Generating Building
- Service Water Building

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04 – 3 samples)

a. Inspection Scope

Partial Walkdown

The inspectors verified that critical portions of the selected systems were correctly aligned by performing partial walkdowns. The inspectors selected systems for assessment because they were a redundant or backup system or train, were important for mitigating risk for the current plant conditions, had been recently realigned, or were a single-train system. The inspectors determined the correct system lineup by reviewing plant procedures and drawings. Documents reviewed are listed in the Attachment.

The inspectors selected the following systems or trains to inspect:

- Unit 2 “A” train residual heat removal (RHR) system while “B” train RHR was out-of-service (OOS) for an outage
- EDG-2 while EDG-1 was OOS for planned maintenance
- Nuclear service water (NSW) system “A” train and conventional service water system on Unit 1 while the Unit 1 “B” NSW pump was OOS for motor replacement

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05Q – 4 samples)

a. Inspection Scope

Quarterly Inspection

The inspectors evaluated the adequacy of selected pre-fire plans by comparing the pre-fire plans to the defined hazards and defense-in-depth features specified in the fire protection program. In evaluating the pre-fire plans, the inspectors assessed the following items:

- control of transient combustibles and ignition sources
- fire detection systems
- water-based fire suppression systems
- gaseous fire suppression systems
- manual firefighting equipment and capability
- passive fire protection features
- compensatory measures and fire watches
- issues related to fire protection contained in the licensee’s corrective action program

The inspectors toured the following four fire areas to assess material condition and operational status of fire protection equipment. Documents reviewed are listed in the attachment.

- Unit 2 reactor building
- EDG building cells 1 through 4
- Control building elevation 24’
- Service water building (20’ and 13’ 4” Elevations)

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

a. Inspection Scope

Internal Flooding

The inspectors reviewed related flood analysis documents and walked down the area listed below containing risk-significant structures, systems, and components susceptible to flooding. The inspectors verified that plant design features and plant procedures for flood mitigation were consistent with design requirements and internal flooding analysis assumptions. The inspectors also assessed the condition of flood protection barriers and drain systems. In addition, the inspectors verified the licensee was identifying and properly addressing issues using the corrective action program. Documents reviewed are listed in the Attachment.

- Service water building

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program and Licensed Operator Performance (71111.11 – 3 samples)

a. Inspection Scope

.1 Resident Inspector Quarterly Review of Licensed Operator Regualification

On November 15, 2017, the inspectors observed a simulator scenario conducted for training of an operating crew during a routine regualification cycle. This evaluated scenario involved a high press coolant injection (HPCI) line leak resulting in a steam leak in the reactor building. This was followed by a leak in the circulating water (CW) system which resulted in internal flooding in the turbine building. Subsequently, the CW pumps were tripped and the reactor was scrammed, however the rods failed to insert into the core. Eventually, the scenario evolved to a line rupture in the suction of the recirculation pumps and with the failure of the HPCI system, an emergency depressurization was required.

The inspectors assessed the following:

- licensed operator performance
- the ability of the licensee to administer the scenario and evaluate the operators
- the quality of the post-scenario critique
- simulator performance

Documents reviewed are listed in the Attachment.

.2 Resident Inspector Quarterly Review of Licensed Operator Performance in the Actual Plant/Main Control Room

On December 13, 2017, the inspectors observed licensed operator performance in the main control room during a Unit 1 power reduction from 95 percent RTP to 87 percent RTP as a prerequisite to a control rod improvement evolution.

The inspectors assessed the following:

- use of plant procedures
- control board manipulations
- communications between crew members
- use and interpretation of instruments, indications, and alarms
- use of human error prevention techniques
- documentation of activities
- management and supervision

.3 Annual Review of Licensee Requalification Examination Results

On September 29, 2017, the licensee completed the comprehensive biennial requalification written examinations and the annual requalification operating examinations required to be administered to all licensed operators in accordance with Title 10 of the *Code of Federal Regulations* 55.59(a)(2), "Requalification Requirements," of the NRC's "Operator's Licenses." The inspectors performed an in-office review of the overall pass/fail results of the individual operating examinations, written examinations, and the crew simulator operating examinations in accordance with Inspection Procedure (IP) 71111.11, "Licensed Operator Requalification Program." These results were compared to the thresholds established in Section 3.02, "Requalification Examination Results," of IP 71111.11.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12 – 3 samples)

a. Inspection Scope

The inspectors assessed the licensee's treatment of the three issues listed below to verify the licensee appropriately addressed equipment problems within the scope of the maintenance rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"). The inspectors reviewed procedures and records to evaluate the licensee's identification, assessment, and characterization of the problems as well as their corrective actions for returning the equipment to a satisfactory condition. In addition, the inspectors performed a review of quality control activities to ensure the licensee was in compliance with their Quality Assurance Program requirements. Documents reviewed are listed in the Attachment.

- Quality Control Sample – EDG-1 activities and safety-related cable verifications
- EVAL-2015-BNP-1005-938 - Unit 2 Safety Relief Valves failed to lift within the required set point
- EVAL-2016-BNP-6235-985 - Unit 1 Reactor Building Floor Drains Multiple Sump Pump Failures

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 4 samples)

a. Inspection Scope

The inspectors reviewed the maintenance activities listed below to verify that the licensee assessed and managed plant risk as required by 10 CFR 50.65(a)(4) and licensee procedures. The inspectors assessed the adequacy of the licensee's risk assessments and implementation of risk management actions. The inspectors also verified that the licensee was identifying and resolving problems with assessing and managing maintenance-related risk using the corrective action program. Additionally, for maintenance resulting from unforeseen situations, the inspectors assessed the effectiveness of the licensee's planning and control of emergent work activities. Documents reviewed are listed in the Attachment.

- Yellow risk - Unit 2 "B" train RHR outage
- Yellow risk - U1 Hardened Vent Wet well Modification and EDG-4 Planned Maintenance
- EDG-4 extended outage beyond the 14-day limiting condition for operation
- Emergent failure of Unit 1 HPCI steam admission valve

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 4 samples)

a. Inspection Scope

The inspectors selected the operability evaluations listed below for review based on the risk-significance of the associated components and systems. The inspectors reviewed the technical adequacy of the determinations to ensure that technical specification operability was properly justified and the components or systems remained capable of performing their design functions. To verify whether components or systems were operable, the inspectors compared the operability and design criteria in the appropriate sections of the technical specification and updated final safety analysis report to the licensee's evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment.

- NCR 2059551 - Unit 2 "A" Core Spray pump venting (operator work around)
- NCR 2126899 - Unit 2 RCIC water intrusion
- NCR 2163106 - EDG-3 loading exceeds 3850 kW
- NCR 2171772 - Master and slave breaker trip from Bus 1C to Bus E-2 during EDG-2 run

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 5 samples)

a. Inspection Scope

The inspectors either observed post-maintenance testing or reviewed the test results for the maintenance activities listed below to verify the work performed was completed correctly and the test activities were adequate to verify system operability and functional capability.

- WO 20170899, Unit 2 RCIC Electronic governor replacement
- WO 12293859, Replace RCIC steam Admission Valve
- WO 20145850, Install knife switch in EDG-1
- WO 20202226, EDG-4 crankshaft repairs
- WO 11970471, NSW pump “1B”

The inspectors evaluated these activities for the following:

- Acceptance criteria were clear and demonstrated operational readiness
- Effects of testing on the plant were adequately addressed
- Test instrumentation was appropriate
- Tests were performed in accordance with approved procedures
- Equipment was returned to its operational status following testing
- Test documentation was properly evaluated

Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with post-maintenance testing. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 4 samples)

a. Inspection Scope

The inspectors reviewed the surveillance tests listed below and either observed the test or reviewed test results to verify testing activities adequately demonstrated that the affected SSCs remained capable of performing the intended safety functions (under conditions as close as practical to design bases conditions or as required by technical specifications) and maintained their operational readiness.

The inspectors evaluated the test activities to assess for preconditioning of equipment, procedure adherence, and equipment alignment following completion of the surveillance. Additionally, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with surveillance testing. Documents reviewed are listed in the attachment.

Routine Surveillance Tests

- OPT-01.1.7, “Automatic Scram Contactors Test,” Rev. 8
- OPT-12.2A, “No. 1 Diesel Generator Monthly Load Test,” Rev. 116
- OPT-12.2C, “No.3 Diesel Generator Monthly Load Test,” Rev. 113

Reactor Coolant System Leak Detection

- 00I-02.3, "Drywell leakage Control," Revision 7

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06 – 1 sample)

a. Inspection Scope

The inspectors observed the simulator evaluation conducted on November 14, 2017. The inspectors observed licensee activities in the simulator to evaluate implementation of the emergency plan, including event classification, notification, and protective action recommendations. The inspectors evaluated the licensee's performance against criteria established in the licensee's procedures. Additionally, the inspectors attended the post-exercise critique to assess the licensee's effectiveness in identifying emergency preparedness weaknesses and verified the identified weaknesses were entered in the corrective action program. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification (6 samples)

a. Inspection Scope

The inspectors reviewed a sample of the performance indicator (PI) data submitted by the licensee for the Unit 1 and Unit 2 PIs listed below. The inspectors reviewed plant records compiled between October 2016 and September 2017 to verify the accuracy and completeness of the data reported for the station. Additionally, the RHR Mitigating System Performance Index (MSPI) data from July 2016 through September 2016 was also reviewed. The inspectors verified that the PI data complied with guidance contained in Nuclear Energy Institute 99-02, "Regulatory Assessment Performance Indicator Guideline," and licensee procedures. The inspectors verified the accuracy of reported data that were used to calculate the value of each PI. In addition, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with PI data. Documents reviewed are listed in the Attachment.

Cornerstone: Mitigating Systems

- MSPI: High Pressure Injection System (HPCI)
- MSPI: Heat Removal System (RCIC)
- MSPI: RHR System

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 1 sample)

a. Inspection Scope

.1 Routine Review

The inspectors screened items entered into the licensee's CAP to identify repetitive equipment failures or specific human performance issues for followup. The inspectors reviewed condition reports, attended screening meetings, or accessed the licensee's computerized corrective action database.

.2 Semi-Annual Trend Review

The inspectors reviewed issues entered in the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors focused their review on human performance trends, but also considered the results of inspector daily condition report screenings, licensee trending efforts, and licensee human performance results. The review nominally considered the 6-month period of July 2017 through December 2017, although some examples extended beyond those dates when the scope of the trend warranted. The inspectors compared their results with the licensee's analysis of trends. Additionally, the inspectors reviewed the adequacy of corrective actions associated with a sample of the issues identified in the licensee's trend reports. The inspectors also reviewed corrective action documents that were processed by the licensee to identify potential adverse trends in the condition of structures, systems, and/or components as evidenced by acceptance of long-standing non-conforming or degraded conditions. Documents reviewed are listed in the Attachment.

b. Findings and Observations

No findings were identified. The inspectors noted a negative human performance trend for the last six months where operators were challenged by human performance errors. The three examples below exhibited gaps in operator performance with respect to plant status control and electrical theory. The inspectors discussed this negative trend with the licensee and the weaknesses were acknowledged by the licensee.

- NCR 2138147 - Operator inadvertently secured EDG during testing
- NCR 2163106 - Operators exceeded kW limit during testing
- NCR 2151329 - Operators failed to utilize procedure to reclose normal feeder breaker during testing (see section 4OA3)

4OA3 Follow-up of Events (71153 – 1 sample)

(Closed) Licensee Event Report (LER) 05000325/2017-004-00, Emergency Diesel Generator and Primary Containment Isolation System Actuations

a. Inspection Scope

On September 17, 2017, the 4160 volt emergency bus E-4 was momentarily de-energized as a result of the operations crew opening the EDG-4 output breaker during planned surveillance testing. At the time of the event, the EDG-4 was solely carrying the loads on E-4 bus due to a spurious trip of the normal feeder breaker. The operators did not recognize this off normal condition and failed to transfer the power source back to

the normal bus, 2C. Subsequently, the E-4 bus momentarily became de-energized until the EDG-4 output breaker automatically reclosed due to the safeguards logic detecting an under voltage condition. At this point, frequency control swapped from the droop mode to the isochronous mode. Upon recognition of the condition, the operators subsequently restored the normal power configuration which required paralleling across the normal feeder breakers. The inspectors evaluated plant status, mitigating actions, and the licensee's classification of the event, to enable the NRC to determine an appropriate NRC response. The events were reported to the NRC as event notification (EN) 52974 and documented in the licensee's corrective action program as NCR 2151329.

The inspectors discussed the event with operations, maintenance, engineering, and licensee management personnel to gain an understanding of the conditions leading up to the event and assess licensee actions taken in response to the event. Additionally, the inspectors reviewed the licensee's causal analysis to assess the detail and thoroughness of the evaluation and the adequacy of the proposed corrective actions. The inspectors reviewed the LER and associated NCR to verify that the cause of the under-voltage condition was identified and whether corrective actions were appropriate. The cause of the spurious opening of the normal feeder breaker (master and slave) was due to a faulty 81PK relay. This relay was designed to open the normal feeder breaker during an under frequency condition. However this relay is effectively bypassed during a design basis LOOP event. The licensee's root cause evaluation identified the direct cause to be the operator's failure to recognize that EDG-4 was the only power source to the E-4 bus due to spurious tripping of the normal feeder breakers. The inspectors concluded that the licensee's corrective actions to this event were appropriate, including the disabling of the failed 81PK relay. The inspectors also verified that timely notifications were made in accordance with 10 CFR 50.72, that licensee staff properly restored the bus using the appropriate plant procedures, and that available plant equipment performed as required during the event. One finding was identified as discussed below. This LER is closed.

b. Findings

Introduction. A Green self-revealing NCV was identified for the licensee's failure to properly transfer power to the E-4 4160 volt emergency bus from the E-4 EDG, to the normal switchgear bus 2C, as required by procedure 00P-50.1 "Diesel Generator Emergency Power System Operating Procedure." This resulted in a momentary under voltage condition followed by a re-energization of the E-4 emergency bus by EDG-4.

Description. On September 17, 2017, the licensee attempted to perform the monthly EDG-4 surveillance in accordance with OPT-12.2D, "No. 4 Diesel Generator Monthly Load Test." This evolution involved paralleling EDG-4 to the E-4 emergency 4160V bus and loading it to approximately 3500 kW to satisfy the monthly technical specification surveillance requirement. Following closure of the EDG-4 output breaker to the E-4 emergency bus, the operators noted what they deemed to be anomalous indications of the real and reactive power. After 45 minutes of troubleshooting, the operators decided to open the EDG-4 output breaker and consult with plant engineering. At the time, the operators failed to note that slightly after the initial closing of the EDG-4 output breaker, the feeder breakers (master and slave) from the normal power source, 2C bus had opened. At this time, EDG-4 was the only power source supplying the E-4 emergency bus. Upon opening of the EDG-4 output breaker, the E-4 bus experienced an under voltage condition and the EDG-4 output breaker immediately reclosed to resupply power to the bus. In this condition, the only change of state to the EDG-4 was the frequency

control swapped from the “droop” mode to the isochronous mode, which was the safety mode for an under-voltage condition. Additionally, the voltage control swapped from droop to unity.

Soon after this event occurred, the operators realized that the master and slave feeder breakers had previously opened. The operators paralleled across the breakers and secured the EDG-4. Subsequent troubleshooting determined that the cause of the opening of the master and slave breaker was due to a failed 81PK relay. This relay provides under frequency protection only when the EDG is operating in parallel with the normal power supply and is bypassed during accident conditions (i.e., LOOP). The licensee disabled the 81PK relay and the surveillance was completed. This event was entered into the licensee’s CAP as NCR 2151329. The licensee performed a causal evaluation and determined that the operators failed to note the initial tripping of the normal feeder breakers which led them to incorrectly open the EDG-4 output breaker without first reclosing the normal feeder breakers.

Analysis. The licensee’s failure to parallel across (i.e., reclose) the normal feeder breakers prior to unloading the EDG-4 and opening the EDG-4 output breaker which resulted in a valid and automatic actuation of the EDG-4 was a performance deficiency. The finding was determined to be greater than minor because it was associated with the human performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during power operations. Using IMC 0609.04, “Initial Characterization of Findings,” Exhibit 1, the issue was classified as a transient initiator contributor because it was associated with a LOOP. Finally, using Appendix A of IMC 0609, “SDP for Findings at-Power,” the finding was determined to be of very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating systems will not be available. The cause of this finding was determined to have a cross-cutting aspect in the area of human performance associated with procedural adherence. Specifically, the operators failed to properly utilize an existing procedure pertinent to their particular situation and this directly resulted in the momentary loss of an emergency 4160 volt bus.

Enforcement. Unit 1 and Unit 2 TS 5.4.1 required, in part, that written procedures be established, implemented, and maintained covering the activities specified in Appendix A, “Typical Procedures for Pressurized Water Reactors and Boiling Water Reactors,” of Regulatory Guide (RG) 1.33, “Quality Assurance Program Requirements (Operations),” Revision 2, dated November 1972. Appendix A of RG 1.33 required, in part, that procedures be used for EDG operation. Brunswick plant procedure OOP-50.1 provides procedural guidance for transferring power to the normal bus from the E-4 emergency bus when the EDG-4 is the sole power source. Contrary to the above, on September 17, 2017, the licensee failed to implement procedure OOP-50.1 as required and this failure resulted in an automatic actuation of EDG-4. Because the finding was of very low safety significance and has been entered into the licensee’s CAP as NCR 2151329, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000325,324/2017004-01, Loss of Emergency 4160V Bus Due to Failure to Implement Procedure.

4OA5 Other Activities

.1 World Association of Nuclear Operators (WANO) Report Review

In accordance with Executive Director of Operations Procedure 0220, "Coordination with the Institute of Nuclear Power Operations," the inspectors reviewed the most recent WANO evaluation report dated January 2017 to determine if this report identified safety or training issues not previously identified by NRC evaluations. The report contained no safety issues that were not already known by the NRC.

.2 Operation of an Independent Spent Fuel Storage Installation (ISFSI) (60855.1 – 1 sample)

a. Inspection Scope

The inspectors performed a walkdown of the onsite ISFSI and monitored the activities associated with the dry fuel storage campaign completed on December 21, 2017. The inspectors reviewed changes made to the ISFSI programs and procedures, including associated 10 CFR 72.48, "Changes, Tests, and Experiments," screens and evaluations to verify that changes made were consistent with the license or certificate of compliance. The inspectors reviewed records to verify that the licensee recorded and maintained the location of each fuel assembly placed in the ISFSI. The inspectors also reviewed surveillance records to verify that daily surveillance requirements were performed as required by technical specifications. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On January 23, 2018, the resident inspectors presented the inspection results to Mr. Gideon and other members of the licensee's staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

4OA7 Licensee-Identified Violation

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which met the criteria of the NRC Enforcement Policy, for being dispositioned as a NCV.

Unit 1 and Unit 2 facility operating license DPR-71 and DPR-62 condition 2.B.(6) requires, in part, that the licensee shall implement and maintain in effect all provisions of the approved fire protection program. Procedure AD-EG-ALL-1522, "Duties of a Fire Watch," requires periodic fire watches to be performed within their designated time periods including any allowed grace periods. Contrary to the above, during the spring 2017 Unit 2 refueling outage, between March 1 and March 19, selected periodic fire watches were missed or not performed within the required grace periods.

The finding was screened using IMC 0609, Appendix F – Fire Protection Significance Determination Process, and was determined to be of very low safety significance (Green), because the reactor was able to reach and maintain safe shutdown. This issue was documented in the licensee's CAP as NCR 2115035.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

K. Allen	Director, Design Engineering
B. Bagwell	Environmental & Chemistry
A. Baker	Supervisor, Environmental & Chemistry
J. Berry	Supervisor, LOCT Training
A. Brittain	Director, Nuclear Plant Security
P. Brown	Manager, Nuclear Performance Improvement
B. Bryant	Manager, Nuclear Oversight
J. Bryant	Regulatory Affairs
R. Carpenter	Radiation Monitor Engineer
P. Dubrouillet	Director, Nuclear Engineering, Mechanical Systems
C. Dunsmore	Manager, Nuclear Outage
W. Gideon	Vice President
L. Grzeck	Manager, Nuclear Regulatory Affairs
J. Hicks	Manager, Nuclear Training
B. Houston	Manager, Nuclear Maintenance
J. Johnson	Manager, Nuclear Chemistry
K. Krueger	Manager, Nuclear Operations
J. McAdoo	Manager, Nuclear Rad Protection
M. McPherson	Director, Nuclear Organizational Effectiveness
K. Moser	Plant Manager
B. Murray	Licensing
J. Nolin	General Manager, Nuclear Engineering
W. Orlando	Superintendent, E/I&C
O. Paladiy	Welding Engineer/Repair & Replacement Engineer
A. Padleckas	Assistant Ops Manager, Training
D. Petrusic	Superintendent, Environmental & Chemistry
J. Pierce	Manager, Nuclear Work Management
E. Rau	Operations Training
M. Regan	Project Manager, Major Projects
L. Rohrbaugh	Operator Training
M. Smiley	Manager, Nuclear Ops Training
L. Spencer	Operator Training
R. Wiemann	Director, Nuclear Engineering, Electrical Reactor Systems
E. Williams	Operations Manager
S. Williams	BWRVIP Program Engineer
C. Winslow	ISI Program Engineer

State of North Carolina

P. Cox	Department of Health and Human Services
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NRC Personnel

S. Rose	Chief, Reactor Projects Branch 4, DRP
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LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000325,324/2017004-01	NCV	Loss of Emergency 4160V Bus Due to Failure to Implement Procedure (Section 4OA3)
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Closed

005000325;324/2017-004	LER	Emergency Diesel Generator and Primary Containment Isolation System Actuations (Section 4OA3)
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LIST OF DOCUMENTS REVIEWED

Common Documents Reviewed

Updated Final Safety Analysis Report
Fire Protection Manual
Individual Plant Examination
Individual Plant Examination of External Events
Technical Specifications and Bases
Technical Requirements Manual
Control Room Narrative Logs
Plan of the Day

Section 1R01: Adverse Weather Protection

Procedures

0OI-01.03, Non-Routine Activities, Rev 69
0AP-062, Seasonal Preparations, Rev. 6
0OI-01.03, Non-Routine Activities, Rev. 68

Work Orders

20121015
20088738

Drawings

LL-09049, Freeze Protection Sheet 1, Rev. 6

Miscellaneous

0PM-HT001, Preventative Maintenance on Plant Freeze Protection and Heat Tracing, Rev. 19

Section 1R04: Equipment Alignment

Procedures

0OP-39, Diesel Generator Operating Procedure, Rev. 187
2OP-17, Residual Heat Removal System Operating Procedure, Rev. 175
1OP-39, Service Water System Operating Procedure, Rev. 130

Section 1R05: Fire Protection (Annual/Quarterly)

Procedures

CSD-BP-PFP-0DG, Diesel Building Pre-Fire Plans, Rev. 0
CSD-BP-PFP-0CB, Control Building Pre-Fire Plans, Rev. 1
CSD-BP-PFP-2RB, Reactor Building Pre-Fire Plans, Rev. 0
CSD-BP-PFP-00PBAA, Power Block Auxiliary Areas Pre-Fire Plans (SW, RW, AOG, TY, EY, PDC, DGS, MCP), Rev. 0

Section 1R06: Flood Protection Measures

Procedures

AG-EG-BNP-1214, Condition Monitoring of Structures, Rev. 0
0AOP-13.0, Operation during Hurricane, Flood Conditions, Tornado, or Earthquake, Rev. 67

Miscellaneous

DBD-144, External and Internal Flooding, Rev. 0

Section 1R11: Licensed Operator Regualification Program and Licensed Operator Performance

Miscellaneous

Simulator exercise guide, LORX-24, Rev. 9

Section 1R12: Maintenance Effectiveness

Procedures

AD-EG-ALL-1210, Maintenance Rule Program, Rev. 1
 0ENP-05, BCAMS: Cable Management System, Rev. 24
 0SMO-CCT002, Installation of Wires and Cables, Rev. 8

Work Orders

WO 20145850
 WO 12229992
 WO 12222583
 WO 20062954

Miscellaneous

NUMARC 93-01, Industry Guidelines for monitoring the effectiveness of maintenance at Nuclear Power Plants, Rev. 4A
 Maintenance Rule EVAL-2015-BNP-1005-938 - Unit 2 Safety Relief Valves failed to lift within the required set point
 Maintenance Rule EVAL-2016-BNP-6235-985 - Unit 1 Reactor Building Floor Drains Multiple Sump Pump Failures

Section 1R13: Maintenance Risk Assessment and Emergent Work Control

Procedures

AD-OP-ALL-0201, Protected Equipment, Rev. 4
 0AP-022, BNP Outage Risk Management, Rev. 57
 AD-WC-ALL-0250, Work Implementation and Completion, Rev. 6
 AD-WC-ALL-0410, Work Activity Integrated Risk Management, Rev. 6
 AD-WC-ALL-0200, Online Work Management, Rev. 10
 AD-OP-ALL-0201, Protected Equipment, Rev. 4
 AD-WC-ALL-0430, Outage Risk Review, Rev. 3
 0AP-025, BNP Integrated Scheduling, Rev. 56

Miscellaneous

BNP Outage Risk Assessment
 BNP U2 Key Safety Function Daily Risk Assessment
 EOOS Risk Assessments

Section 1R15: Operability Determinations and Functionality Assessments

Procedures

AD-PI-ALL-0104, Prompt Investigation Response Team, Rev. 3
 2OI-03.4.1 Unit 2 Reactor Operator Daily Check Sheets, Rev. 84

Condition Reports

2059551
 2126899
 2163106
 2171772
 2158222

Work Orders (WO)

WO 20165559

WO 12293859

WO 20043580

Section 1R19: Post Maintenance TestingProcedures

OPT-12.2A, No.1 Diesel Generator Monthly Load Test, Rev. 114

OPT-12.2B, No.2 Diesel Generator Monthly Load Test, Rev. 109

OPT-12.2C, No.3 Diesel Generator Monthly Load Test, Rev. 111

OPT-12.2D, No.4 Diesel Generator Monthly Load Test, Rev. 116

OOP-39, Diesel Generator Operating Procedure, Rev. 186

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

Work Orders (WO)

WO 20170899, Unit 2 RCIC Electronic governor replacement

WO 12293859, Replace RCIC steam Admission Valve

WO 20145850, Install knife switch in EDG-1

WO 20202226, EDG-4 crankshaft repairs

WO 11970471, NSW pump '1B'

WO 20165559, RCIC maintenance

Condition Reports

2153997

2126899

2158222

Section 1R22: Surveillance TestingProcedures

OPT-01.1.7, "Automatic Scram Contactors Test," Rev. 8

OPT-12.2A, "No. 1 Diesel Generator Monthly Load Test," Rev. 116

OPT-12.2C, "No.3 Diesel Generator Monthly Load Test," Rev. 113

OPT-12.2D, Units 1 and 2, No. 1 Diesel Generator Monthly Load Test, Rev. 118

OOI-02.3, "Drywell leakage C0PT-01.1.7, "Automatic Scram Contactors Test," Rev. 8

Work Orders (WO)

WO 20153205

Section 1EP6: Drill EvaluationProcedures

OOI-01.07, Notifications, Rev. 39

2EOP-01-RSP, Reactor Scram Procedure, Rev. 16

OPEP-02.1, Initial Emergency Actions, Rev. 54

OPEP-02.1.1, Emergency Control – Notification of Unusual Event, Alert, Site Area Emergency, and General Emergency, Rev. 30

Section 4OA1: Performance Indicator VerificationProcedures

AD-LS-ALL-0004. Performance Indicators and Monthly Operating Report, Rev. 2

Miscellaneous

Operator Logs

NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Rev. 7

Brunswick Unit 1 PI Summary, January 1, 2016, through December 31, 2017
 Brunswick Unit 2 PI Summary, January 1, 2016, through December 31, 2017
 Monthly PI Reports, April 1, 2016, through March 31, 2017
 System Health Reports, January 1, 2016, through December 31, 2017
 Licensee Event Reports, January 1, 2016, through December 31, 2017

Section 40A2: Problem Identification and Resolution

Procedures

AD-HU-ALL-0001, Human Performance Program, Rev. 12
 AD-PI-ALL-0100, Corrective Action Program, Rev. 18
 AD-SY-ALL-0401, Fitness for Duty Program, Rev. 2
 AD-SY-ALL-0460, Managing Fatigue and Work Hour Limits, Rev. 1
 AD-SY-ALL-1000, Conduct of Security, Rev. 2
 AD-SY-ALL-0520, Security Training, Rev. 3
 AD-PI-ALL-0101, Root Cause Evaluation, Rev. 04
 AD-PI-ALL-0102, Apparent Cause Evaluation, Rev. 04
 AD-PI-ALL-0103, Quick Cause Evaluation, Rev. 04
 AD-PI-ALL-0400, Operating Experience Program, Rev. 05

Section 40A3: Follow-up of Events

Procedures

0AOP-36.1, Loss of Any 4160V Buses or 480V E-buses
 0OP50.1, Diesel Generator Emergency Power System Operating Procedure, Rev. 92

Miscellaneous

LER 1-2017-004-00

Condition Reports

2138147
 2151329
 2163106

Section 40A7: Licensee Identified Violations

Procedures

AD-EG-ALL-1522, Duties of a Fire Watch, Rev. 4

Condition Reports

2115035