



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
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ATLANTA, GEORGIA 30303-1200

January 31, 2019

Mr. J. W. Shea  
Vice President  
Nuclear Regulatory Affairs  
and Support Services  
Tennessee Valley Authority  
1101 Market Street, LP 4A  
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT – NRC INTEGRATED INSPECTION  
REPORT 05000259/2018004, 05000260/2018004, AND 05000296/2018004

Dear Mr. Shea:

On December 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Browns Ferry Nuclear Plant, Units 1, 2, and 3. On January 18, 2019, the NRC inspectors discussed the results of this inspection with Mr. Lang Hughes and other members of your staff. The results of this inspection are documented in the enclosed report.

Three findings of very low safety significance (Green) are documented in this report. Two of these findings involved violations of NRC requirements. We are treating these violations as noncited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or the significance 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, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Browns Ferry Nuclear Plant.

If you disagree with the cross-cutting aspect assignment or the finding not associated with a regulatory requirement 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 Browns Ferry Nuclear Plant.

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/**

Anthony D. Masters, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket Nos.: 50-259, 50-260, 50-296  
License Nos.: DPR-33, DPR-52, DPR-68

Enclosure: NRC Integrated Inspection Report 05000259/2018004,  
05000260/2018004 and 05000296/2018004

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SUBJECT: BROWNS FERRY NUCLEAR PLANT – NRC INTEGRATED INSPECTION  
 REPORT 05000259/2018004, 05000260/2018004 and 05000296/2018004  
January 31, 2019

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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket Nos.: 50-259, 50-260, and 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Report No.: 05000259/2018004, 05000260/2018004, AND 05000296/2018004

Enterprise Identifier: I-2018-004-0036

Licensee: Tennessee Valley Authority (TVA)

Facility: Browns Ferry Nuclear Plant, Units 1, 2, and 3

Location: Corner of Shaw and Nuclear Plant Road  
Athens, AL 35611

Dates: October 1, 2018 through December 31, 2018

Inspectors: T. Stephen, Senior Resident Inspector  
M. Kirk, Resident Inspector  
N. Hobbs, Resident Inspector  
D. Lanyi, Senior Operations Engineer  
S. Ninh, Senior Project Engineer  
P. Cooper, Reactor Inspector  
C. Smith, Construction Inspector

Approved by: Anthony D. Masters, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Enclosure

## SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring licensee’s performance by conducting quarterly integrated baseline inspections and an emergency preparedness program inspection at Browns Ferry Nuclear Plant, Units 1, 2, and 3 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. NRC and self-revealed findings, violations, and additional items are summarized in the table below.

### List of Findings and Violations

High Crew Failure Rate During Annual Requalification			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000259/2018004-01 Closed	H.8 Procedure Adherence	71111.11
A self-revealed Green Finding was identified for a performance deficiency against the expected knowledge and abilities of licensed operators as demonstrated during the requalification examinations required by 10 CFR 55.59(a)(2). Specifically, the licensee had four (4) of fifteen (15) crews fail their annual simulator scenario examinations.			
Failure to Control the Design of the High Pressure Coolant Injection (HPCI) Containment Isolation Circuitry			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000259/2018004-02 Closed	None	71153
A self-revealed Green non-cited violation of 10 CFR 50 Appendix B, Criterion III “Design Control”, was identified for the failure to control the design of the HPCI containment isolation circuitry. Specifically, the licensee added additional relays to the circuitry without fully evaluating the effect on the circuit’s design.			
Failure to Establish Adequate Surveillance Test Procedures to Check Battery Category C Limits			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000259, 260, 296/2018004-03 Closed	None	71153
A self-revealed Green non-cited violation of TS 5.4.1.a, “Procedures,” required, in part, that written procedures be established, implemented, and maintained covering Emergency Power Sources (e.g., diesel generator, batteries) related to procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, 1978. Regulatory Guide 1.33. Specifically, surveillance test procedures 0-SR-3.8.6.2(DG-A/B/C/D), Quarterly Check of Diesel Generator Battery and 0-SR3.8.4.4 (DG-A/B/C/D), Diesel Battery Performance Test, do not require a verification of Technical Specification (TS) 3.8.6 Category C limits.			

### Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000259/2018-004-00	High Pressure Coolant Injection Declared Inoperable Due to Steam Supply Isolation	71153	Closed
LER	05000259/2018-005-00	Inoperability of Unit 1 and 2 Emergency Diesel Generators Results in Condition Prohibited by Technical Specifications	71153	Closed

### PLANT STATUS

Unit 1 operated at 83 percent rated thermal power (RTP) until October 14, 2018, when then plant was shut down for a planned refueling outage U1R12. The unit was restarted on November 20, 2018, and achieved 100 percent of the previously licensed RTP on November 29, 2018. Unit 1 performed power ascension testing associated with reaching the new Extended Power Uprate (EPU) 100 percent RTP for the rest of the inspection period.

Unit 2 operated at 100 percent RTP until October 12, 2018, when it reduced power to repair an oil leak on a recirculation pump. The unit returned to 100 percent RTP on October 19, 2018, and remained at 100 percent RTP for the remainder of the inspection period.

Unit 3 began the inspection period at 72 percent RTP until it shut down for a forced outage on October 10, 2018. The unit started up on October 10 and achieved 100 percent RTP on October 13, 2018, where it operated until October 21, 2018, when a manual scram was inserted due to a condenser tube leak. Unit 3 was restarted on October 28, 2018, and reached 100 percent RTP on November 5, 2018 where it remained for the remainder of the inspection period.

### 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 (2 Samples)

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

- (1) Unit 1, High Pressure Coolant Injection (HPCI) on December 12, 2018
- (2) Unit 1, Hardened Containment Vent System (HCVS) on December 14, 2018

#### 71111.05AQ - Fire Protection Annual/Quarterly

##### Quarterly Inspection (5 Samples)

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

- (1) Unit 1 Auxiliary Instrument Room, Fire Area 16-K on October 23, 2018
- (2) Unit 3 Control Bay Chillers Room, Fire Area 16-A on October 24, 2018
- (3) Units 1, 2 and 3, Fire Area YARD on November 6, 2018
- (4) Unit 1, 2, and 3, Control Building Air Handling Unit Space and FLEX Storage Room, Fire Area 16P on November 15, 2018
- (5) Unit 2 Electric Board Room 2B, Fire Area 08 on December 11, 2018

#### 71111.08 - Inservice Inspection Activities (1 Sample)

The inspectors evaluated boiling water reactor non-destructive testing by observing/reviewing the following examinations from October 22 – 25, 2018:

- (1) Visual Examination
  - a) Residual Heat Removal System Pipe Support (1-47B452-1476), ASME Class 2 (observed)
  - b) Reactor Pressure Vessel Nuts and Bolts (N7-1-3-BC), ASME Class 1 (observed)
  - c) Reactor Pressure Vessel Nuts and Washers (RPV-NUTS-1-01 thru 30), ASME Class 1 (observed)
- (2) Ultrasonic Examination
  - a) Reactor Pressure Vessel Nozzle (N6A-NV), ASME Class 2 (observed)
- (3) Liquid Penetrant
  - a) WO 118225266, Weld on 1-SHV-001-0512 (1-SW-911), ASME Class 3 (reviewed)

#### 71111.11 - Licensed Operator Requalification Program and Licensed Operator Performance

##### Operator Requalification (1 Sample)

The inspectors observed licensed operator requalification simulator training scenarios for the Group 3 operating crew on the Unit 2 and Unit 3 Simulators on October 1, 2018.

##### Licensed Operator Requalification Program and Licensed Operator Performance Operator Requalification (1 Sample)

Annual Review of Licensee Requalification Examination Results: The inspectors completed an in-office review of the overall pass/fail results of the individual operating examinations, written examinations, and the crew simulator operating examinations on November 28, 2018.

### Operator Performance (1 Sample)

The inspectors observed and evaluated the following

- Unit 3 shutdown on October 6, 2018.
- Unit 3 restart on October 10, 2018.
- Unit 2 downpower to 12 percent RTP for drywell entry on October 12, 2018.
- Unit 1 shutdown on October 14, 2018.
- Unit 2 syncing to the grid on October 16, 2018.
- Unit 1 power ascension and operation above previous licensed thermal power on December 17 & 18, 2018.
- Unit 1 flow induced vibration data acquired at 87.5 percent power.

### 71111.12 - Maintenance Effectiveness

#### Routine Maintenance Effectiveness (2 Samples)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the following equipment and/or safety significant functions:

- (1) Unit 3, System 85, Control Rod Drive System
- (2) Units 1, 2, and 3, Emergency Diesel Generator (EDG) Air Start System

### 71111.13 - Maintenance Risk Assessments and Emergent Work Control (5 Samples)

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

- (1) Planned risk associated with Unit 1 high decay heat load during transition to shutdown cooling on October 14, 2018.
- (2) Planned risk associated with timeframe from Unit 1 entry into Mode 5 (refueling) until flood-up of the reactor vessel on October 15, 2018.
- (3) Planned risk associated with Unit 1 Reactor Vessel head lift on October 15, 2018.
- (4) Shutdown risk associated with a Unit 1 Unplanned Operations with Potential for Draining the Reactor Vessel (OPDRV) during repairs of 1-PCV-85-23, Control Rod Drive pressure control valve, on November 7, 2018
- (5) Shutdown risk associated with Unit 1 during OPDRV for replacing 1A Recirculation Pump seal while Fuel movements are in progress on November 11, 2018.

### 71111.15 - Operability Determinations and Functionality Assessments (5 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) C Standby Gas Treatment (SBGT) operability following failure to auto start after reaching +2" during Unit 3 scram on October 6, 2018.
- (2) Operability of B Main Steam line Inboard Isolation Valve Not Fully Open function following the identification of logic circuits for limits switches being crossed on October 7, 2018.
- (3) EDG D AC Circulating Pump Low Flow following no indication of oil level in the lube oil gallery vent lower sightglass on November 6, 2018.



- (4) Unit 1 HPCI operability after suction source unexpectedly swapped during pump test and discharge piping was overpressurized on November 21, 2018.
- (5) Unit 1 Reactor Core Isolation Cooling (RCIC) prompt determination of operability following pressure transient that impacted RCIC turbine trip function on low suction pressure on December 5, 2018.

#### 71111.18 – Plant Modifications (2 Samples)

The inspectors evaluated the following plant modifications:

- (1) Units 1, 2, and 3 temporary air conditioning unit installed in Communications Room while both permanent air conditioning units were out of service
- (2) Reactor Recirculation Motor Replacement EPU Additional Changes per DCN 69389

#### 71111.19 - Post Maintenance Testing (3 Samples)

The inspectors evaluated the following post maintenance tests:

- (1) Unit 1, post maintenance testing following installation on the Unit 1 Emergency High Pressure Makeup pump on October 16, 2018.
- (2) EDG A post maintenance testing following STA switch replacement on November 1, 2018.
- (3) Various Unit 1 integrated systems testing per 1-TI-700, 1-TI-701, 1-TI-130, and 1-TI-131 at extended power uprate conditions from October 28, 2018 to December 31, 2018

#### 71111.20 – Refueling and Other Outage Activities (3 Samples)

The inspectors evaluated the Unit 3 planned mid-cycle outage activities from October 6, 2018 through October 10, 2018.

The inspectors evaluated refueling outage U1R12 activities from October 14, 2018 through November 22, 2018.

The inspectors evaluated the Unit 3 unplanned forced outage activities from October 21, 2018 through October 29, 2018.

#### 71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

##### Routine (3 Samples)

- (1) 1-SR-3.3.6.1.5 for Primary Containment Isolation System Main Steamline High Flow Instrument Calibrations for Channels A1, A2, B1 and B2 per ECP 51243 Stage 12 associated with Extended Power Uprate (EPU) modification on October 15 - 21, 2018.
- (2) 0-TI-322 for Residual Heat Removal Heat Exchanger Thermal Performance Testing on 2A and 2C RHR heat exchangers on October 3, 2018.
- (3) 1-SR-3.6.1.3.6 for Main Steam Isolation Valve Fast Closure Test on November 5, 2018.

Containment Isolation (1 Sample)

- (1) As Found and As Left Local Leak Rate Testing of 1-CKV-073-0045, HPCI System Check Valve that was completed during the Unit 1 Refueling Outage.

**OTHER ACTIVITIES – BASELINE**

71151 - Performance Indicator Verification

The Resident inspectors verified licensee performance indicators submittals listed below for the period from October 1, 2017 through September 30, 2018. (9 Samples)

- (1) Units 1, 2, and 3 Scrams (IE 01)
- (2) Units 1, 2, and 3 Scrams with Complications (IE04)
- (3) Units 1, 2, and 3 Unplanned Downpowers > 20 percent (IE 03)

71152 - Problem Identification and Resolution

Semiannual Trend Review (1 sample)

The inspectors reviewed the licensee's corrective action program (CAP) for trends that might be indicative of a more significant safety issue.

Annual Follow-up of Selected Issues (1 sample)

The inspectors reviewed the licensee's implementation of its corrective action program related to Problem Identification & Resolution associated with Unit 1 Extended Power Uprate.

71153 - Follow-up of Events and Notices of Enforcement Discretion

Licensee Event Reports (2 samples)

The inspectors evaluated the following licensee event reports (LER) which can be accessed at <https://lersearch.inl.gov/LERSearchCriteria.aspx> :

- (1) LER 05000259/2018-004, High Pressure Coolant Injection Declared Inoperable Due to Steam Supply Isolation
- (2) LER 05000259, 260/2018-005, Inoperability of Unit 1 and 2 Emergency Diesel Generators Results in Condition Prohibited by Technical Specifications

**OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT, AND ABNORMAL**

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

- (1) The inspectors also evaluated changes to ISFSI programs and procedures to verify that changes were made consistent with the license and/or certificate of compliance.

71004 - Power Uprate

Summary of Power Uprate Inspection Samples Contained in this Report:

Integrated Plant Operations at the Uprated Power Level (Unit 1)

- (1) Power ascension above previous thermal power limit and flow induced vibration data reviews (Section 71111.11).

Plant Modifications (Unit 1)

- (1) Reactor Recirculation Motor Replacement EPU Additional Changes per DCN 69389 (Section 71111.18)

Monitor Major Integrated Tests (Unit 1)

- (1) Various Unit 1 integrated systems testing per 1-TI-700, 1-TI-701, 1-TI-130 and 1-TI-131 at from October 28, 2018 to December 31, 2018 (Section 71111.19).

Post-Maintenance / Post-Modification or Surveillance Tests (Unit 1)

- (1) 1-SR-3.3.6.1.5 for Primary Containment Isolation System Main Steamline High Flow Instrument Calibrations for Channels A1, A2, B1 and B2 per ECP 51243 Stage 12 associated with Extended Power Uprate (EPU) modification on October 15 - 21, 2018 (Section 71111.22)

Identification and Resolution of Problems (Unit 1)

- (1) Problem Identification and Resolution related to EPU (Section 71152)

**INSPECTION RESULTS**

High Crew Failure Rate During Annual Requalification			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000259, 260, 296/2018004-01 Closed	H.8 Procedure Adherence	71111.11
A self-revealed Green Finding was identified for a performance deficiency against the expected knowledge and abilities of licensed operators as demonstrated during the requalification examinations required by 10 CFR 55.59(a)(2). Specifically, the licensee had four (4) of fifteen (15) crews fail their annual simulator scenario examinations.			
During the annual requalification testing during the Fall of 2018, four of fifteen crews failed the scenario portion of their annual operating exam. Each crew failed because they did not adequately address a single critical task in one of their scenarios.			
Corrective Action(s): Each crew was remediated and then successfully passed another set of simulator scenario evaluations. A Condition Report was written to document the high failure rate and to determine what the causes of the errors were. The licensee also performed a			

self-assessment that included a review of the causes of the failure. They identified the following causal factors:

- Critical Parameter Control.
- Acknowledgement and reporting of key annunciators.
- Main Control Room Board Awareness and Monitoring.
- Understanding of Plant and System Response.
- Emergency Operating Instruction (EOI)1 and EO11A flowchart execution.
- EOI entry and reentry for EOI entry conditions.
- Procedure Use and Adherence.
- Radiological Emergency Plan execution.
- Immediate Actions of Abnormal Operating Instruction (AOI)-701.

Note that the last five bulleted items are all part of the licensed operators' ability to properly read and use their procedures.

Corrective Action Reference(s): Condition Report 1458831, Self-assessment, BFN-TRN-SA-19-009.

Performance Assessment:

Performance Deficiency: Failure of the operating crews to exhibit the expected knowledge and abilities of licensed operators as demonstrated during the requalification examinations required by 10 CFR 55.59(a)(2). Specifically, the licensee had four (4) of fifteen (15) crews fail their annual simulator scenario examinations.

Screening: The performance deficiency was more than minor because if left uncorrected, the performance deficiency could result in a more significant safety concern. Specifically, the failure of the operating crews to demonstrate the knowledge and abilities of licensed operators during an actual plant transient could result in placing the unit in a more significantly complex recovery condition.

Significance: Using Chapter 0609, Appendix I, "Licensed Operator Requalification Significance Determination Process (SDP)," the issue screened as having very low safety significance (Green) because the deficiency was identified and corrected in a timely manner. Additionally, the deficiency existed in a small percentage of the licensed operators.

Cross Cutting Aspect: A cross cutting aspect of H.8 Procedure Adherence was assigned due to the direct cause of each of the operating crew failures was a failure to follow their emergency and abnormal procedures.

Enforcement: The inspectors did not identify a violation of regulatory requirements associated with this finding.

Failure to Control the Design of the High Pressure Coolant Injection (HPCI) Containment Isolation Circuitry			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000259/2018004-02 Closed	None	71153

A self-revealed Green non-cited violation of 10 CFR 50 Appendix B, Criterion III Design Control, was identified for the failure to control the design of the HPCI containment isolation circuitry. Specifically, the licensee added additional relays to the circuitry without fully evaluating the effect on the circuit's design.

On July 9, 2018, while surveillance procedure 1-SR-3.3.6.1.2(3B) , High Pressure Coolant Injection System Steam Supply Low Pressure Functional Test, an unexpected High Pressure Coolant Injection (HPCI) isolation occurred. The isolation was discovered at 1111 Central Daylight Time (CDT) during a walkdown of the Unit 1 Control Room when the Unit Operator identified that the inboard and outboard HPCI steam supply valves were closed.

It was determined that the valves had closed at approximately 0958 CDT during performance of 1-SR-3.3.6.1.2(3B). Unit 1 entered Technical Specifications (TS) Limiting Conditions for Operation (LCO) 3.5.1, ECCS - Operating, Condition C, at approximately 1111 CDT, which required restoring HPCI to operable status within 14 days and verification that Reactor Core Isolation Cooling (RCIC) is operable by administrative means. Following successful completion of the functional test, HPCI was placed in standby readiness lineup. The HPCI system was declared operable on July 10, 2018, at 1344 CDT. During the period of Primary Containment Isolation, the HPCI system was unable to perform its safety function. However, in an emergency, sufficient systems were available to provide the required safety functions.

The cause of the unexpected HPCI isolation during performance of the HPCI test was determined to be past operation of the steam supply low pressure switches at an electrical current level very near or above the manufacturer's rating, which resulted in degradation of the switch electrical contacts. The degradation eventually resulted in momentary contact closure during functional testing of an adjacent switch, which energized the downstream logic relays causing HPCI to isolate.

Corrective Action(s): Corrective actions were to replace the Unit 1 pressure switches that, either one of which, could have caused the spurious isolation. Work orders were initiated to replace these same pressure switches on Units 2 and 3. Additionally, the testing procedures for these pressure switches were revised to minimize the chances of a spurious HPCI steam supply isolation.

Corrective Action Reference(s): Condition Reports (CRs1429497 and CR1437895)

Performance Assessment:

Performance Deficiency: Failure to control the design of the HPCI containment isolation circuitry was a performance deficiency.

Screening: The performance deficiency was more-than-minor because it was associated with the design control attribute of the Mitigating Systems cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, the failure to control the design of the HPCI containment isolation circuitry resulted in the Unit 1 HPCI being declared inoperable during the period of July 9, 2018 at 1111 CDT to July 10, 2018 at 1344 CDT.

Significance: Using Chapter 0609, Appendix A, "The Significance Determination Process for Findings At-Power," Exhibit 2, "Mitigating Systems Screening Questions," the issue screened as having very low safety significance (Green) because the Unit 1 HPCI was able to be unisolated and was available for use following the spurious isolation signal.

Cross Cutting Aspect: No cross cutting aspect was assigned because this issue does not reflect the licensee's current performance.

Enforcement:

Violation: 10 CFR 50 Appendix B, Criterion III "Design Control", required, in part, that the design control measures shall provide for verifying or checking the adequacy of design by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, the licensee failed to ensure that the design changes that added additional relays to the HPCI containment isolation circuitry were fully evaluated. This evaluation should have ensured that the circuitry did not have current flows that were at the maximum allowed design limits for the installed relays.

Enforcement Actions: This violation is being treated as a Non-Cited Violation (NCV), consistent with Section 2.3.2 of the Enforcement Policy.

Failure to Establish Adequate Surveillance Test Procedures to Check Battery Category C Limits

Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000259, 260, 296/2018004-03 Closed	None	71153

A self-revealed Green non-cited violation of TS 5.4.1.a, "Procedures," required, in part, that written procedures be established, implemented, and maintained covering Emergency Power Sources (e.g., diesel generator, batteries) related to procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, 1978. Regulatory Guide 1.33. Specifically, surveillance test procedures 0-SR-3.8.6.2(DG-A/B/C/D), Quarterly Check of Diesel Generator Battery and 0-SR3.8.4.4 (DG-A/B/C/D), Diesel Battery Performance Test, do not require a verification of Technical Specification (TS) 3.8.6 Category C limits.

On July 2, 2018, the licensee discovered that the last performed surveillance on the C EDG Battery had recorded the specific gravity of Battery Cell 20 at 1.204. This was 0.025 less than the average battery cell specific gravity of 1.229. The difference in specific gravity between the individual cell and the average cell was more than the BFN Unit 1 and Unit 2 TS Limiting Conditions for Operation (LCO) 3.8.6, Table 3.8.6-1, Category C, limit of 0.020.

TS LCO 3.8.4 requires that Unit 1 and 2 EDG DC subsystems be operable in Modes 1, 2, and 3. TS LCO 3.8.4 Condition C states that, with one or more EDG DC electrical power subsystems inoperable (including the DG battery), the associated EDG must immediately be declared inoperable.

TS LCO 3.8.1 Condition H states that, with two required Unit 1 and 2 EDGs inoperable, action must be taken to restore all but one Unit 1 and 2 EDG to operable status. During the time when C EDG was inoperable, there were two periods where B EDG was inoperable for longer than two hours.

TS LCO 3.8.1 Condition I states that if required actions and completion times are not met for Condition A, B, C, D, E, F, or H, action must be taken to be in Mode 3 within twelve hours, and to be in Mode 4 within thirty-six hours.

A review of surveillances performed on June 6, 2018, determined that the specific gravity of C EDG Battery Cell 20 was 1.204. This was 0.025 below the average cell specific gravity of 1.229, and did not meet the requirements of Table 3.8.6-1. Therefore, the C EDG Battery was inoperable by LCO 3.8.6, and the C EDG was inoperable by LCO 3.8.4. A past operability evaluation determined that, because of a declining trend in Cell 20 specific gravity, the battery would be considered inoperable from the date of its last satisfactory surveillance on April 10, 2018, to June 4, 2018, when the EDG was declared inoperable for its planned maintenance window. During this time, the Required Actions of TS LCO 3.8.6 Condition B; TS LCO 3.8.4 Condition C; and TS LCO 3.8.1 Conditions B, H, and I were not completed. Therefore, BFN was in violation of its TS during this time.

Surveillance test procedures 0-SR-3.8.6.2(DG-A/B/C/D), Quarterly Check of Diesel Generator Battery and 0-SR3.8.4.4 (DG-A/BC/D, Diesel Battery Performance Test did not specify to check the Category C limits.

Corrective Action(s): Corrective actions were to replace the battery cell, to issue an Operations Standing Order ensuring TS 3.8.6 Category C limits are met when quarterly SRs are performed on DG batteries, to revise battery surveillance requirement (SR) procedures, and to revise Unit 1, 2, and 3 TS 3.8 to address the discrepancy between the SR and the TS 3.8.6 LCO Condition B required action.

Corrective Action Reference(s): Condition Reports (CRs1429012 and CR1434547)

Performance Assessment:

Performance Deficiency: Failure to Establish Adequate Surveillance Test Procedures to Check Battery Category C Limits was a performance deficiency.

Screening: The performance deficiency was more-than-minor because it was associated with the procedure quality attribute of the Mitigating Systems cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, the failure to establish adequate surveillance test procedures to check battery Category C limits resulted in the C EDG inoperable during the period of April 10 to June 14, 2018.

Significance: Using Chapter 0609, Appendix A, "The Significance Determination Process for Findings At-Power," Exhibit 2, "Mitigating Systems Screening Questions," the issue screened as having very low safety significance (Green) because the entire battery bank was sufficient to supply the power necessary for C EDG to perform its safety function for its seven-day mission time.

Cross Cutting Aspect: No cross cutting aspect was assigned because this violation did not reflect current licensee performance.

Enforcement:

Violation: TS 5.4.1.a, "Procedures," required, in part, that written procedures be established, implemented, and maintained covering Emergency Power Sources (e.g., diesel generator, batteries) related to procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, 1978. Regulatory Guide 1.33.

Contrary to the above, the licensee failed to establish adequate surveillance test procedures to check battery Category C limits as required by TS 3.8.6, Table 3.8.6-1, Category C limits for a long time. This resulted in the C EDG inoperable during the period of April 10 to June 14, 2018, which was longer than the LCO 3.8.1 Condition B, 7 day allowed outage time. Also, during this time, there were two periods where a second Unit 1 and 2 DG was inoperable for longer than the two hours allowed by TS LCO 3.8.1, Condition H.

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

## **EXIT MEETINGS AND DEBRIEFS**

The inspectors confirmed that proprietary information was controlled to protect from public disclosure.

- On January 18, 2019, the quarterly resident inspector inspection results were presented to Mr. Lang Hughes , and other members of the licensee staff.



## **DOCUMENTS REVIEWED**

### IP 71111.04

#### Procedures

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0-GOI-300-1/ATT-16, Unit 1 Operator at the Controls Duty Station Checklist, Revision 15  
1-OI-73, High Pressure Coolant Injection System, Revision 30  
1-OI-73/ATT-1, High Pressure Coolant Injection System Attachment 1 Valve Lineup Checklist, Revision 17  
1-OI-73/ATT-2, High Pressure Coolant Injection System Attachment 2 Panel Lineup Checklist, Revision 17  
1-OI-73/ATT-3, High Pressure Coolant Injection System Attachment 3 Electrical Lineup Checklist, Revision 15

#### Drawings

1-47E812-1, Flow Diagram High Pressure Coolant Injection, Revision 47  
2-47E2847-10, Mechanical I&C Flow Diagram Control Air System, Revision 1  
3-47E865-12, ASME Section XI Heating & Ventilating Air Flow Code Class Boundaries, Revision 9

#### Other Documents

BFN-50-7073, High Pressure Coolant Injection System, Revision 31  
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WO 119827193  
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CR 1469446  
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CR 1428037  
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### IP 71111.05

#### Procedures

FPR-Volume 2, Fire Protection Report Volume 2, Revision 61  
NPG-SPP-18.4.7, Control of Transient Combustibles, Revision 12  
NPG-SPP-01.3, Housekeeping, Revision 6  
NPG-SPP-18.4.8, Control of Ignition Sources (Hot Work), Revision 7

#### Other Documents

NFPA 805 Fire Protection Report, Appendix F, Fire Area 16, Revision 2  
MDN0009992012000100, Browns Ferry Nuclear Plant, Units 1, 2, and 3, Fire Risk Evaluations, Revision 8  
MDQ099920110009, NFPA 805 Transition – Fire Area Designation – Appendix A, Revision 7

#### Drawings

3-47E216-71-1, NFPA 805 Physical Analysis Units Plan El. 606.0, 617.0 and 621.0, Revision 0  
0-47E216-64, NFPA 805 Fire Areas, Revision 0  
0-47E216-64-1, NFPA 805 Physical Analysis Units, Revision 0

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N-UT-78, PDI Generic Procedure for the Manual Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6, Rev. 9  
N-UT-90, Generic Procedure for the Ultrasonic Detection and Sizing of Reactor Pressure Vessel Nozzle to Shell Welds and Nozzle Inner Radius, Rev. 3  
N-VT-1, Visual Examination Procedure for ASME Section XI Preservice and Inservice, Rev.48  
0-SI-4.6.G, Inservice Inspection Program, Rev. 3  
0-TPP-ENG-376, Containment Inservice Inspection Program, Rev. 0

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1-CHM-2102-A, Closure Head Assembly Weld Locations, Rev. 0  
1-CHM-2001-C, Vessel Stud Locations, Rev. 1  
47B452-1476, Residual Heat Removal System Pipe Support, Rev. 3  
UT-W-0174, 22 Deg Beam, Rev. A  
UT-W-0175, 22 Deg Beam, Rev. A  
UT-W-0176, 26 Deg Beam, Rev. A  
UT-W-0177, 35 Deg Beam, Rev. A  
UT-W-0178, 35 Deg Beam, Rev. A  
UT-W-0179, 40 Deg Beam, Rev. A  
UT-W-0180, 40 Deg Beam, Rev. A

Other Documents

BF-19, Calibration Block As-Built Verification, 4/16/97  
BFN-MNT-55A-15-008, Weld Program Self Assessment, 9/2/15  
Certificate of Qualification: S. Sawatzky  
CRP-ENG-FSA-17-004, Inservice Inspection Self Assessment, 9/14/17  
IR-2013-535, EPRI Browns Ferry Nozzle Inner Corner Radius and Nozzle to Shell Weld Examinations, February 2013  
NOI No. U1R11-010, 1-CHM-0992, N4A Nozzle to Shell Weld, 10/19/16  
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S/N 791719, Certificate of Compliance Reference Block, 7/15/83  
Transducer Certification: L97-160223-001, L97-160223-002, L97-160223-003, L97-160223-004, L97-160223-005, L97-160223-006  
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OPDP-1, Conduct of Operations, Revision 42  
1-TI-700, EPU Master Startup Test Instruction, Revision 0

1-TI-701, EPU Vibration Monitoring, Revision 2

Other Documents

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                                                 LOR-Exam-73, Revision 1

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NPG-SPP-03.4, Maintenance Rule Performance Indicator Monitoring, Trending and Reporting –  
10CFR50.65, Revision 3

0-TI-346, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting –  
10CFR50.65, Revision 51

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3-ARP-25-4094, Panel 25-4094 Alarm Response Procedure, Revision 26

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MSI-0-000-LFT002, Rigging Equipment and Portable Hoist Control, Inspection and Testing, Revision 23  
MSI-0-001-VSL001, Reactor Vessel Disassembly and Reassembly, Revision 124  
1-POI-200.5, Operations with Potential for Draining the Reactor Vessel/Cavity, Revision 10  
NPG-SPP-10.6, Infrequently Performed Test or Evolution, Revision 1

Other Documents:

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Operator Logs on November 7, 2018

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3-SR-3.3.1.1.8(5), MSIV Closure – RPS Trip Channel Functional Test, Revision 19  
3-SR-3.3.1.1.14(5 II), MSIV Closure – RPS Trip Logic System Functional Test (Channel B1/B2), Revision 2  
0-OI-82, Standby Diesel Generator System, Revision 167  
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3-730E915-1, Reactor Protection System, Revision 26  
3-730E915-10, Reactor Protection System, Revision 29  
3-47E801-1, Unit 3, Flow Diagram Main Steam, Revision 40  
0-47E861-8 Flow Diagram – Cooling System and Lubricating Oil System Standby Diesel Generator D, Revision 17  
1-47E610-71-1, Mechanical Control Diagram RCIC System, Revision 20  
1-45E626-2, Wiring Diagram Reactor Core Isolation Cooling System Schematic Diagram, Revision 14

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MDQ0073880139, High Pressure Coolant Injection (HPCI) System - Design Temperatures and  
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1-47E605-208, Mechanical Component Scales and Misc Details for Control Panel 1-9-4,  
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1-47E605-228, Mechanical Component Scales and Misc Details for Control Panel 1-9-8,  
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1-45E1718-21, Wiring Diagram Panel 1-PNLA-261-25 Connection Diagram, Revision 3

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1-TI-130, Main Steam Pressure Control, Revision 3  
1-TI-131, Feedwater Level Control System, Revision 2

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3-SR-3.4.9.1(1) Reactor Heatup and Cooldown Rate Monitoring, Revision 26

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1-SI-4.7.A.2.g-3/3a, Primary Containment Local Leak Rate Test Reactor Feedwater Line A: Penetration X-9A, Revision 8 and Revision 9

WO Instructions, Revision 0 for WO 118762701 (1-PDIS-001-0013A), WO 119057073 (1-PDIS-001-0013B), WO 119057078 (1-PDIS-001-0013C) and WO 119057082 (1-PDIS-001-0013D)  
0-TI-322 RHR Heat Exchanger Performance Testing, Revision 5

1-SR-3.3.6.1.5(1C/A1), Primary Containment Isolation System Main Steamline High Flow Instruments Channel A1 Calibration, Revisions 7 and 8

1-SR-3.3.6.1.5(1C/B1), Primary Containment Isolation System Main Steamline High Flow Instruments Channel B1 Calibration, Revisions 6 and 7

1-SR-3.3.6.1.5(1C/A2), Primary Containment Isolation System Main Steamline High Flow Instruments Channel A2 Calibration, Revisions 7 and 8

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1-SR-3.6.1.3.6 Main Steam Isolation Valve Fast Closure Test, Revision 10

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1-47E801-1, Mechanical Flow Diagram Main Steam, Revision 26

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Other Documents

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