



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
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ATLANTA, GEORGIA 30303-1257

May 10, 2017

Mr. J. W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3D-C
Chattanooga, TN 37402-2801

**SUBJECT: BROWNS FERRY NUCLEAR PLANT – NRC INTEGRATED INSPECTION
REPORT 05000259/2017001, 05000260/2017001, AND 05000296/2017001**

Dear Mr. Shea:

On March 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Browns Ferry Nuclear Plant. On April 14, 2017, the NRC inspectors discussed the results of this inspection with Mr. S. Bono and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented four findings which were determined to be of very low safety significance (Green) in this report. All of these findings involved violations of NRC requirements. Additionally, a violation identified by the licensee is documented in this report. Because of their very low safety significance, the NRC is treating these violations as noncited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest any of these violations or significance of these NCVs, 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, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Browns Ferry Nuclear Plant.

If you disagree with the 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 20555-001; with copies to the Regional Administrator, RII, and the NRC Senior Resident Inspector at Browns Ferry Nuclear Plant.

J. Shea

2

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, and Requests for Withholding."

Sincerely,

/RA/

Alan Blamey, Chief
Reactor Projects Branch 6
Division of Reactor Projects

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

Enclosure:
NRC IIR 05000259/2017001, 05000260/2017001
and 05000296/2017001 w/Attachment:
Supplemental Information

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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.: 05000259/2017001, 05000260/2017001, and 05000296/2017001

Licensee: Tennessee Valley Authority (TVA)

Facility: Browns Ferry Nuclear Plant

Location: Athens, AL 35611

Dates: January 1, 2017, through March 31, 2017

Inspectors: D. Dumbacher, Senior Resident Inspector
T. Stephen, Resident Inspector
A. Ruh, Resident Inspector
J. Seat, Reactor Inspector
A. Nielsen, Senior Health Physicist
W. Pursley, Health Physicist
R. Kellner, Senior Health Physicist
P. Cooper, Reactor Inspector

Approved by: Alan Blamey, Chief
Reactor Projects Branch 6
Division of Reactor Projects

Enclosure

SUMMARY

05000259/2017001, 05000260/2017001, 05000296/2017001; 01/01/2017- 03/31/2017; Browns Ferry Nuclear Plant, Units 1, 2, and 3; Operability Determinations and Functionality Assessment, Radiological Hazard Assessment and Exposure Controls, Follow-up of Events and Notices of Enforcement Discretion.

The report covered a three-month period of inspection by resident and regional inspectors. Four violations were identified. The significance of inspection findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Components 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 operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6. Documents reviewed not identified in the Report Details are listed in the Attachment.

Cornerstone: Barrier Integrity

- Green. An NRC identified non-cited violation (NCV) of 10 *Code of Federal Regulations* (CFR) 50, Appendix B, Criterion XVI, Corrective Action, was identified for the licensee's inadequate corrective actions to preclude repetition (CAPR) of a significant condition adverse to quality (SCAQ). The licensee's failure to take appropriate CAPRs for a SCAQ that resulted in an inoperable RCIC containment isolation check valve was a performance deficiency. The licensee entered the condition into their corrective action plan as condition report (CR) 1265552, performed repairs to the valve, and initiated a new root cause analysis. This performance deficiency was more than minor, because it was associated with the configuration control attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective because the misalignment of the stem to disc for 2-CKV-71-14 resulted in a loss of reliability. The finding screened as Green because the RCIC subsystem remained operable. The finding was not assigned a cross-cutting aspect because the cause was not related to current licensee performance. (Section 1R15)

Cornerstone: Mitigating Systems

- Green. An NRC identified NCV of 10 CFR Part 50, Appendix B, Criterion VI, Document Control, was identified after maintenance on safety-related 4kv to 480 volt transformers TS1A and TS1B (Unit 1) resulted in the windings tap setting being misconfigured. The licensee's failure to develop work instructions to change TS1A and TS1B transformer configuration was a performance deficiency. This performance deficiency was more than minor because it impacted the Mitigating Systems cornerstone attribute of configuration control in that the loads supplied by 480 volt shutdown boards 1A and 1B were challenged by this misconfiguration. The finding screened as Green because the electrical system remained operable. The licensee entered the condition into their corrective action plan as CR 1221265 and corrected the tap setting. The finding was not assigned a cross-cutting aspect because the cause was not related to current licensee performance. (Section 4OA3)

Cornerstone: Occupational Radiation Safety

- Green. A self-revealing NCV of Technical Specifications (TS) 5.7.1 was identified for a worker who entered a High Radiation Area (HRA) (Unit 1 reactor building steam tunnel) without proper authorization. This performance deficiency was determined to be greater than minor because it was associated with the Occupational Radiation Safety Cornerstone attribute of Human Performance and adversely affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. The inspectors determined the finding to be of very low safety significance (Green). The licensee entered the issue into their Corrective Action Program (CAP) as CR 1219539 and took immediate corrective actions including restricting Radiologically Controlled Area (RCA) access for the individuals involved and performing confirmatory surveys of the area. This finding involved the cross-cutting aspect of Human Performance, Teamwork, [H.4], because a significant contributor to this event was poor communication between different work groups (workers entering the reactor building steam tunnel and RP personnel at the control point). [Section 2RS1]
- Green. An inspector-identified NCV of TS 5.4.1 was identified for the licensee's failure to obtain an air sample while performing work in an area with smearable contamination levels greater than 50,000 disintegrations per minute (DPM) per 100cm². This performance deficiency was determined to be greater than minor because it was associated with the Occupational Radiation Safety Cornerstone attribute of Human Performance and adversely affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. The inspectors determined the finding to be of very low safety significance (Green). The licensee entered the issue into their CAP (CR 1219539) and, since the work created airborne radioactivity in the area, performed in-vivo monitoring on the affected workers to assess doses from the intake of radioactive material. This finding involved the cross-cutting aspect of Human Performance, Avoid Complacency, [H.12], because, considering the contamination levels present, RP staff underestimated the risk for potential airborne radioactive material in the area. [Section 2RS1]

A violation of very low safety significance that was identified by the licensee has been reviewed by the NRC. Corrective actions taken or planned by the licensee have been entered into the licensee's CAP. This violation and corrective action tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status:

Unit 1 operated at 100 percent rated thermal power (RTP) except for one planned power reduction for rod sequence exchange and turbine control valve testing.

Unit 2 operated in coast down for a planned refueling outage that began on February 25, 2017. Prior to the beginning of the outage, the unit experienced one unplanned power reduction to 85 percent RTP due to a 2C2 extraction steam isolation. The unit was restarted from the refueling outage on March 29, 2017. During the restart, two instrument malfunctions occurred which required the operators to insert a manual scram while the plant was in the intermediate range of power. The unit was restarted on March 30, 2017, and continued power ascension for the remainder of the inspection period.

Unit 3 operated at 100 percent RTP except for six planned power reductions for rod sequence exchanges, moisture separator normal level control valve repairs, and condenser circulating water (CCW) water box maintenance.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Summer Readiness of Offsite and Alternate AC Power Systems

a. Inspection Scope

The inspectors reviewed the licensee's procedures to monitor for degradations in offsite power to include conditions similar to those that occurred during the Byron nuclear station open phase condition (OPC). The inspectors reviewed the results of recent switchyard and transformer yard walkdowns conducted by the licensee. Additionally, the inspectors performed a switchyard and transformer yard walkdown with the licensee. The inspectors discussed the differences between the design of the Browns Ferry switchyard and the Byron switchyard with members of the TVA corporate staff. The inspectors discussed the design change strategy to mitigate any potential OPC such as the event that occurred at Byron nuclear station. This inspection was conducted in conjunction with Temporary Instruction (TI)-192 which is documented in Section 4OA5 of this report. This activity constitutes one Summer Readiness of Offsite and Alternate AC Power Systems sample as described in IP 71111.01.

b. Findings

No findings were identified.

.2 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors reviewed the licensee's preparations and actions to protect risk-significant systems during a tornado warning on March 1, 2017. The inspectors evaluated the licensee's implementation of adverse weather preparation procedures and compensatory measures, before the onset of and during the adverse weather conditions. The inspectors reviewed the licensee's plans to address the short and long term effects that may result from the tornado event. The inspectors verified that operator actions specified in the licensee's adverse weather procedure maintain readiness of essential systems. This activity constitutes one Readiness for Impending Adverse Weather Conditions sample as described in IP 71111.01.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

.1 Partial Walkdown

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems to verify the operability of redundant or diverse trains and components when safety equipment was inoperable. The inspectors focused on identification of discrepancies that could impact the function of the system and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, walked down control system components, and determined whether selected breakers, valves, and support equipment were in the correct position to support system operation. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the corrective action program (CAP). The inspectors completed three Equipment Alignment Partial Walkdown samples.

- Unit 1, 2, 3 Secondary Containment system barriers
- Unit 3 Control Rod Drive System
- Unit 2 Torus

b. Findings

No findings were identified.

.2 Complete Walkdown

a. Inspection Scope

The inspectors completed a system walkdown of the emergency equipment cooling water (EECW) system. The inspectors reviewed relevant portions of the Updated Final Safety Analysis Report (UFSAR) and technical specifications (TS). This detailed

walkdown verified valve and electrical power alignment, the condition of applicable system instrumentation and controls, component labeling, pipe hangers and support installation. The inspectors examined applicable System Health Reports, open work orders (WOs), and previous condition reports (CRs) that could affect system alignment and operability. This activity constituted one Equipment Alignment Complete Walkdown inspection sample, as defined in Inspection Procedure 71111.04.

- Emergency equipment cooling water system

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Fire Protection Tours

a. Inspection Scope

The inspectors reviewed licensee procedures for transient combustibles and fire protection impairments, and conducted a walkdown of the fire areas (FA) and fire zones (FZ) listed below. Selected FAs/FZs were examined in order to verify licensee control of transient combustibles and ignition sources; the material condition of fire protection equipment and fire barriers; and operational lineup and operational condition of fire protection features or measures. The inspectors verified that selected fire protection impairments were identified and controlled in accordance with procedures. The inspectors reviewed applicable portions of the Fire Protection Requirements Manual (FPRM) including the applicable Pre-Fire Plan drawings, to verify that the necessary firefighting equipment, such as fire extinguishers, hose stations, ladders, and communications equipment, was in place. This activity constituted three Fire Protection Walkdown inspection samples, as defined in inspection Procedure 71111.05.

- “SWITCH” (Switchyard) Fire Area
- “REFUEL” (Refueling floor) Fire Area
- Fire Area 24 – Bus Tie Board Room

b. Findings

No findings were identified.

.2 Annual Drill Observations

a. Inspection Scope

On February 28, 2017, the inspectors observed a fire brigade response to a smoke alarm in the Unit 2 portion of the control building, cable spreading rooms. The smoke alarm was due to dust generated by grinding activities. The inspectors assessed fire alarm effectiveness; response time for notifying and assembling the fire brigade; the selection and placement of firefighting equipment; condition and readiness of personnel fire protective clothing and equipment (e.g., turnout gear, self-contained breathing

apparatus); communications; incident command and control; and teamwork. The inspectors reviewed the licensee's documentation of the fire brigade response and compared their observations with the inspector's observations. This activity constituted one Annual Drill Observation inspection sample as defined in Inspection Procedure 71111.05.

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06)

.1 Annual Review of Cables Located in Underground Bunkers/Manholes

a. Inspection Scope

The inspectors conducted a review of licensee inspections of safety-related cables located in underground bunkers/manholes subject to flooding. The inspectors reviewed maintenance records and observed an inspection of hand hole 15 and hand hole 26 to determine if water was present and, if found, whether it would affect safety-related system operation. In addition, the inspectors reviewed the licensee's CAP to ensure that the licensee was identifying underground cabling issues and that they were properly addressed for resolution. This activity constituted one Underground Cable inspection sample, as defined in inspection Procedure 71111.06.

b. Findings

No findings were identified.

.2 Internal Flooding

a. Inspection Scope

The inspectors reviewed internal flood protection measures for the Unit 3 diesel generator building internal flood design to verify that flood mitigation plans were consistent with the design requirements and risk analysis assumptions and that equipment essential for reactor shutdown was properly protected from a flood caused by pipe breaks in the rooms/building. Specifically, the inspectors reviewed the licensee's moderate energy line break flooding study to fully understand the licensee's flood mitigation strategy, reviewed licensee drawings and then verified that the assumptions and results remained valid. The inspectors walked down the areas to verify the assumed flooding sources, adequacy of common area drainage, and flood detection instrumentation to ensure that a flooding event would not impact reactor shutdown capabilities. The inspectors completed one Internal Flooding sample as defined in Inspection Procedure 71111.06.

b. Findings

No findings were identified.

1R08 Inservice Inspection (71111.08)a. Inspection Scope

Non-Destructive Examination Activities and Welding Activities: The inspectors conducted an onsite review of the implementation of the licensee's inservice inspection (ISI) program for Unit 2. The ISI program is designed to monitor degradation of pressure retaining components in vital system boundaries. The scope of this program includes components within the reactor coolant system boundary, risk-significant piping boundaries, and containment system boundaries.

The inspectors directly observed the following non-destructive examination (NDE) activities. These activities were mandated by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code of Record: 2007 Edition with 2008 Addenda). The inspectors evaluated the NDE activities for compliance with the requirements in Section XI and Section V of the ASME Code. The inspectors also evaluated if any identified indications or defects were dispositioned in accordance with either the ASME Code or an NRC-approved alternative requirement. Additionally, the inspectors reviewed the qualifications of the NDE technicians performing the examinations to determine if they were in compliance with ASME Code requirements.

- Ultrasonic Examination (UT) GFW-2-32, Feedwater Elbow to Tee, ASME Class 1 (observed)
- UT, KFW-2-38, Feedwater Elbow to Pipe, ASME Class 1 (observed)
- Liquid Penetrant (PT), RHR-2-029-007-C0R2, 2" Pipe to Sockolet, ASME Class 1 (reviewed)

The inspectors reviewed the following welding activities, qualification records, and associated documents in order to evaluate compliance with procedures and the ASME Code, Section XI and Section IX requirements. Specifically, the inspectors reviewed the work order (WO), repair and replacement plan, weld data sheets, welding procedures, procedure qualification records, welder performance qualification records, and NDE reports.

- WO 116646165, BFN-2-CKV-068-00, Replace Pump A Seal Supply Check Valve, ASME Class 1
- WO 116022653, BFN-2-SHV-074-0850, Repair Unit 2 RHR system leak identified downstream of 2-FCV-074-0048, ASME Class 1
- WO# 116366514, Reactor Bldg RHR Pump C Room Cooler, BFN-2-CLR-064-0070, ASME Class 2

The inspectors reviewed the listing of non-destructive surface and volumetric examinations performed since the previous refueling outage. The inspectors verified that the licensee did not identify any relevant indications that were analytically evaluated and accepted for continued service.

Identification and Resolution of Problems: The inspectors reviewed a sample of ISI-related issues entered into the CAP. The inspectors determined if the licensee had appropriately described the scope of the problem and had initiated corrective actions. The review also included the licensee's consideration and assessment of operating

experience events applicable to the plant. The inspectors performed this review to ensure compliance with 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action, requirements.

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification and Performance (71111.11)

.1 Licensed Operator Regualification

a. Inspection Scope

On February 14, 2017, the inspectors observed a licensed operator training session for an operating crew on the Unit 2 Simulator Involving security event response, control room abandonment, and loss of offsite power. The inspectors evaluated the following attributes related to the operating crew's performance to assess the performance of their licensed operators:

- Clarity and formality of communication
- Ability to take timely action to safely control the unit
- Prioritization, interpretation, and verification of alarms
- Correct use and implementation of normal and emergency procedures
- Timely control board operation and high-risk operator actions
- Timely oversight and direction provided by the shift supervisor, including implementing appropriate technical specifications and emergency plan notifications
- Group dynamics involved in crew performance.

The inspectors reviewed the in-process critiques performed by the licensee evaluators and verified that licensee-identified issues were comparable to issues identified by the inspector. The inspectors reviewed the degree of similarity between the simulator and the reference plant control room. This activity constituted one Regualification Activity inspection sample.

b. Findings

No findings were identified.

.2 Control Room Observations

a. Inspection Scope

Inspectors observed and assessed licensed operator performance in the plant and main control room particularly during periods of heightened activity or risk and where the activities could affect plant safety. Inspectors reviewed various licensee policies and procedures covering Conduct of Operations, Plant Operations, and Power Maneuvering. Inspector's used activities such as post maintenance testing, surveillance testing, and other activities to focus on the following conduct of operations as appropriate. This activity constituted one Control Room Observation inspection sample.

- Operator compliance and use of procedures.
- Control board manipulations.
- Communication between crew members.
- Use and interpretation of plant instruments, indications and alarms.
- Use of human error prevention techniques.
- Documentation of activities, including initials and sign-offs in procedures.
- Supervision of activities, including risk and reactivity management.
- Pre-job briefs.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine

a. Inspection Scope

The inspectors reviewed the specific structures, systems and components (SSC) within the scope of the Maintenance Rule (MR - 10CFR50.65) with regard to some or all of the following attributes, as applicable:

- Appropriate work practices;
- Identifying and addressing common cause failures;
- Scoping;
- Characterizing reliability issues;
- Tracking unavailability;
- Balancing reliability and unavailability;
- Trending key parameters for condition monitoring;
- System classification and reclassification;
- Appropriateness of performance criteria;
- Appropriateness and adequacy of 50.65 (a) (1) goals, monitoring and corrective actions; and
- Quality control aspects.

The inspectors compared the licensee's performance against site procedures. The inspectors reviewed, as applicable, WOs, surveillance records, CRs, system health reports, engineering evaluations, and MR expert panel minutes, and attended MR expert panel meetings to verify that regulatory and procedural requirements were met. This activity constituted two Maintenance Effectiveness inspection samples.

- Dominator compensatory water pumps
- Emergency equipment cooling water system

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation (71111.13)

a. Inspection Scope

For planned on-line work and/or emergent work that affected the combinations of risk significant systems, listed below, the inspectors examined on-line maintenance risk assessments and actions taken to plan and/or control work activities to effectively manage and minimize risk. The inspectors verified that risk assessments and applicable risk management actions (RMA) were conducted as required by 10 CFR 50.65(a) (4) and applicable plant procedures. As applicable, the inspectors verified the actual in-plant configurations to ensure accuracy of the licensee's risk assessments and adequacy of RMA implementations. This activity constituted seven Maintenance Risk Assessment inspection samples.

- Unit 1 and 2, unplanned D EDG outage with a planned swing CRD pump (CRD pump 1B) outage in progress
- Unit 1 and 2, planned A EDG outage and Station Battery A out of service
- Unit 1 and 2 Common Accident Signal Logic test lineup
- Emergent work on A Shutdown Board Battery due to low battery cell voltage
- Unit 2 shutdown risk associated with high decay heat, emergent inoperability of C EDG, and removal of normal feeder to 4kv Shutdown Bus 2
- Unit 2 risk associated with reactor vessel head lift.
- Unit 2 in Yellow risk with one loop of shutdown cooling available with vessel level lowered for testing on the MSIVs.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessment (71111.15)

.1 Routine

a. Inspection Scope

The inspectors reviewed the operability/functional evaluations listed below to verify technical adequacy and ensure that the licensee had adequately assessed TS operability. The inspectors reviewed applicable sections of the UFSAR to verify that the system or component remained available to perform its intended function. In addition, where appropriate, the inspectors reviewed licensee procedures to ensure that the licensee's evaluation met procedure requirements. Where applicable, inspectors examined the implementation of compensatory measures to verify that they achieved the intended purpose and that the measures were adequately controlled. The inspectors reviewed CRs on a daily basis to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. This activity constituted seven Operability Evaluation inspection samples.

- EDG D inoperable due to a failure in the output breaker circuit (CR 1248939)
- Alarm light illuminated on Main Transformer 1A (CR 1258425)
- 2-Out-Of-4 Voter 1 power supply failure (CR 1245292)

- EECW system functionality during fire scenarios affecting EECW strainers (CRs 1260785 & 1263434)
- Gross impact review of incorrect 480 volt transformer tap setting during a complete loss of offsite power
- Unit 2 RCIC steam exhaust stop check valve 71-14 found stuck open.
- Unit 2 2C Core Spray pump failed to restart during B EDG LAT (CR 1267320)

b. Findings

The enforcement aspects of the review of the EDG D inoperability are discussed in Section 4OA7.

Introduction: A Green NRC identified NCV of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, was identified for the licensee's inadequate corrective actions to preclude repetition (CAPR) of a significant condition adverse to quality (SCAQ).

Description: On February 23, 2017, radiography discovered the RCIC exhaust line check valve, 2-CKV-71-14, was failed in the open position. Since 2002, this check valve was repeatedly discovered with its disc not in the closed position after RCIC operation. The licensee believed that corrosion was causing the check valve disc to bind and changed maintenance and testing procedures. The licensee also began using radiography to monitor the valve position after RCIC operation.

Radiography on March 2, 2013, revealed that the valve had been stuck open for most of the operating cycle. The licensee considered this a SCAQ with an 'A level' classification requiring a root cause analysis and a CAPR. The licensee determined that check valve misalignment due to tight tolerances was the most likely cause. However, the only CAPR was to reclassify the check valve from a Run-to-Failure hand valve to a Critical Check valve. There was also a corrective action to obtain critical internal dimensions from the valve vendor to prevent misalignment. However, no maintenance took place to include/establish the correct tolerances.

The licensee performed a full root cause evaluation following the 2017 failure. The licensee determined that reassembly procedural practices were critical to center the bonnet and stem such that the valve stop is correctly aligned with the disc.

The inspectors reviewed the 2013 and 2017 root causes and identified that the 2013 CAPR was ineffective as the reclassification alone would not have prevented recurrence. Further, the inspectors noted the licensee had sufficient information in 2013 that had it been used would have prevented the 2017 failure.

Analysis: The inspectors determined that the licensee's failure to take appropriate CAPRs for a SCAQ was a performance deficiency. This performance deficiency was more than minor because it was associated with the configuration control attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective in that the misalignment of the stem to disc for 2-CKV-71-14 resulted in a loss of reliability of the associated penetration isolation function. Using Manual Chapter 0609 Appendix A, Significance Determination Process for At-Power Findings, Exhibit 3, Barrier Integrity questions, this finding was determined to be of very low safety significance (Green) because it did not represent an actual open pathway in the physical integrity of reactor

containment (valves, airlocks, etc.) or involve an actual reduction in function of hydrogen igniters in the reactor containment. This performance deficiency occurred more than three years ago and is not indicative of current licensee performance.

Enforcement: 10 CFR 50 Appendix B, Criterion XVI, Corrective Action, required in part, that measures shall be established to assure that significant conditions adverse to quality are promptly identified, corrected, and measures taken shall determine the cause of the condition and preclude repetition. Contrary to the above, from March 2, 2013, until February 23, 2017, the licensee failed to take adequate corrective actions to preclude repeated failures of RCIC check valve 2-CKV-71-14 as required by procedure NPG-SPP-22.300, Corrective Action Program. The licensee's immediate corrective actions were to reduce the stem diameter, enlarged the dashpot inner diameter, and aligned the bonnet/stem to be centered on the disc. Because this finding was determined to be of very low safety significance and has been entered into the licensee's CAP as CR 1265552, this violation is being treated as an NCV consistent with Section 2.3.2 of the Enforcement Policy: NCV 05000260/2017001-01, Failure to Take Corrective Actions to Preclude a Repeat Failure of a Containment Isolation Valve.

1R18 Plant Modifications (71111.18)

Permanent Plant Modifications

a. Inspection Scope

The inspectors verified that the plant modification listed below did not affect the safety functions of important safety systems. The inspectors confirmed the modifications did not degrade the design bases, licensing bases, and performance capability of risk-significant structures, systems, and components (SSCs). The inspectors also verified modifications performed during plant configurations involving increased risk did not place the plant in an unsafe condition. Additionally, the inspectors evaluated whether system operability and availability, configuration control, post-installation test activities, and changes to documents, such as drawings, procedures, and operator training materials, complied with licensee standards and NRC requirements. The inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with modifications. This activity constituted one Plant Modification sample as defined in Inspection Procedure 71111.18.

- Unit 2 HPCI steam exhaust piping and vacuum breaker modification per Design Change Notice (DCN) 71988

b. Findings

No findings were identified.

1R19 Post Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors witnessed and reviewed the post-maintenance tests (PMT) listed in the Attachment to verify that procedures and test activities confirmed SSCs operability and

functional capability following the described maintenance. The inspectors reviewed the licensee's completed test procedures to ensure any of the SSC safety function(s) that may have been affected were adequately tested and that the acceptance criteria were consistent with information in the applicable licensing basis and/or design basis documents. The inspectors witnessed and/or reviewed the test data, to verify that test results adequately demonstrated restoration of the affected safety function(s). The inspectors verified that problems associated with PMTs were identified and entered into the CAP. This activity constituted 13 Post Maintenance Test inspection samples.

- WO 117452934, Unit 3 Core Spray Loop II scheduled outage
- WO 117445422, Unit 1 HPCI Cold Quick Start following refueling outage
- WO 117447377, A EDG post maintenance test following scheduled maintenance period
- CR 1265098C, EDG post maintenance test following repairs to the generator blower fan shaft
- WO 11769056 and WO 117675055, Unit 2 Core Spray Pump 2B and 2D Load Shed Logic Relay replacements
- WO 117994071, Unit 2 Residual Heat Removal (RHR) Loop II Suppression Chamber Isolation Valve (2-FCV-74-71) following valve control circuitry modification
- WO 118593254, Unit 2 LPCI injection valve 2-FCV-74-52 MOVATs test following motor gearing replacement
- WO 117535017 Unit 2, RCIC post maintenance test consisting of a 150 psig test to verify open and radiography to verify shut the 71-14 valve
- WO 117534980 Unit 2, Standby Liquid Control (SLC) functional test following installation of pump suction side accumulators
- WO 117534934, Unit 2 RCS hydrostatic leak test covering B inboard MSIV rebuild, SRV pilot valve replacements, HPCI 73-2 packing replacement and other maintenance activities
- WO 117197682, Unit 2 B Inboard MSIV LLRT following repairs
- WO 118619388, Unit 2 post maintenance test following Core Spray Pump 2C Load Shed Logic Relay replacement
- Unit 2 HPCI post maintenance test, 2-SR-3.5.1.8 HPCI Main and Booster Pump Set Developed Head and Flow Rate Test at 150 psig Reactor Pressure

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20)

.1 Unit 2 Refueling Outage

a. Inspection Scope

From February 25 through March 30, 2017, the inspectors examined the refueling outage activities to verify that they were conducted in accordance with TS, applicable plant procedures, and the licensee's outage risk assessment and management plans. The inspectors monitored critical plant parameters and observed operator control of plant conditions through Cold Shutdown (Mode 4), Refueling (Mode 5), Plant restart and

power ascension through Startup (Mode 2) and Run (Mode 1). Some of the significant outage activities specifically reviewed and/or witnessed by the inspectors were:

- Review of the licensee's outage plan prior to the outage;
- Review and verification of the licensee's fatigue management activities;
- Monitoring of shut-down and cool-down activities;
- Verification that the licensee maintained defense-in-depth including decay heat removal;
- Observation and review of reduced-inventory activities;
- Observation and review of fuel handling activities; and
- Monitoring of heat-up and startup activities.

The inspectors reviewed CRs generated during the refueling outage and attended management review committee meetings to verify that initiation thresholds, priorities, mode holds, operability concerns, and significance levels were adequately addressed. Resolution and implementation of corrective actions were also reviewed for completeness. This activity constituted one Refueling and Other Outage Activities sample, as defined in Inspection Procedure 71111.20.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors witnessed portions of and/or reviewed completed test data for the following surveillance tests of risk-significant and/or safety-related systems to verify that the tests met technical specification surveillance requirements, UFSAR commitments, and in-service testing and licensee procedure requirements. The inspectors' review confirmed whether the testing effectively demonstrated that the SSCs were operationally capable of performing their intended safety functions and fulfilled the intent of the associated surveillance requirement. This activity constituted nine Surveillance Testing inspection samples: Six routine test, one in-service test, and two containment isolation valve tests.

Routine Surveillance Tests:

- Common Accident Signal Logic, 0-SR-3.8.1.6
- HPCI Main and Booster Pump Set Developed Head and Flow Rate Test at Rated Reactor Pressure, 1-SR-3.5.1.7
- Diesel Generator A Monthly Operability Test, 0-SR-3.8.1.1(A)
- Diesel Generator B Emergency Unit Load Acceptance Test, 0-SR-3.8.1.9(B)
- HPCI discharge check valve 2-73-45 Local Leak Rate test
- ADS Simulated Auto Actuation Test, 2-SR-3.5.1.10

In-service Tests:

- Unit 3 SLC Pump Functional Test, 3-SI-4.4.A.1

Containment Isolation Valve Tests:

- Primary Containment Local Leak Rate test of Unit 2 HPCI turbine exhaust check valve, 2-SI-4.7.A.2.G-3/73B: Penetration X-214
- Primary Containment Local Leak Rate Test Main Steam Line A-D Outboard Penetration X-7A – X-7D

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06)a. Inspection Scope

The inspectors observed an Emergency Planning (EP) Radiological Emergency Plan (REP) training drill that contributed to the licensee's Drill/Exercise Performance (DEP) and ERO performance indicator (PI) measures on January 25, 2017. This drill was intended to identify any licensee weaknesses and deficiencies in classification, notification, dose assessment and protective action recommendation (PAR) development activities. The inspectors observed emergency response operations in the Simulated Control Room and the Technical Support Center, to verify event classification and notifications were done in accordance with the licensee's procedures. The inspectors attended the post-drill critiques to compare any inspector-observed weaknesses with those identified by the licensee in order to verify whether the licensee was properly identifying EP related issues and entering them into the CAP, as appropriate. This constituted one Simulator based sample as defined in Inspection Procedure 71114.06.

b. Findings

No findings were identified.

2. RADIATION SAFETY

2RS1 Radiological Hazard Assessment and Exposure Controlsa. Inspection Scope

Hazard Assessment and Instructions to Workers: During facility tours, the inspectors directly observed radiological postings and container labeling for areas established within the radiologically controlled area (RCA) of the Unit 1 (U1), Unit 2 (U2), and Unit 3 (U3) reactor buildings, U1, U2, and U3 turbine buildings, and radioactive waste (radwaste) processing and storage locations. The inspectors independently measured radiation dose rates or directly observed conduct of licensee radiation surveys for selected RCA areas. The inspectors reviewed survey records for several plant areas including surveys for airborne radioactivity, gamma surveys with a range of dose rate gradients, surveys for alpha-emitters and other hard-to-detect radionuclides, and pre-job surveys for upcoming tasks. The inspectors also discussed changes to plant operations that could contribute to changing radiological conditions since the last inspection. The

inspectors attended pre-job briefings and reviewed Radiation Work Permit (RWP) details to assess communication of radiological control requirements and current radiological conditions to workers.

Control of Radioactive Material: The inspectors observed surveys of material and personnel being released from the RCA using gamma and beta sensitive detection instruments. The inspectors discussed equipment sensitivity, alarm setpoints, and release program guidance with licensee staff. The inspectors also reviewed records of leak tests on selected sealed sources and discussed nationally tracked source transactions with licensee staff.

Hazard Control: The inspectors evaluated access controls and barrier effectiveness for selected High Radiation Area (HRA), Locked High Radiation Area (LHRA), and Very High Radiation Area (VHRA) locations and discussed changes to procedural guidance for LHRA and VHRA controls with Radiation Protection (RP) supervisors. The inspectors reviewed implementation of controls for the storage of irradiated material within the spent fuel pool. Established radiological controls, including airborne controls and electronic dosimeter (ED) alarm setpoints, were evaluated for selected U2 Refueling Outage 19 (U2R19) tasks. In addition, the inspectors reviewed licensee controls for areas where dose rates could change significantly as a result of plant shutdown and refueling operations. The inspectors also reviewed the use of personnel dosimetry including extremity dosimetry and multi-badging in high dose rate gradients.

Radiation Worker Performance and RP Technician Proficiency: Occupational workers' adherence to selected RWPs and RP technician proficiency in providing job coverage were evaluated through direct observations and interviews with licensee staff. Jobs observed included maintenance and refueling activities in the drywell, reactor building, and refueling floor in HRAs and contaminated areas. The inspectors also evaluated worker responses to dose and dose rate alarms during selected work activities.

Problem Identification and Resolution: The inspectors reviewed and assessed CRs associated with radiological hazard assessment and control. The inspectors evaluated the licensee's ability to identify and resolve the issues in accordance with licensee procedures. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection activities were evaluated against the requirements of TS Sections 5.4 and 5.7, 10 CFR Parts 19 and 20, and approved licensee procedures. Licensee programs for monitoring materials and personnel released from the RCA were evaluated against 10 CFR Part 20 and IE Circular 81-07, "Control of Radioactively Contaminated Material".

b. Findings

- .1 Introduction: A self-revealing, Green, NCV of TS 5.7.1 was identified for a worker who entered a HRA without proper authorization. Specifically, the worker entered a HRA using an incorrect RWP and without being briefed on the radiological conditions.

Description: On October 4, 2016, two workers who were to perform a task in the U1 reactor building steam tunnel went to an RP control point for an HRA brief. This particular control point provided briefings for the reactor building and the turbine building.

The workers approached the desk and requested a brief for the steam tunnel. The workers subsequently received a brief for the turbine building steam tunnel, which was not the correct work location and was not an HRA. The workers were informed of the radiological conditions in the turbine building steam tunnel and were directed to use RWP 1616061, which did not allow access into HRAs. Following the brief, the workers entered the U1 reactor building (the correct work location) and one of the workers entered the reactor building steam tunnel while the other remained outside as support. Upon entering the steam tunnel, the worker encountered a 239 mrem/hr dose rate field and exceeded his ED alarm setpoint of 50 mrem/hr. The worker exited the RCA and reported to RP that an alarm had been received. The licensee took immediate corrective action including restricting RCA access for the individuals involved and performing confirmatory surveys of the area.

Analysis: The inspectors determined that the entry into the U1 reactor building steam tunnel without being knowledgeable of the dose rates in the area and without using an appropriate RWP, as required by TS 5.7.1, was a performance deficiency. This finding was determined to be greater than minor because it was associated with the Occupational Radiation Safety Cornerstone attribute of Human Performance and adversely affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. Specifically, workers who enter HRAs without knowledge of the radiological conditions in the area could receive unintended occupational exposures. Inspection Manual Chapter 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process", was used to assess the significance of this finding. The finding was not related to As Low As Reasonably Achievable (ALARA) planning, nor did it involve an overexposure or substantial potential for overexposure, and the ability to assess dose was not compromised. Therefore, the inspectors determined the finding to be of very low safety significance (Green). This finding involved the cross-cutting aspect of Human Performance, Teamwork, because a significant contributor to this event was poor communication between workers entering the reactor building steam tunnel and RP personnel at the control point. [H.4]

Enforcement: Technical Specification 5.7.1 requires that access to HRAs be controlled by means of an RWP, and that entry into such areas shall be made only after dose rates in the area have been determined and entry personnel are knowledgeable of them. Contrary to this, on October 4, 2016, a worker entered a posted HRA without proper RWP authorization and without being knowledgeable of the dose rates in the area. Upon identification, the licensee immediately implemented RCA access restrictions for the individuals involved and performed follow up surveys of the areas entered (CR 1219539). This violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy: NCV 05000259/260/296/2017001-02, Unauthorized Entry into a High Radiation Area.

- .2 Introduction: An inspector-identified, Green, NCV of TS 5.4.1 was identified for the licensee's failure to follow a procedure during foreign material retrieval in the U2 Drywell. Specifically, the licensee failed to obtain an air sample while performing work in an area with smearable contamination levels greater than 50,000 disintegrations per minute (DPM) per 100cm².

Description: On March 29, 2017, two radwaste laborers and one RP technician (RPT) entered the U2 Drywell to remove Foreign Material Exclusion (FME) covers and trash

from the Vent Headers on the 550' elevation. Removable contamination levels in the work area were as high as 1,000,000 DPM per 100cm². During performance of the work some of the radioactive contamination became airborne, and all three individuals alarmed the portal monitors at the RCA exit. Follow up surveys determined that two of the workers had received intakes that exceeded the licensee's threshold for performing additional dose assessment (> 40 nano curies of Co-60). Although licensee procedure RCI-1.2, Airborne Radioactivity Surveys, Revision 32, required that air samples be taken during work in areas with removable contamination levels greater than 50,000 DPM per 100cm², the inspectors noted that no air samples were collected prior to or during this work activity. The licensee entered the issue into their CAP (CR 1219539) and performed in-vivo monitoring (using multiple whole body counts) on the affected workers to assess doses from the intake of radioactive material. The inspectors noted that the contamination smears taken during the work activity showed no alpha-emitting radionuclides present and that the internal dose assessment results were well below regulatory limits.

Analysis: The inspectors determined that the failure to obtain an air sample while performing work in an area with smearable contamination levels greater than 50,000 DPM per 100cm², as required by a licensee procedure, was a performance deficiency. This finding was determined to be greater than minor because it was associated with the Occupational Radiation Safety Cornerstone attribute of Human Performance and adversely affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. Specifically, failure to perform sampling for airborne radioactive material can potentially impact the licensee's ability to assess dose to workers exposed to airborne conditions. Inspection Manual Chapter 0609, Appendix C, Occupational Radiation Safety Significance Determination Process, was used to assess the significance of this finding. The finding was not related to ALARA planning, nor did it involve an overexposure or substantial potential for overexposure. Although no air sample was taken, the ability to assess dose was not compromised due to alternate means of assessment being available (via whole body counting). Therefore, the inspectors determined the finding to be of very low safety significance (Green). This finding involved the cross-cutting aspect of Human Performance, Avoid Complacency, [H.12], because, considering the contamination levels present, RP staff underestimated the risk for potential airborne radioactive material in the area.

Enforcement: Technical Specification 5.4.1 required that the procedures recommended in Regulatory Guide (RG) 1.33, Revision 2, be implemented, including procedures for airborne radioactivity monitoring. Licensee procedure, RCI-1.2, Airborne Radioactivity Surveys, Revision 32, required that air samples be taken during work in an area where loose contamination exists in amounts \geq 50,000 DPM per 100 cm². Contrary to this, on March 29, 2017, work was performed in an area where smearable contamination levels were \geq 50,000 DPM per 100 cm² and no air sample was taken. The licensee entered the issue into their CAP (CR 1278434) and performed in-vivo monitoring on the affected workers to assess doses from the intake of radioactive material. This violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy: NCV 05000259/260/296/2017001-03, Failure to Perform Airborne Radioactivity Surveys.

2RS2 Occupational As Low As Reasonably Achievable (ALARA) Planning and Controls

a. Inspection Scope

Work Planning and Exposure Tracking: The inspectors reviewed work activities and their collective exposure estimates for the U2R19 refueling outage. The inspectors reviewed ALARA planning packages for activities related to the following high collective exposure tasks:

- Under-vessel Maintenance
- Refuel Floor Activities
- High Pressure Coolant Injection System Modification
- Drywell Carpenter Activities
- Drywell Insulation and Shielding Support

For the selected tasks, the inspectors reviewed established dose goals and discussed assumptions regarding the bases for the current estimates with responsible ALARA planners. The inspectors evaluated the incorporation of exposure reduction initiatives and operating experience, including historical post-job reviews, into RWP requirements. Day-to-day collective dose data for the selected tasks were compared with established dose estimates and evaluated against procedural criteria (work-in-progress review limits) for additional ALARA review. Where applicable, the inspectors discussed changes to established estimates with ALARA planners and evaluated them against work scope changes or unanticipated elevated dose rates.

Source Term Reduction and Control: The inspectors reviewed the collective exposure three-year rolling average from (2013–2015). The inspectors also evaluated historical dose rate trends for reactor coolant system piping and compared them to current U2R19 results. Source term reduction initiatives, including cobalt reduction and the use of temporary shielding, were reviewed and discussed with RP staff.

Radiation Worker Performance: The inspectors observed pre-job ALARA briefings and radiation worker performance for various HRA jobs in the RCA. While observing job tasks, the inspectors evaluated the use of remote technologies to reduce dose including teledosimetry and remote visual monitoring. Additional observations of worker performance were made as part of Inspection Procedure 71124.01.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with ALARA program implementation. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: ALARA program activities were evaluated against the requirements of TS Section 5, 10 CFR Part 20, and approved licensee procedures.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation

a. Inspection Scope

Engineering Controls: The inspectors reviewed the use of temporary and permanent engineering controls to mitigate airborne radioactivity during U2R19 in the Drywell and the U2 reactor building. The inspectors observed the use of portable air filtration units for work in contaminated areas of the RCA and reviewed filtration unit testing certificates. The inspectors evaluated the effectiveness of continuous air monitors to provide indication of increasing airborne levels and the placement of air samplers in work area breathing zones, and the licensee's methods for accounting for alpha emitting nuclides in setpoint determinations.

Respiratory Protection Equipment: The inspectors reviewed the use of respiratory protection devices to limit the intake of radioactive material. This included review of devices used for routine tasks and devices stored for use in emergency situations. The inspectors reviewed ALARA evaluations for the use of respiratory protection for U2 reactor building FME cover removal and the U2 reactor water cleanup (RWCU) heat exchanger drain valve cutout and replacement. Selected self-contained breathing apparatus (SCBA) units and negative pressure respirators (NPRs) staged for routine and emergency use in the main control room and other locations were inspected for material condition, SCBA bottle air pressure, number of units, and number of spare masks and availability of air bottles. The inspectors reviewed maintenance records for selected SCBA units for the past two years and evaluated SCBA and NPR compliance with National Institute for Occupational Safety and Health certification requirements. The inspectors also reviewed records of air quality testing for supplied-air devices and SCBA bottles.

The inspectors observed the use of air-supplied suits during control rod drive removal and powered air-purifying respirators during U2 RWCU heat exchanger valve cutout and replacement. The inspectors discussed training for various types of respiratory protection devices with licensee staff and interviewed radworkers and control room operators on use of the devices including SCBA bottle change-out and use of corrective lens inserts. The inspectors reviewed respirator qualification records for several main control room operators and emergency responder personnel. In addition, inspectors evaluated qualifications for individuals responsible for testing and repairing SCBA vital components.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with airborne controls and respiratory protection activities. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection program activities associated with airborne radioactivity controls were evaluated against details and requirements documented 10 CFR Part 20; RG 8.15, "Acceptable Programs for Respiratory Protection" and approved licensee procedures.

b. Findings

No findings were identified

2RS4 Occupational Dose Assessment

a. Inspection Scope

Source Term Characterization: The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) and assessed the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

External Dosimetry: The inspectors reviewed National Voluntary Accreditation Program certification data for the licensee's optically stimulated luminescent dosimeter (OSLD) processor for the current year for ionizing radiation dosimetry. The inspectors observed and evaluated onsite storage of OSLDs. Comparisons between ED and OSLD results, including correction factors, were reviewed and discussed. The inspectors also evaluated licensee procedures for unusual dosimetry occurrences. ED alarm logs were also reviewed as part of Inspection Procedure 71151.

Internal Dosimetry: The inspectors reviewed and discussed the in vivo bioassay program with the licensee. Inspectors reviewed procedures that addressed methods for determining internal or external contamination, releasing contaminated individuals, and the assignment of dose. The inspectors evaluated the licensee's program for in vitro monitoring. In addition, the inspectors reviewed contamination logs and evaluated events with the potential for internal dose.

Special Dosimetric Situations: The inspectors reviewed records for declared pregnant workers (DPWs) from April 2015 to March 2017 and discussed guidance for monitoring and instructing DPWs. Inspectors reviewed the licensee's program for monitoring external dose in areas of expected dose rate gradients, including the use of multi-badging and extremity dosimetry. The inspectors evaluated the licensee's neutron dosimetry program including instrumentation used to perform neutron surveys. In addition, the inspectors reviewed the licensee's program for evaluation of shallow dose equivalent (SDE). During the review of contamination logs, the inspectors also evaluated events with the potential for SDE.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with occupational dose assessment. The inspectors evaluated the licensee's ability to identify and resolve issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: The licensee's occupational dose assessment activities were evaluated against the requirements of TS Section 5.4; 10 CFR Parts 19 and 20; and approved licensee procedures.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation

a. Inspection Scope

Walkdowns and Observations: During tours of the site areas, the inspectors observed installed radiation detection equipment including the following instrument types:

- Area radiation monitors
- Continuous air monitors
- Personnel contamination monitors
- Small article monitors
- Portal monitors

The inspectors observed the calibration status, physical location, and material condition of this equipment and evaluated the observations against TS and UFSAR requirements. In addition, the inspectors observed the calibration status and functional testing of selected in-service portable instruments and discussed the bases for established frequencies and source ranges with RP staff personnel. The inspectors reviewed periodic source check records for compliance with plant procedures and manufacturer's recommendation for selected instruments and observed the material condition of sources used.

Calibration and Testing Program: The inspectors reviewed calibration data for selected RCA exit point instruments, portable instruments, count room instruments, and the whole body counter located in the dosimetry area. The inspectors also reviewed calibration data, calibration methodology, and source certification records for the following radiation monitors:

- U2 Drywell Radiation Monitor 2-RE-90-272A
- U2 Drywell Radiation Monitor 2-RE-90-273A
- U2 Traversing Incore Probe Room Area Monitor (2-RE-90-22)
- U1 Main Control Room Area Monitor (1-RE-90-8)
- U2 Reactor Building Service Floor ARM (2-RE-90-2)

The current output values for the Cesium-137 source used to perform source checks on portable instruments were reviewed by the inspectors. The inspectors reviewed the licensee's process for investigating instruments that are removed from service for calibration or response check failures and discussed specific instrument failures with plant staff. In addition, the inspectors reviewed 10 CFR Part 61 data to determine if sources used in the maintenance of the licensee's radiation detection instrumentation were representative of radiation hazards in the plant and scaled appropriately for "hard to detect" nuclides.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with radiological instrumentation. The inspectors evaluated the licensee's ability to identify and resolve issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Operability and reliability of selected radiation detection instruments were reviewed against details documented in the following: 10 CFR Part 20; NUREG-

0737, "Clarification of TMI Action Plan Requirements"; UFSAR Chapter 7; TS Sections 3 and 5; and applicable licensee procedures.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

.1 Cornerstone: Initiating Events

a. Inspection Scope

The inspectors reviewed the licensee's procedures and methods for compiling and reporting the following PIs. The inspectors examined the licensee's PI data for the specific PIs listed below for the first quarter of 2016 through the fourth quarter of 2016. The inspectors reviewed the licensee's data and graphical representations as reported to the NRC to verify that the data was correctly reported. The inspectors validated this data against relevant licensee records (e.g., CRs, Daily Operator Logs, Plan of the Day, Licensee Event Reports, etc.), and assessed any reported problems regarding implementation of the PI program. The inspectors verified that the PI data was appropriately captured, calculated correctly, and discrepancies resolved. The inspectors used the Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline, to ensure that industry reporting guidelines were appropriately applied. This activity constituted six PI inspection samples, as defined in Inspection Procedure 71151.

- Units 1, 2, and 3 Reactor coolant system activity
- Units 1, 2, and 3 Reactor coolant system leakage

b. Findings

No findings were identified.

.2 Cornerstone: Public and Occupational Radiation Protection Cornerstones

Occupational Radiation Safety Cornerstone: The inspectors evaluated Occupational Exposure Control Effectiveness PI data from March 2016 through February 2017 and reviewed recent PI results. For the assessment period, the inspectors reviewed ED alarm logs and CRs related to controls for exposure significant areas.

Public Radiation Safety Cornerstone: The inspectors evaluated Radiological Control Effluent Release Occurrences PI data from June 2016 through February 2017 and reviewed recent PI results. For the assessment period, the inspectors reviewed cumulative and projected doses to the public contained in liquid and gaseous release permits and CRs related to effluent control issues. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data.

4OA2 Problem Identification and Resolution of Problems (71152)

.1 Review of items entered into the Corrective Action Program:

As required by Inspection Procedure 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished by reviewing daily CR reports, and periodically attending Management Review Committee (MRC) and Plant Screening Committee (PSC) meetings.

.2 Annual Follow-up of Selected Issues: Extent of Condition Review for CR 1228065 Missing Limitorque Actuator Worm Gear Spacer

a. Inspection Scope

Inspectors reviewed CR 1244964, which documented the results of an extent of condition review that was performed as part of the root cause analysis for a previous motor operated valve (MOV) failure. The root cause analysis for CR 1228065 described that a MOV in the high pressure coolant injection system failed to stroke when subjected to differential pressure because the actuator was reassembled without a required worm gear spacer. The extent of condition review identified seven other MOVs that had the potential to be similarly improperly reassembled and recommended that the MOVs be inspected at a future date. Operators determined all of the valves were operable based on satisfactory in-service test stroke times.

Inspectors identified that the list of valves included the MOVs that supported both trains of the Unit 2 residual heat removal (RHR) system for suppression pool cooling and spray. If both valves lacked worm gear spacers, there could be a significant impact on nuclear safety and risk since the suppression pool cooling and spray function could be lost. Additionally, inspectors identified that satisfactory stroke times, by themselves, were not a sufficient basis for operability since the original valve failure occurred despite satisfactory stroke times. The lack of a spacer would potentially only be revealed when the MOV was stroked against differential pressure, but in-service tests generally do not simulate differential pressure conditions. Inspectors reviewed operating procedures and emergency operating procedures, which revealed that the valves were not stroked against differential pressure during normal operations; however, the emergency procedures could subject the valves to full design basis differential pressure. The inspectors questioned the licensee about the potential safety significance of the extent of condition and how they planned to prioritize corrective actions. In response, the licensee performed additional engineering reviews and prepared a prompt determination of operability for each of the valves, which demonstrated a reasonable assurance of operability. The results from these reviews were factored into the final classification and prioritization of inspecting the MOVs. During the follow-up of this selected issue, the inspectors identified weaknesses with the licensee's performance regarding evaluation of the identified extent of condition and consideration of the safety significance of potential common cause failure when classifying and prioritizing problem resolution.

b. Findings

No findings were identified.

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153).1 (Closed) Licensee Event Report 05000259/2016-005-00, Main Steam Relief Valves Lift Settings Outside of Technical Specification Required Setpointsa. Inspection Scope

The inspectors reviewed LER 05000259/2016-005-00 for the Unit 1 Main Steam Relief Valves Lift Settings Outside of Technical Specifications Required Setpoints dated January 30, 2017. There were three main steam relief valves (MSRVs) that lifted outside of their TS-required band of +/- 3 percent of setpoint. There are 13 MSRVs in Unit 1 of which 12 are required to be operable. The cause of failure was attributed to a change in the process of application of the platinum coating to the pilot valves for the MSRVs. The organization that performs this platinum coating had coated pilot valves for all three units. The inspectors had inspected a previous similar technical specification violation coming out of the Unit 3 refueling outage which was documented as a Green NCV in Browns Ferry Integrated Inspection Report 05000259/260/296/2016003 Section 4OA3.3 (ML 16315A108). The causes and corrective actions for the Unit 3 Green NCV are the same as for the violation described in this LER. Based on the amount of time between the discovery of the Unit 3 violation and this violation, there was an inadequate amount of time for the licensee to implement corrective actions to prevent this additional example of the previously documented violation.

b. Findings

The violation described in this LER is another example of the violation documented in Browns Ferry Integrated Inspection Report 05000259/260/296/2016003 in accordance with the guidance contained in IMC 0612.

.2 (Closed) Licensee Event Report 05000259/2016-004-00, Incorrect Tap Settings for 480 Volt Shutdown Transformer Results in Inoperability of Associated 480V Shutdown Boardsa. Inspection Scope

The inspectors reviewed LER 05000259/2016-004-00, Incorrect Tap Settings for 480 Volt Shutdown Transformers Results in Inoperability of Associated 480V Shutdown Boards. An NRC recommended preventative maintenance change led to the discovery that safety related 480 volt transformers TS1A and TS1B were misconfigured. Specifically the load tap setting was too low. The licensee LER documented the discovery as a condition prohibited by TS and safety system functional failure. Inspectors identified an additional noncited green violation

b. Findings

Introduction. An NRC identified Green NCV of 10 CFR Part 50, Appendix B, Criterion VI, "Document Control," was identified after maintenance on safety related 4kv to 480 volt transformers TS1A and TS1B (Unit 1) resulted in the windings tap setting being misconfigured.

Description. On November 18, 2004, and December 15, 2004, Browns Ferry transformer replacement design documentation called for maintenance personnel to change the windings tap for transformers TS1A and TS1B (Unit 1) as part of design change (DCN) 51216. The work instructions did not contain actions to correct the tap settings as specified in the DCN. The work instructions also incorrectly listed the drawings as “documentation only” and thus the drawings were not used. The transformers were delivered by the vendor with the incorrect tap settings and stayed in this configuration until October 12, 2016. On February 15, 2013, TVA generated condition report 683071 in response to NRC Component Design Basis Inspection 2013-007 which identified that the licensee was not performing periodic maintenance (PM) testing as required by the TS1A and TS1B vendor. By August 1, 2013, Browns Ferry had added transformer resistance and voltage turns ratio tests to the existing preventative maintenance activities. Unit 1 performed the PM in refueling outage U1R11 on October 8, 2016. This first implementation of the revised PM guidance discovered the incorrect tap setting.

With voltage tap settings incorrectly configured transformers TS1A and TS1B would not, in the event of a complete loss of offsite power or a degraded grid condition, always be able to perform their Technical Specification 3.8.7 safety function of supplying a minimum of 440 volts to safety-related 480 volt shutdown boards 1A and 1B. The licensee engineering staff evaluation for these 480 volt boards determined that a voltage of 414 volts associated with the incorrect tap setting would preserve the safety function provided the upstream supplying 4kv boards remained at or above 3900 volts. The supplying 4kv shutdown boards will transfer to emergency diesels at 3900 volts based on degraded voltage relay logic and actuation. Although not credited for operability, the Unit boards that supply the 4kv shutdown boards also have non-safety automatic load tap changers that, if functional, would also alleviate degraded grid voltages. For the past operability aspect the licensee confirmed that the 4kv system had no instances where voltages had dropped below 4160 volts. As immediate corrective action the licensee moved the tap setting to the correct tap for each transformer and initiated LER 50-259/2016-004-00.

Analysis. The performance deficiency associated with this finding involved the licensee’s failure to develop work instructions to change TS1A and TS1B transformer configuration. Specifically, the PM work instructions and drawings were not appropriate to the circumstances for maintenance on safety related electrical equipment. The finding was determined to be greater than minor because it impacted the Mitigating Systems cornerstone attribute of configuration control and affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Using Manual Chapter 0609 Appendix A, Significance Determination Process for At-Power Findings, Exhibit 2, Mitigating Systems questions, this finding was determined to be of very low safety significance since the performance deficiency did not result in a high-safety significant loss of system function. The finding was not assigned a crosscutting aspect because the cause was not related to current licensee performance.

Enforcement: 10 CFR Part 50, Appendix B, Criterion VI, Document Control, required, in part, measures to be established to control the issuance of documents, such as instructions, procedures, and drawings, including changes thereto, which prescribe all activities affecting quality. These measures shall assure that documents, including changes, are reviewed for adequacy. Contrary to the above, from December 12, 2004,

to October 12, 2016, the installation work order associated with DCN 51216 engineering review note (PIC 61525) was not reviewed for adequacy. This resulted in missed specified transformer tap changes challenging LPCI, Core Spray and Drywell Spray valve functions. Because of the very low safety significance and TVA's action to place this issue in their corrective action program as CR 1221265, this violation is being treated as an NCV in accordance with Section 2.3.2 of the Enforcement Policy: NCV 05000259/2017001-04 Failure to Control the Issuance of Instructions and Drawings for Transformer Replacements.

.3 Unit 2 Manual Scram during Reactor Startup on March 29, 2017

a. Inspection Scope

Unit 2 was placed in Mode 2 on March 29, 2017, for a planned restart following the refueling outage. During the power ascension at approximately 6:44 p.m., the F Intermediate Range Meter (IRM) failed. During the operators' recovery, the A channel of the reactor protection system (RPS) received a scram signal. The operators then attempted to clear this scram signal. A second fault occurred which resulted in the G IRM generating a scram signal on the B channel of RPS. This second fault caused half of the control rods to scram. The operators then inserted a manual full scram of the plant. The scram was reported to the NRC as EN 52648. The inspectors responded to the plant following the scram to verify the plant was in a stable condition and that all safety systems operated as designed. The inspectors verified the licensee had identified and corrected the cause of the scram prior to the restart of the reactor on March 30, 2017. The cause of the IRM failures will be inspected during the closeout of the LER for this event.

b. Findings

No findings were identified.

4OA5 Other Activities

.1 Temporary Instruction (TI) 2515/192, "Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems."

a. Inspection Scope

The objective of this performance based TI is to verify implementation of interim compensatory measures associated with an open phase condition design vulnerability in electric power system for operating reactors. The inspectors conducted an inspection to determine if the licensee had implemented the following interim compensatory measures. These compensatory measures are to remain in place until permanent automatic detection and protection schemes are installed and declared operable for open phase condition design vulnerability. The inspectors verified the following:

- The licensee identified and discussed with plant staff the lessons-learned from the open phase condition events at US operating plants including the Byron Station open phase condition and its consequences. This included conducting operator training

for promptly diagnosing, recognizing consequences, and responding to an open phase condition.

- The licensee updated plant operating procedures to help operators promptly diagnose and respond to open phase conditions on off-site power sources credited for safe shutdown of the plant.
- The licensee established and implemented periodic walkdown activities to inspect switchyard equipment such as insulators, disconnect switches, and transmission line and transformer connections associated with the offsite power circuits to detect a visible open phase condition.
- The licensee ensured that routine maintenance and testing activities on switchyard components have been implemented and maintained. As part of the maintenance and testing activities, the licensee assessed and managed plant risk in accordance with 10 CFR 50.65(a) (4) requirements.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

.1 Exit Meeting Summary

On April 14, 2017, the resident inspectors presented the quarterly inspection results to Mr. Steve Bono, Site Vice President, and other members of the licensee's staff who acknowledged the finding. The inspectors verified that all proprietary information was returned to the licensee.

4OA7 Licensee Identified Violations

The following licensee-identified violations of NRC requirements were determined to be of very low safety significance or Severity Level IV and the NRC Enforcement Policy criteria for being dispositioned as a Non-Cited Violation.

- 10 CFR 50 Appendix B, Criterion III, "Design Control" required, in part, that measures be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, between July 17, 2014, and January 8, 2017, the licensee failed to correctly translate into applicable drawings as required by their NPG-SPP-9.3 Nuclear Plant Modifications and Engineering Change Control procedure the changes associated with DCN 70491 to the EDG D output breaker. This resulted in two separate modifications using the same terminal point that caused a short circuit when the breaker was manually closed. This violation is documented in the licensee's CAP as CR 1248939. This violation screened as Green because it was determined that the EDG D was operable during this entire period.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

J. Barker, Operations Superintendent
R. Beck, Engineering FIN team Manager
S. Bono, Site Vice President
B. Bruce, Work Management Director
B. Calkin, Licensing Engineer
D. Coffey, Reactor Engineering Manager
R. Coons, Licensing
P. Cooper, TVA Corporate Electrical Systems Analysis Program Manager
R. Cox, TVA Corporate Electrical Design Engineering Manager
J. D. Walcott, NFPA-805 Project Team member
A. Diaz-Lucier, System Engineer
D. Drummonds, Program Engineer
T. Fallesen, TVA Corporate Electrical Design Engineer
R. Guthrie, Emergency Diesel System Engineer
J. Hicks, Browns Ferry Transmission Services Manager
L. Hughes, General Manager, Site Operations
M. Kirschenheiter, Assistant Director for Site Engineering
M. Lawson, Radiation Protection Manager
M. McAndrew, Manager of Operations
F. Nilsen, ISI Program
M. Oliver, Acting Nuclear Site Licensing Manager
J. Paul, Acting Director of Safety and Licensing
J. R. Sampson, TVA Corporate Electrical Design Manager
L. Slizewski, Superintendent of Operations
H. Smith, Fire Marshal
J. Smith, System Engineer
T. Stafford, NFPA-805 Program Manager
J. Steele, Fire Operations Supervisor
J. Story, ISI Program
A. Taylor, TVA Corporate Design Engineering Senior Manager
G. Williams, TVA Corporate Senior Licensing Project Manager
T. Womack, TVA Corporate Electrical Design Program Manager

LIST OF REPORT ITEMS

Opened and Closed

NCV 05000260/2017001-01	Failure to Take Corrective Actions to Preclude a Repeat Failure of a Containment Isolation Valve (Section 1R15.2)
NCV 05000259/260/296/2017001-02	Unauthorized Entry into a High Radiation Area (Section 2RS1)
NCV 05000259/260/296/2017001-03	Failure to Perform Airborne Radioactivity Surveys (Section 2RS1)
NCV 05000259/2017001-04	Failure to Control the Issuance of Instructions and Drawings for Transformer Replacements (Section 4OA3.2)

Closed

LER 05000259/2016-005-00	Main Steam Relief Valves Lift Settings Outside of Technical Specification Required Setpoints (Section 4OA3.1)
LER 05000259/2016-004-00	Incorrect Tap Settings for 480 Volt Shutdown Transformer Results in Inoperability of Associated 480V Shutdown Boards (Section 4OA3.2)
TI 2515/192	Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems (Section 4OA5.1)

LIST OF DOCUMENTS REVIEWED

Section 1R01 Adverse Weather Protection

Procedures

0-AOI-100-7, Severe Weather, Rev. 39

Drawings

PIP-02-03, AC Electrical Distribution System for the Browns Ferry Nuclear Plant, Rev. March 15, 2010

Other Documents

Class 1E Protection (Unbalanced Voltage Relays) presentation at the NRC Public Meeting December 7-8, 2016 (ML 16327A369)
Browns Ferry, Units 1, 2, & 3, Sequoyah, Units 1 & 2, Watts Bar, Units 1 & 2, 90-Day Response to NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System."

Section 1R04 Equipment Alignment

Procedures

0-GOI-300-3/ATT 1, Locked Valve Audit, Rev. 173
0-OI-67/ATT-1, Valve Lineup Checklist Unit 0, Rev. 92
0-OI-67/ATT-1C, Valve Lineup Checklist Unit 3, Rev. 95
0-OI-67/ATT-2, Panel Lineup Checklist Unit 0, Rev. 88
0-OI-67/ATT-2C, Panel Lineup Checklist Unit 3, Rev. 84
0-OI-67/ATT-3, Electrical Lineup Checklist Unit 0, Rev. 88
OPDP-6, Locked Valve/Breaker Program, Rev. 3

Drawings

0-37W205-4, Mechanical Pumping Station & Water Treatment – Piping and Equipment, Rev. 11
0-37W205-10, Mechanical Pumping Station & Water Treatment – Piping and Equipment, Rev. 10
3-47E859-2, Flow Diagram Emergency Equipment Cooling Water, Rev. 28

Other Documents

CRs 1259277, 1262500

Section 1R05 Fire Protection

Drawings

3-47W3392-208, Fire Protection – 10CFR50 Appendix R Penetration Seal Tabular Drawings EL 565.50 Section A-A and Details, Rev. 2
3-47W3392-212, Fire Protection – 10CFR50 Appendix R Penetration Seal Tabular Drawings EL 565.50 Section B-B Details, Rev. 2
3-47W3392-233, Fire Protection – 10CFR50 Appendix R Penetration Seal Tabular Drawings EL 565.00, Rev. 5
3-47W588-1, Mechanical Exposed Oil, Air, Water & Misc. Piping, Rev. 6
3-47W588-2, Mechanical Exposed Oil, Air, Water & Misc. Piping, Rev. 6
0-47W451-6, Mechanical Emergency Equipment Cooling Water, Rev. 10

Other Documents

NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor
Electric Generating Plants, 2001 Edition
NFPA 805 Fire Protection Requirements Manual, Rev. 2
Browns Ferry Fire Protection Report, Volume 1, Rev. 0
Browns Ferry Fire Protection Report, Volume 2, Rev. 55
Fire Operations Critique of February 28, 2017 response to Unit 2 cable spreading rooms
CR 1267200, Fire Operations Response on February 28, 2017

Section 1R06 Flood Protection MeasuresProcedures

0-TI-412, Work Permits, Rev. 32
MAI-5.4, Concrete Removal, Repair, Core Boring, Grouting and Drypacking, Rev. 22
3-ARP-9-20A, Alarm Response Procedure Panel 9-20 3-XA-55-20A, Rev. 30
3-SIMI-67B, Emergency Equipment Cooling Water System Scaling and Setpoint
Documents, Rev. 16

Drawings

0-47E851-4-LR, License Renewal Flow Diagram, Drainage, Rev. 1
3-47E220-2, Equipment Plans & Sections, Rev. 1
1-47E859-1, Flow Diagram Emergency Equipment Cooling Water, Rev. 97
3-47E859-1, Flow Diagram Emergency Equipment Cooling Water, Rev. 41
3-47E859-2, Flow Diagram Emergency Equipment Cooling Water, Rev. 28
3-47W588-1, Mechanical Exposed Oil, Air, Water & Misc. Piping, Rev. 6
3-47W588-2, Mechanical Exposed Oil, Air, Water & Misc. Piping, Rev. 6
3-47W587-1, Mechanical Drains & Embedded Piping, Rev. 4
3-47E850-2, Flow Diagram Fire Protection & Raw Service Water, Rev. 17
3-47E850-4, Flow Diagram Fire Protection & Raw Service Water, Rev. 12

Other Documents

FSAR Section 10.16.4.6, Evaluation for Flooding due to Failure of Low Energy Piping
Systems Outside Primary Containment
BFN-50-C-7105, Pipe Rupture, Internal Missiles, Internal Flooding, and Vibration
Qualification of Piping, Rev. 12
BFN-50-720, Evaluating the Effects of a Pipe Failure Outside Containment, Rev. 1
MDQ00004020110008, Flow Capacity of the Diesel Generator Building Emergency
Drain Piping, Rev. 0
Moderate Energy Line Break (MELB) Flood Evaluation Report for Browns Ferry Unit 1,
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dated April 9, 1993
Design Basis Evaluation Report Moderate Energy Line Break (MELB) Flood Evaluation
Requirements for Browns Ferry Unit 2 Restart
DED-TM-PF1, Concluding Report on the Effects of Postulated Pipe Failure Outside of
Containment for Unit 1 of the Browns Ferry Nuclear Plant, dated October 15, 1973
DED-TM-PF2, Concluding Report on the Effects of Postulated Pipe Failure Outside of
Containment for the Browns Ferry Nuclear Plant Units 2 and 3, dated March 1, 1974
Supplement No. 3 to the Safety Evaluation by the Directorate of Licensing U.S. Atomic
Energy Commission in the Matter of Tennessee Valley Authority Browns Ferry Nuclear
Plant Units 1, 2, and 3, dated July 9, 1973

NDN00099920070031, IF – BFN Probabilistic Risk Assessment – Internal Flooding Analysis, Rev. 0
 ABS Consulting Report, Internal Flood PRA Peer Review for Browns Ferry Nuclear Plant, dated October 2009
 NDQ0999910033, Safe Shutdown Analysis, Rev. 27
 CRs 205156, 992185, 1080033, 1144474, 1170124, 1214115, 1260749, 1260752

Section 1R08 Inservice Inspection

Procedures:

N-PT-9, Liquid Penetrant Examination of ASME and ANSI Code Components and Welds, Rev. 39
 N-UT-76, Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds, Rev. 12
 PDI-UT-1, Generic Procedure for the Ultrasonic Examination of Ferritic Pipe Welds, Rev. F

Work Orders/Work Requests:

WO# 116022653, Repair Unit 2 RHR system leak identified downstream of 2-FCV-074-0048
 WO# 116366514, Reactor Bldg RHR Pump C Room Cooler
 WO# 116646165, Replace Pump A Seal Supply Check Valve

Miscellaneous Documents:

BFN-MNT-SSA-1-008, Maintenance Weld Program Self-Assessment, 8/23/15
 Certificate of Method Qualification: Hubert King, Larry Owens, Matthew Welch, Duncan Maclean,
 DWPS GT88-O-1-N, ASME/ANSI Detail Welding Procedure Specification, Rev. 5
 DWPS GT18-O-1-N, Detailed Welding Procedure Specifications ASME/ANSI-GWPS 1.M.1.2, Rev. 3
 EPRI Performance Demonstration: Duncan Maclean,
 Hands on Practice Demonstration: Matthew Welch, Duncan Maclean, Krautkramer
 Transducer Certification: SN SIO287
 Letter from Browns Ferry Nuclear Plant, Unit 2, to NRC, American Society of Mechanical Engineers Section XI, Inservice Inspection, System Pressure Test, Containment Inservice Inspection, and Repair and Replacement Programs – Owner's Activity Report for Browns Ferry Nuclear Plant, Unit 2, Cycle 18 Operation, Dated: 7/9/2015
 Report of Calibration for Digital Thermometer SN T-242562, 218407,
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 TVA Calibration Block As-Built Verification, Block No: WB-78 Thru 81
 UT Calibration/Examination Report No.: R-146, R-147
 Visual Examination Record: Hubert King, Larry Owens, Matthew Welch
 Welder/Welding Operator Performance Qualification Record: Troy Potts, Benny Lawrence,
 CRs 1007032, 1071734

Section 1R11 Licensed Operator Regualification and Performance

Other Documents

Simulator Exercise Guide (SEG) OPL173S060, Security Event Response & Control Room Abandonment, Rev. 16
 Simulator Exercise Guide (SEG) OPL173S348, DG 2B Lube Oil Leak, D3 EECW Pump Trip, RFPT 2C Trip, Station Blackout, Rev. 0

Section 1R12 Maintenance EffectivenessProcedures

BFN-ODM-4.23 Time Critical Operator Actions, Rev. 1

EDMG-23, Spent Fuel Pool Makeup, Rev. 10

TI-346, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting –
10 CFR 60.65, Rev. 49

Other Documents

Maintenance Rule Data for EECW System 067 from February 2014 through
January 2017

CRs 1253687, 1080033, 1020900, 1170124, 1191587, 1214115

Section 1R13 Maintenance Risk Assessments and Emergent Work EvaluationProcedures:

0-TI-403 Common Cause Failure Evaluation for Emergency Diesel Generators,
Rev. 1 (Completed on January 9, 2017)

NPG-SPP-09.11.1 Equipment Out of Service Management, Rev. 12

BFN-ODM-4.18 Protected Equipment, Rev. 17

Drawings:

0-45E709-1 Wiring Diagram Shutdown Bds 250V Btry & Chgr Single Line, Rev. 38

0-45E234 Electrical Equipment 250V Bat. & DC Equip Rms SB-A, B, C, D Plans,
Sections & Details, Rev. 0

0-45E708-10 Wiring Diagram Battery Board, Charger, & MG Set Connection Diagram,
Rev. 21

Other Documents:

CR 1243278 EDG D output breaker amber light is out

Operator logs from January 8, 2017 until January 10, 2017 and February 21, 2017

Equipment Out of Service list February 21, 2017

CR 1264244

WO 118544828

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Section 1R15 Operability Determinations and Functionality AssessmentProcedures:

NPG-SPP-09.3, Nuclear Plant Modifications and Engineering Change Control, Rev. 17

DCN 70491 NFPA-805 (Issue 8, 13, 18) Switchboard Bus Lockout Relays, Crosstie
relays; Fault Relays, Rev. A

DCN 71241 NFPA-805 Issues 47, 50a – Install Mode Switch to Prevent Parallel 4kV
Breaker Closure, Rev. A

0-TI-403 Common Cause Failure Evaluation for Emergency Diesel Generators, Rev. 1
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0-GOI-300-1/ATT-12, Outside Operator Round Log, Rev. 237

Drawings:

0-0223R0432-1B 4kV Shutdown Board D Spare Terminals, Rev. 2

0-0223R0432-6A 4kV Shutdown Board D Unit 20 Breaker 1816, Rev. 7

0-0223R0432-6A 4kV Shutdown Board D, Rev. 8

0-0223R0432-6A 4kV Shutdown Board D, Rev. 10

0-45E765-11 Wiring Diagram 4160V Shutdown Auxiliary Power Schematic Diagrams, Rev. 63
 2-107E5784-18 Power Range Neutron Monitoring System, Rev. 2

Other Documents:

CR 1243278, 1245078, 1245292, 1258425, 1260785, 1263434, 365232, 1267320
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 IEEE Standard C57.104 Guide for Interpretation of Gases Generated in Oil Immersed Transformers, 2008 Edition
 NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition
 BFN-VTD-K143-0020, Installation and Maintenance Instructions for Kinney Automatic Self-Cleaning Strainers Model AV Series, Rev. 7
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 TS Bases for RPS Instrumentation LCO 3.3.1.1
 Vendor literature for the Main Transformer 1A monitoring equipment
 WOs 118392420 and WO 118561123

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Drawings:

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 47W455-221, Revision 3

Other Documents:

Unit 2 HPCI Modification Radiographic Examination Report dated 3/21/2017
 2-SI-4.7.A.2.G-2/PBB, Primary Containment Local Leak Rate Test: HPCI Turbine Exhaust Vacuum Relief Isolation Valves
 WO 118491608

Section 1R19 Post Maintenance Testing

Procedures

3-SR-3.5.1.6(CS II) Core Spray Flow Rate Loop II, Rev. 46
 1-SR-3.5.1.7 HPCI Main and Booster Pump Set Developed Head and Flow Rate Test at Rated Reactor Pressure, Rev. 37
 0-SR-3.8.1.1(A) Diesel Generator 'A' Monthly Operability Test, Rev. 56
 0-OI-82, Standby Diesel Generator System, Rev. 0163
 Unit 2 Post Maintenance Testing of BFN-2-RLY-075-14AK127B and BFN-2-RLY-075-14AK128B, Rev. 1
 Unit 2 DCN 71214 Stage 3 Testing Steps, Rev. 0
 2-SR-3.5.3.4 – RCIC System Rated Flow at Low RPV Pressure, Rev. 24
 2-SR-3.6.1.3.10(B) – (As Left) Main Steam Line B: Penetration X-7B, Rev. 9
 Unit 2 Post Maintenance Testing of BFN-2-BKR-075-0014 Core Spray Pump 2C Auto Start Testing of Simulated DGVA, Rev. 2
 2-SR-3.1.7.7 Standby Liquid Control System FT – Pump, Rev. 30

Other Documents

WOs 117445422, 117447377, 117679056, 117679055, 117994071, 117535017,
118619388

DCN 71802 Addition of Suction Side Accumulator to the SLC system, Rev. A
G-94 Piping Installation Specifications, Rev. 4

Section 1R20 Refueling and Other Outage ActivitiesProcedures

2-SR-3.4.9.1 (1) [Shutdown] Reactor Heatup and Cooldown Rate Monitoring

Section 1R22 Surveillance TestingProcedures

0-SR-3.8.1.1(A) Diesel Generator 'A' Monthly Operability Test, Rev. 56

0-SR-3.8.1.6, Common Accident Signal Logic, Rev 26

0-SR-3.8.1.9(B) Diesel Generator B Emergency Unit Load Acceptance Test, Rev. 19

1-SR-3.5.1.7 HPCI Main and Booster Pump Set Developed Head and Flow Rate Test at
Rated Reactor Pressure, Rev. 37

2-SI-3.3.1.A, ASME Section XI System Leakage Test of the Reactor Pressure Vessel
and Associated Piping (ASME Section III, Class 1 and 2)

2-SI-4.7.A.2.G Turbine Exhaust Supply: Penetration X-214

2-SI-4.7.A.2.G-3/3A Reactor Feedwater Line A: Penetration X-9A

2-SR-3.6.1.3.10 (A-D) Outboard Main Steam Line Penetrations X-7A thru X-7D

3-SI-4.4.A.1 – SLC Pump Functional Test, Rev. 58

2-SR-3.5.1.10 ADS Simulated Auto Actuation Test, Rev. 13

Drawings

0-731E718, Elementary Diagram Diesel Generator PROT Relaying & Metering

0-731E761, Elementary Diagram Emergency Equipment, Sheets 1 – 25.

Other Documents

CRs 1253017, 1267106, 1267143

WOs 117197557, 117197690, 117197693, 117197700, 117197711, 117445422,
117447377, 117534934, 117535027

Section 1EP6 Drill EvaluationProcedures

EPIP-1, Emergency Classification Procedure, Rev. 54

REP-Appendix A, Radiological Emergency Plan Appendix A, Rev. 108

Other Documents

Drill Report for the Browns Ferry Training Drill conducted on January 25, 2017

EDMG-24, Reactor Pressure Vessel Makeup, Rev. 17

Section 2RS1 Radiological Hazard Assessment and Exposure ControlsProcedures, Guidance Documents, and Manuals

NPG-SPP-05.1, Radiological Controls, Rev. 0007

NPG-SPP-05.18, Radiation Work Permits, Rev. 0003

RCDP-10, Personnel Decontamination and Personnel Contamination Event Reporting,
Rev. 0007

RCDP-17, Radiological Postings, Rev. 0000

RCI-1.2, Radiation, Contamination, and Airborne Surveys, Rev. 0032

RCI-1.1, Radiation Operations Program Implementation, Rev. 0167
 RCI-17, Control of High Radiation Areas and Very High Radiation Areas, Rev. 0087
 RCI-40.2, RP Actions for Operation's Unit 2 Procedural Hold Points, Rev. 0048
 RCI-41, Radiation Protection Periodic Routines, Rev. 0033
 NPG-SPP-05.6, Controlling Byproduct and Source Material, Rev. 0005
 SII-2-XX-90-136
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 2-RM-90-136 (Channel A1), Revision 0019

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BFN Sealed Source Inventory List (Excel Worksheet), 2/25/2017
 Browns Ferry Unit 1, National Source Tracking System (NSTS) Confirmation of Annual Inventory Reconciliation for Gammatron, Inc AmBe Source, 1/24/2017
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 Control of SFSPs [Unit 1 Spent Fuel Pool Inventory], 0-TI-540 Attachment 1, 7/11/2016
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 RWP 17280402, U2R19 Drywell CRD Exchange Activities - HRA, Rev. 3
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 Survey Map M-20161001-25, U1 RXB Steam Tunnel Elev 555'
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 Survey Map M-20170314-12, U2 Drywell Elev 550' Vent Header
 Survey Map M-20170226-19, U2R19DW Undervessel Update Survey
 Survey Map M-20170226-26, DW elevations update survey
 Survey Map M-20170305-36, U2 RWCU HX 593' Elev.
 Survey Map M-20170314-20, U2 RWCU HX 593' Elev.
 Survey Map M-20170325-6, ISFSI Pad-Annual Routine
 Survey Map M-20160523-18, RCI-30 (HISTORM 0-CASK-00FW/13 Containing MPC#0027
 Survey Map M-20160710-4, ISFSI Pad, HISTORM Containing MPC # 0027
 BFN Airborne Radiation Survey 17-20151, RWCU HX Room, Samples 01-09, 03/14/2017

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Section 2RS2 ALARA

Procedures, Guidance Documents, and Manuals

NPG-SPP-05.2, ALARA Program, Rev. 9
 NPG-SPP-05.2.1, Operational ALARA Planning and Controls, Rev. 5
 RCI-15.2, Temporary Shielding, Rev. 29
 Dose Excellence Plan, 2016 – 2020
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 ALARA Plan 17-0005, U2R19 Drywell Insulation and Shielding Support
 ALARA Plan 17-0010, U2R19 Refuel Outage Under-Vessel Maintenance
 ALARA Plan 17-0022, U2R19 Refuel Floor Maintenance Activities
 ALARA Plan 17-0028, U2R19 High Pressure Cooling Injection (HPCI) System
 Modification
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 ALARA Work-in-Progress Review, U2R19 RXB RWCU Valve Maintenance Activities,
 3/13/17
 Station ALARA Committee minutes, 11/30/16, 12/15/16, 12/28/16, 1/18/17, 2/9/17,
 3/21/17
 U2R19 Temporary Shielding Log
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 Removal System Piping
 Unit 2 Recirculation Piping BRAC Point Dose Rates, 3/20/15 – 3/2/17
 BFN-RP-FSA-16-002, ALARA Program Self-Assessment
 CR 1092988

Section 2RS3 In-Plant Airborne Radioactivity Control and MitigationProcedures and Guidance Documents

RCI-35, DOP Testing of Vacuum Cleaners and Portable HEPA Filters, Rev. 0006
 FP-0-000-INS027, Self-Contained Breathing Apparatus (SCBA), Rev. 0018
 NPG-SPP-05.1.1, Alpha Radiation Monitoring Program, Rev. 5
 NPG-SPP-05.10, Radiological Respiratory Protection Program, Rev. 0004
 RCI-11.2, Radiation Protection Airborne Instrument Maintenance, Rev. 9
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Section 40A1 Performance Indicator Verification

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Section 40A2

Procedures

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Section 40A3 Follow-up of Events and Notices of Enforcement DiscretionProcedures

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Section 40A5 Other ActivitiesDrawings

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