



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

August 11, 2017

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

**SUBJECT: WATTS BAR NUCLEAR PLANT – NRC INTEGRATED INSPECTION REPORT
05000390/2017002, 05000391/2017002**

Dear Mr. Shea:

On June 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Bar Nuclear Plant, Unit 1 and Unit 2. On July 14, 2017, the NRC inspectors discussed the results of this inspection with Mr. Jesse James and other members of your staff. The results of this inspection are documented in the enclosed inspection report.

NRC inspectors documented four findings of very low safety significance (Green) in this report. Three of these findings involved violations of NRC requirements; two of these violations were determined to be Severity Level IV under the traditional enforcement process. Further, inspectors documented two licensee-identified violations which were determined to be of very low safety significance in this report. The NRC is treating these violations as noncited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest the 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 U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Watts Bar Nuclear Plant.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at the Watts Bar Nuclear Plant.

J. Shea

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

Sincerely,

/RA/

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

Docket Nos.:50-390, 50-391
License No.: NPF-90, 96

Enclosure:
NRC IR 05000390/2017002, 05000391/2017002
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-390, 50-391

License No.: NPF-90, NPF-96

Report No.: 05000390/2017002, 05000391/2017002

Licensee: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Units 1 and 2

Location: Spring City, TN 37381

Dates: April 1 through June 30, 2017

Inspectors: J. Nadel, Senior Resident Inspector
J. Hamman, Resident Inspector
J. Jandovitz, Senior Resident Inspector
G. Crespo, Senior Construction Inspector
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Approved by: Alan Blamey, Chief
Reactor Projects Branch 6
Division of Reactor Projects

Enclosure

SUMMARY

IR 05000390/2017-002; 05000391/2017-002; April 1, 2017 – June 30, 2017; Watts Bar Nuclear Plant Units 1 and 2; Event Follow-up, Other Activities.

The report covered a three-month period of inspection by the resident inspectors. Four Green non-cited violations were identified. The significance of most findings is indicated by their color (i.e., greater than Green, or 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, "Aspects Within 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-149, "Reactor Oversight Process," Revision 6. Documents reviewed by the inspectors not identified in the Report Details are listed in the Attachment.

- Severity Level IV. The inspectors identified a Severity Level IV non-cited violation of 10 *Code of Federal Regulations* (CFR) 50.72 and 50.73, with multiple examples due to the licensee's failure to make the required eight-hour non-emergency notification and submit a Licensee Event Report (LER) to the NRC within 60 days for conditions that, at the time of discovery, could have prevented fulfillment of a safety function. These issues have been entered into the licensee's corrective action program as condition report (CR) 1310096.

The inspectors determined that the licensee's failure to comply with 10 CFR 50.72(b)(3)(v) and 50.72(a)(2)(v) was a performance deficiency. This performance deficiency was dispositioned under traditional enforcement because the failure to make a non-emergency notification and submit an LER within the time requirements may impact the ability of the NRC to perform its regulatory oversight function. The violation was assessed using Sections 2.2.4 and 6.9.d.9 of the NRC's Enforcement Policy and determined to be a SL IV violation. Traditional enforcement violations are not assessed for cross-cutting aspects. (4OA5.2)

Cornerstone: Barrier Integrity

- Green. A self-revealed non-cited violation of Technical Specification (TS) 3.6.3, "Containment isolation Valves," was identified for a failure to properly implement a clearance for containment isolation valve surveillance testing. Clearance 1-30-1011-WW removed fuses from a different valve than the one specified in the clearance. The licensee entered this issue into their corrective action program as CR 1245529.

The failure to comply with NPG-SPP-10.2, Steps 3.1.2.B.5 and 6, was a performance deficiency. The performance deficiency was more than minor because it adversely affected the configuration control attribute of the Barrier Integrity Cornerstone because the incorrectly placed clearance resulted in the inoperability of the containment isolation valve for longer than its TS allowed outage time, reducing assurance that the containment function assumed in the safety analyses would be maintained. The inspectors determined that this violation was of very low safety significance (Green) because the finding did not represent an actual open pathway in the physical integrity of reactor containment and did not involve an actual reduction in function of hydrogen igniters. The finding has a cross-cutting aspect in the Avoid Complacency component of the Human Performance area as defined in NRC IMC 0310, because multiple personnel failed to recognize and plan for the possibility of

mistakes and error reduction tools, such as concurrent verification, were not appropriately implemented [H.12]. (Section 4OA3.5)

- SL IV. A self-revealed severity level (SL) IV non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified when implementing an inadequate procedure resulted in rendering the steam generator chemistry sample containment isolation valves inoperable. The licensee entered this issue into their corrective action program as CR 1160910.

The inspectors determined that the use of an inadequate procedure that rendered the containment isolation valves inoperable was a performance deficiency. The performance deficiency was determined to be more than minor in accordance with IMC-2517, Appendix C, because the use of an inadequate procedure rendered the containment isolation valves inoperable. The inspectors determined this finding to be of very low safety significance because it did not represent a breakdown of the licensee's quality assurance program. This finding had a cross-cutting aspect in the work management component of the Human Performance cross-cutting area because the work process did not include the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities [H.5]. (Section 4OA3.1)

Cornerstone: Initiating Events

- Green. A self-revealed Green finding was identified for the failure to follow procedure NPG-SPP-22.207, "Procedure Use and Adherence" Revision 4, which requires that applicable procedures are used for all activities controlled by a written procedure. The licensee entered this into their corrective action program as CR 1291140

The failure to follow procedure NPG-SPP-22.207, "Procedure Use and Adherence," Revision 4, was a performance deficiency. The performance deficiency was more than minor because it affected the Initiating Events Cornerstone attribute of Human Performance and adversely affected the cornerstone objective in that it resulted in two reactor trips. The inspectors determined that the finding was of very low safety significance (Green) because it did not cause a reactor trip and the loss of mitigation equipment. The finding was not assigned a cross-cutting aspect since none of the CCAs described in IMC 0310 corresponded to an apparent cause or most significant causal factor of the performance deficiency. (Section 4OA3.6)

Two violations of very low safety or security significance that were identified by the licensee have been reviewed by the NRC. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. These violations and their corrective action tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 started the reporting period shutdown in a refueling outage. The unit was restarted on April 30, 2017. On May 2, 2017, the unit was manually tripped from 26 percent rated thermal power (RTP) when RCP #3 failed to transfer to its normal power supply. The unit was restarted on May 4, 2017 and again tripped from 26 percent RTP when RCP #3 again failed to transfer to its normal power supply. The unit was restarted on May 8, 2017, and reached 100 percent RTP on May 13, 2017. The unit remained at 100 percent RTP until June 4, 2017, when power was reduced to approximately 72 percent RTP due to operators manually tripping the 1B main feedwater pump. The unit returned to 100 percent RTP on June 11, 2017, and remained there through the end of the reporting period.

Unit 2 started the reporting period shutdown in a maintenance outage and remained there through the end of the reporting period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

Review of Offsite Power and Alternate AC Power Readiness

a. Inspection Scope

The inspectors verified that plant features and procedures for operation and continued availability of offsite and alternate alternating current (AC) power systems were appropriate. The inspectors reviewed the licensee's procedures affecting those areas and the communications protocols between the transmission system operator and the nuclear power plant to verify that the appropriate information was exchanged when issues arose that could impact the offsite power system. The inspectors evaluated the readiness of the offsite and alternate AC power systems by reviewing the licensee's procedures that address measures to monitor and maintain the availability and reliability of the offsite and alternative AC power systems. The inspectors reviewed licensee and TVA transmission organization's response to a partial loss of offsite power due to the collapse of power poles outside of the Watts Bar nuclear plant protected area. The inspectors inspected a sample of the power poles in the protected area and in the 500 kV switchyard for corrosion effects. The inspectors reviewed condition reports generated by TVA power systems operations as well as WBN condition reports for the pole failure. This activity constituted one summer readiness sample, as defined in Inspection Procedure (IP) 71111.01.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)Partial System Walkdownsa. Inspection Scope

The inspectors conducted the equipment alignment partial walkdowns, listed below, to evaluate the operability of selected redundant trains or backup systems with the other train or system inoperable or out of service. This also included that redundant trains were returned to service properly. The inspectors reviewed the functional system descriptions, the Updated Final Safety Analysis Report (UFSAR), system operating procedures, and Technical Specifications (TS) to determine correct system lineups for the current plant conditions. The inspectors performed walkdowns of the systems to verify that critical components were properly aligned and to identify any discrepancies which could affect operability of the redundant train or backup system. This activity constituted five inspection samples, as defined in IP 71111.04.

- B main control room chiller with A main control room chiller out of service (OOS)
- 1A residual heat removal (RHR) system train
- 1B RHR system train
- 2B RHR system train while the 2A was in service for shutdown cooling
- A train auxiliary feedwater (AFW) with B motor driven auxiliary feedwater (MDAFW) pump out of service OOS for maintenance

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05AQ).1 Fire Protection Toursa. Inspection Scope

The inspectors conducted tours of the areas important to reactor safety, listed below, to verify the licensee's implementation of fire protection requirements as described in: the Fire Protection Program, Nuclear Power Group Standard Programs and Processes (NPG-SPP)-18.4.6, Control of Fire Protection Impairments; NPG-SPP-18.4.7, Control of Transient Combustibles; and NPG-SPP-18.4.8, Control of Ignition Sources (Hot Work). The inspectors evaluated, as appropriate, conditions related to: 1) licensee control of transient combustibles and ignition sources; 2) the material condition, operational status, and operational lineup of fire protection systems, equipment, and features; and 3) the fire barriers used to prevent fire damage or fire propagation. This activity constituted five inspection samples, as defined in IP 71111.05AQ.

- Auxiliary building elevation 737 rooms 737.0-AI, A4, A11, Unit 1 and Unit 2 heating and ventilation rooms
- Auxiliary building elevation 692 room 692.0-A19, safety injection pump 2A-A
- Unit 1 lower containment
- Unit 1 upper containment
- High pressure fire pump room - train B

b. Findings

No findings were identified.

.2 Annual Drill Observations

a. Inspection Scope

On June 20, 2017, the inspectors observed a fire drill for a fire in the 250 volt battery board room II on the 692 foot level of the control building. The drill was observed to evaluate the readiness of the site fire brigade to fight fires. The inspectors verified that the licensee staff identified deficiencies, openly discussed them in a self-critical manner at the drill debrief, and took appropriate corrective actions. Specific attributes evaluated were: 1) specified number of individuals responding; 2) proper wearing of turnout gear; 3) self-contained breathing apparatus available and properly worn and used; 4) control room personnel followed procedures for initiation and verification of response; 5) fire brigade leader exhibited command and had a copy of the pre-fire plan; 6) fire brigade leader maintained control starting at the dress-out area; 7) fire brigade response was timely and followed the appropriate access route; 8) command/control set up near the location and communications were established; 9) proper use and layout of fire hoses; 10) fire area entered in a controlled manner; 11) sufficient firefighting equipment brought to the scene; 12) search for victims and propagation of the fire into other plant areas; 13) utilization of pre-planned strategies; 14) adherence to the pre-planned drill scenario and drill objectives acceptance criteria were met; and 15) firefighting equipment returned to a condition of readiness to respond to an actual fire. This activity constituted one fire protection annual drill inspection sample as defined in IP 71111.05AQ.

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06)

Cables in Underground Manholes

a. Inspection Scope

Inspectors directly observed, as listed below, the underground bunkers/manholes subject to flooding that contained cables whose failure could disable risk-significant equipment. Specific attributes evaluated were: the cables were not submerged in water; the cables and/or splices appeared intact and the material condition of cable support structures was acceptable; and dewatering devices (sump pump) operation and level alarm circuits were set appropriately to ensure that the cables would not be submerged or were in an environment for which they were qualified. Where dewatering devices were not installed, the inspectors ensured that drainage was provided and was functioning properly. This inspection constituted two Underground Manhole Internal Flooding inspection samples, as defined in IP 71111.06.

- Manhole 9B, under work order (WO) 117979467
- Manhole 5A, under WO 117979467

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors reviewed performance of the C component cooling heat exchanger to verify proper test controls and method, as applicable. The inspectors reviewed design basis documents, calculations, test procedures, and results to evaluate the licensee's program for maintaining heat sinks in accordance with the licensing basis, as applicable.

The inspectors performed walkdowns of the heat exchanger to verify material conditions were acceptable and physical arrangement matched procedures and drawings. The inspectors observed portions of the disassembly, cleaning, and eddy current inspections performed during unit 1 refueling outage (U1R14) in accordance with WO 117725774. Inspectors reviewed licensee compliance to commitments made based on their response to the NRC Generic Letter 89-13 for service water system problems that could affect heat exchanger performance. This activity constituted one Heat Sink Performance inspection sample.

b. Findings

No findings of significance were identified.

1R08 Inservice Inspection Activities (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 1. The ISI program is designed to monitor degradation of pressure retaining components in vital system boundaries. The scope of this program included components within the reactor coolant system boundary, risk-significant piping boundaries, and containment system boundaries.

The inspectors either directly observed or reviewed 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: 2006 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 whether 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), Weld SIF-D076-04 Pipe-to-Elbow, ASME Class 1 (observed)

- UT, Weld SIF-D076-04 Pipe-to-Elbow (follow-up), Class 1 (observed)
- UT, Weld CVCF-D036-10H Pipe-to-Elbow, Class 1 (reviewed)
- Visual Examination VT-2, Reactor Vessel Head, Class 1 (reviewed)

The inspectors either directly observed or reviewed the following welding activities. The inspectors evaluated these activities for compliance with site procedures and the requirements in Section IX and Section XI of the ASME Code. Specifically, the inspectors reviewed the work orders, repair or replacement plans, weld data sheets, welding procedures, procedure qualification records, welder performance qualification records, and NDE reports.

- WBN-1-ROD-085-E3, Replace Eye Bolt with Plug, Class 1 (reviewed)
- WBN-1-PIPE-067-C, Replace Containment Upper Compartment Cooler 1A Coils, Class 3 (reviewed)

The inspectors reviewed the listing of non-destructive surface and volumetric examinations performed during 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.

PWR Vessel Upper Head Penetration Inspection Activities

The inspectors verified that for the Unit 1 reactor vessel closure head, a bare metal visual examination based on ASME Code Case N-729-1, was not required during this outage. The inspectors also concluded that based a volumetric examination of the reactor closure head penetrations was not required during this outage, in accordance with the requirements of ASME Code Case N-729-1 and 10 CFR 50.55a(g)(6)(ii)(D).

The inspectors verified that the licensee did not identify any indications that were accepted for continued service. Additionally, the inspectors verified that the licensee did not perform any welding repairs to the upper head penetrations since the last Unit 1 refueling outage.

Boric Acid Corrosion Control Inspection Activities

The inspectors reviewed the licensee's boric acid corrosion control program (BACCP) activities to determine if they were implemented in accordance with program requirements, applicable regulatory requirements, and industry guidance. Specifically, the inspectors performed the following activities:

- Reviewed applicable procedures and the results of the licensee's most recent containment walkdown inspection
- Interviewed the BACCP owner
- Conducted an independent walkdown of accessible areas of the Unit 1 reactor building containment pipe chase
- Verified that degraded or non-conforming conditions, such as boric acid leaks, were properly identified and corrected in accordance with the licensee's BACCP and the corrective action program
- Reviewed engineering evaluations of components with boric acid leakage which verified that minimum wall thickness of those components was maintained

Steam Generator Tube Inspection Activities

The inspectors reviewed the Unit 1 steam generator maintenance program. This inspection schedule was verified with the requirements of the ASME Code, the licensee's TS, and applicable industry guidance. For steam generators 1, 2, 3, and 4, the inspectors performed the following activities to verify compliance with program requirements, regulatory requirements, and industry guidance:

- Reviewed the scope of the eddy current (ET) examinations, and the implementation of scope expansion criteria
- Reviewed documentation for a sample of ET data analysts, probes, and testers to verify that personnel and equipment were qualified to detect the applicable degradation mechanisms
- Reviewed a sample of site-specific examination technique specification sheets (ETSSs)
- Reviewed the in-situ steam generator tube pressure testing screening criteria. The inspectors verified that the assumed NDE flaw sizing accuracy was consistent with data from the examination technique specification sheets or other applicable performance demonstrations.
- Reviewed a sample of ET data for four steam generator tubes with a qualified data analyst
- Verified that recordable indications were detected and sized in accordance with vendor procedures
- Reviewed ET indication reports to determine if steam generator tubes with relevant indications were appropriately screened for in-situ pressure testing
- Compared the latest ET examination results with the last Condition Monitoring and Operational Assessment report to assess the licensee's prediction capability for maximum tube degradation
- Verified that current examination results were bound by the operational assessment projections
- Assessed the latest ET examination results to verify that new degradation mechanisms, if any, were identified and evaluated before plant startup
- Observed the licensee's secondary side steam generator Foreign Object Search and Retrieval activities
- Reviewed the steam generator tube plugging procedure and verified that no tubes were selected for plugging based on the required plugging criteria
- Reviewed a sample of primary-to-secondary leakage data for Unit 1 to confirm that operational leakage in each steam generator remained below the detection or action level threshold during the previous operating cycle

Identification and Resolution of Problems

The inspectors reviewed a sample of ISI-related issues entered into the corrective action program. The inspectors evaluated 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.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification and Performance (71111.11)

.1 Licensed Operator Requalification Review

a. Inspection Scope

On May 23, 2017, the inspectors observed the simulator evaluation for Operations Crew 4 per 3-OT-SRT-S1-1, Loss of CCS Induced ATWS, Revision 5. The inspectors specifically evaluated the following attributes related to the operating crews' performance:

- 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 abnormal operating instructions and emergency operating instructions
- Timely and appropriate Emergency Action Level declarations per emergency plan implementing procedures
- Control board operation and manipulation, including high-risk operator actions
- Command and Control provided by the unit supervisor and shift manager

The inspectors also attended the critique to assess the effectiveness of the licensee evaluators and to verify that licensee-identified issues were comparable to issues identified by the inspector. This activity constituted one Observation of Requalification Activity inspection sample, as defined in IP 71111.11.

b. Findings

No findings were identified.

.2 Observation of Operator Performance

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 such as procedures OPDP-1, Conduct of Operations; NPG-SPP-10.0, Plant Operations; and GO-4, Normal Power Operation.

Inspectors used activities such as post maintenance testing, surveillance testing and refueling, and other outage activities to focus on the following conduct of operations as appropriate. This activity constituted one Observation of Operator Performance inspection sample, as defined in IP 71111.11.

- 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)

a. Inspection Scope

The inspectors reviewed the performance-based problems listed below. A review was performed to assess the effectiveness of maintenance efforts that apply to scoped structures, systems, or components (SSCs) and to verify that the licensee was following the requirements of TI-119, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting - 10 CFR 50.65, and NPG-SPP-03.4, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting - 10 CFR 50.65. Reviews focused, as appropriate, on: 1) appropriate work practices; 2) identification and resolution of common cause failures; 3) scoping in accordance with 10 CFR 50.65; 4) characterizing reliability issues for performance monitoring; 5) tracking unavailability for performance monitoring; 6) balancing reliability and unavailability; 7) trending key parameters for condition monitoring; 8) system classification and reclassification in accordance with 10 CFR 50.65(a)(1) or (a)(2); 9) appropriateness of performance criteria in accordance with 10 CFR 50.65(a)(2); and 10) appropriateness and adequacy of 10 CFR 50.65 (a)(1) goals, monitoring and corrective actions. This activity constituted two Maintenance Effectiveness inspection samples, as defined in IP 71111.12.

- CR 1286688 for unit 2 vital inverter 2-III tripped and unplanned technical specification entry
- CR 1243528 and cause determination evaluation (CDE) 1492 for 1E Manhole 1 sump pump failure

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors evaluated, as appropriate, for the work activities listed below: 1) the effectiveness of the risk assessments performed before maintenance activities were conducted; 2) the management of risk; 3) that, upon identification of an unforeseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and 4) that maintenance risk assessments and emergent work problems were adequately identified and resolved. The inspectors verified that the licensee was complying with the requirements of 10 CFR 50.65 (a)(4); NPG-SPP-07.0, Work Control and Outage Management; NPG-SPP-07.1, On Line Work Management; and TI-124, Equipment to Plant Risk Matrix. This activity constituted five Maintenance Risk Assessment and Emergent Work Control inspection samples, as defined in IP 71111.13.

- Risk assessment for work week 0410 during testing of 2A-A motor-driven auxiliary feedwater (MDAFW) pump with outstanding questions of the 2B-B MDAFW pump operability.
- Risk assessment for April 10, 2017, with unit 1 in mode 6 and time to core boil 13.3 hours.
- Risk assessment for April 26, 2017, with mode 4 to mode 3 transition on unit 1 with the TDAFW pump inoperable due to a design change.
- Risk assessment for work week 0515 with unit 1 turbine driven auxiliary feedwater (TDAFW) pump OOS due to a relay failure in the speed governor circuit.
- Risk assessment for work week 0522 with 2A RHR pump inoperable for surveillance testing in mode 5.

b. Findings

No findings were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed the operability evaluations affecting risk-significant mitigating systems listed below, to assess, as appropriate: 1) the technical adequacy of the evaluations; 2) whether continued system operability was warranted; 3) whether the compensatory measures, if involved, were in place, would work as intended, and were appropriately controlled; 4) where continued operability was considered unjustified, the impact on TS Limiting Conditions for Operation (LCO) and the risk significance in accordance with the significant determination process (SDP). The inspectors verified that the operability evaluations were performed in accordance with NPG-SPP-03.1, Corrective Action Program. This activity constituted six Operability Evaluation inspection samples, as defined in IP 71111.15.

- Immediate Determinations of Operability (IDO) for CRs 1279793, and 1281651, for 2B MDAFW pump packing gland leakage and vent valve leakage resulting in rust formation
- IDO for CR 1281633, 2B MDAFW sampled with water in the inboard bearing oil reservoir
- IDO for CR 1285589, Containment spray pump 1A breaker not closing from MCR handswitch
- Past Operability Determination (POE) for CR 1270924, Possibly wrong fuses installed in 0-BKR-228-0001/2C2
- POE for CR 1286683, 2B containment spray ring header did not meet surveillance acceptance criteria for standpipe level
- POE for CR 1273552, 2-FCV-67-9B repeatedly getting stuck in a throttled position

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)a. Inspection Scope

The inspectors reviewed the temporary plant modification listed below against the requirements of NPG-SPP-09.3, Plant Modifications and Engineering Change Control, and NPG-SPP-09.4, 10 CFR 50.59 Evaluation of Changes, Tests, and Experiments, and verified that the modification did not affect system operability or availability as described by the TS or the UFSAR. In addition, the inspectors determined whether: 1) the installation of the permanent modification was in accordance with the work package; 2) adequate configuration control was in place; 3) procedures and drawings were updated; and 4) post-installation tests verified operability of the affected systems. This activity constituted one Plant Modifications inspection sample, as defined in IP 71111.18.

- Special Test Instruction 0-STI-67.009, 0-STI-67.010, Emergency Raw Cooling Water (ERCW) Flow Data Acquisition

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)a. Inspection Scope

The inspectors reviewed the post-maintenance test procedures and/or test activities (listed below) as appropriate, for selected risk-significant mitigating systems to assess whether: 1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; 2) testing was adequate for the maintenance performed; 3) acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; 4) test instrumentation had current calibrations, range, and accuracy consistent with the application; 5) tests were performed as written with applicable prerequisites satisfied; 6) jumpers installed or leads lifted were properly controlled; 7) test equipment was removed following testing; and 8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with NPG-SPP-06.9, Testing Programs; NPG-SPP-06.3, Pre-/Post-Maintenance Testing; and NPG-SPP-07.1, On Line Work Management. This activity constituted six Post Maintenance Testing inspection samples, as defined in IP 71111.19.

- WO 117725724, Disassemble, clean and ECT perform M4049F and MI-70.02 WM 4049F of C component cooling heat exchanger following cleaning
- WO 117841585, 0-MI-57.011, for 1B-B MDAFW pump breaker replacement
- WO 118739836, 1-SOI-3.02, Unit 1 TDAFW pump run following relay replacement
- WO 117979467, PM 600107659, Post maintenance test of manhole 5A alarm following troubleshooting and adjustment
- WO 117953115, PMTI 58314, for the turbine driven auxiliary feedwater pump following a governor upgrade design change
- WO 118785223, for 1B turbine driven feedwater pump following corrective maintenance to remove foreign material from the governor control system

b. Findings

No findings were identified.

1R20 Refueling and Outage Activities (71111.20)

.1 Unit 1 Refueling Outage Cycle 14

a. Inspection Scope

The inspectors reviewed the outage risk control plan for the U1R14 refueling outage (RFO) to assess whether the licensee had appropriately considered risk, industry experience, and previous site-specific problems, and to also confirm that the licensee had mitigation/response strategies for losses of key safety functions.

The licensee continued its U1R14 refueling outage on April 1, 2017. From that date through the end of this reporting period, the inspectors observed portions of the startup, criticality, refueling, and maintenance activities to verify that the licensee maintained defense-in-depth (DID) commensurate with the outage risk plan and applicable TS.

The inspectors monitored licensee controls over the outage activities listed below. In addition, the inspectors reviewed the licensee's corrective action program to ensure that the licensee was identifying equipment alignment problems and that they were properly addressed for resolution.

- Licensee configuration management, including daily outage reports, to evaluate DID commensurate with the outage safety plan and compliance with the applicable TS when taking equipment out of service.
- Installation and configuration of reactor coolant instruments to provide accurate indication and an accounting for instrument error
- Controls over the status and configuration of electrical systems and switchyard to ensure that TS and outage safety plan requirements were met
- Decay heat removal processes to verify proper operation and that steam generators, when relied upon, were a viable means of backup cooling
- Controls to ensure that outage work was not impacting the ability to operate the spent fuel pool cooling system during and after core offload
- Reactor water inventory controls including flow paths, configurations, and alternative means for inventory addition, and controls to prevent inventory loss
- Reactivity controls to verify compliance with TS and to verify that activities which could affect reactivity were reviewed for proper control within the outage risk plan

This activity constituted one Refueling and Other Outage Activities sample, as defined in IP 71111.20.

.2 Unit 2 Forced Outage (April 1, 2017 – June 30, 2017)

a. Inspection Scope

The Unit 2 forced outage which began on March 23, 2017, due to a structural failure causing an implosion of the B condenser waterbox, continued on April 1, 2017. On April 1, 2017, the unit was in mode 4 until April 26, 2017, when the unit transitioned to

mode 5 and remained there through the end of the reporting period. The inspectors observed the licensee's mode change and verified that this was performed in accordance with plant TS. The inspectors attended forced outage meetings and reviewed the daily risk assessments and condenser repair plans. The inspectors also observed the performance of some surveillance testing being performed while the unit was shutdown. This activity constituted one Refueling and Other Outage Activities sample, as defined in IP 71111.20.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors witnessed the surveillance tests and/or reviewed test data of selected risk-significant SSCs listed below, to assess, as appropriate, whether the SSCs met the requirements of the TS; the UFSAR; NPG-SPP-06.9, Testing Programs; NPG-SPP-06.9.2, Surveillance Test Program; and NPG-SPP-09.1, ASME Section XI. The inspectors also determined whether the testing effectively demonstrated that the SSCs were operationally ready and capable of performing their intended safety functions. This activity constituted seven Surveillance Testing inspection samples; one in-service; three routine; one ice condenser and two containment isolation valve, as defined in IP 71111.22.

In-Service Test:

- WO 117761817, 1-SI-0-905, Primary Pressure Boundary Isolation Valve Leak Test (Residual Heat Removal Return Valves)

Routine Surveillances

- WO 117761560, 0-SI-82-4, 18 Month Loss of Offsite Power with Safety Injection Test - DG 1B-B
- WO 118121419, 2-SI-3-121, 92 Day TADOT MAFW Pump 2A-A Suction Header Pressure Switch (2-PS-3-139A, 2-PS-3-139B, 2-PS-3-139D)
- WO 118243486, 0-SI-82-12-B, Monthly Diesel Generator Start and Load Test DG - 2B-B

Ice Condenser Surveillance Test

- WO 117761499, 1-SI-61-7, 18 Month Ice Condenser Intermediate Deck Doors Operational Check

Containment Isolation Valve

- WO 117741614, 1-SI-26-701, Containment Isolation Valve Local Leak Rate Test High Pressure Fire Protection, testing of valve 1-1SV-26-1295
- WO 117761815, Conduct of 1-SI-0-904, Primary Boundary Isolation Valve Leak Test (RHR Cold Leg Injection Check Valves)

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06)a. Inspection Scope

On June 21, 2017, the inspectors observed an emergency planning (EP) radiological emergency plan training drill that did not contribute to the licensee's drill/exercise performance and emergency response organization performance indicator measures. This drill was intended to demonstrate that the revised flood mode operating instructions and procedures can be appropriately implemented during an extreme flooding event. The inspectors observed emergency response operations in the technical support center to verify that event classification and notifications were done in accordance with Emergency Plan Implementing Procedure (EPIP)-1, Emergency Classification Procedure, and licensee conformance with other applicable EPIPs. The inspectors observed emergency response operations in the operations support center to verify that procedure 0-AOI-7.01 fragnet management logic was properly implemented. The inspectors attended the post-drill critique 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 activity constituted one EP drill evaluation inspection sample.

b. Findings

No findings were identified.

2. RADIATION SAFETY (RS)

2RS1 Radiological Hazard Assessment and Exposure Controls (Seven Inspection Samples Completed)a. 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) containment, Unit 1 and Unit 2 (U2) auxiliary buildings, independent spent fuel storage installation (ISFSI), 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 small article monitor, personnel contamination monitor, and portal monitor 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 reviewed 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 U1R14 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 multibadging 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 steam generator (S/G) eddy current, refueling, and valve repair activities in high radiation 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 condition reports 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 UFSAR Sections 11 and 12; TS Sections 5.0; 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

No findings were identified.

2RS2 Occupational As Low As Reasonably Achievable (ALARA) Planning and Controls (Five Inspection Samples Completed)

a. Inspection Scope

Work Planning and Exposure Tracking: The inspectors reviewed work activities and their collective exposure estimates for U1R14. The inspectors reviewed ALARA planning packages for activities related to the following high collective exposure tasks: reactor disassembly and assembly, S/G Inspections, reactor coolant pump (RCP) hydro-nut replacement, and scaffolding. 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 2012 to 2015. The inspectors evaluated historical dose rate trends for reactor coolant system piping and compared them to current U1R14 values. Source term reduction initiatives, including cobalt reduction and zinc injection, were reviewed and discussed with RP staff. The inspectors also reviewed temporary shielding packages for U1R14.

Radiation Worker Performance: As part of IP 71124.01, the inspectors observed pre-job ALARA briefings and radiation worker performance for various HRA jobs in the auxiliary building and containment. While observing job tasks, the inspectors evaluated the use of remote technologies to reduce dose including teledosimetry and remote visual monitoring.

Problem Identification and Resolution: The inspectors reviewed and discussed selected corrective action program 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 UFSAR Section 12; TS Section 5.11; 10 CFR Part 20; and approved licensee procedures.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (Four Inspection Samples Completed)

a. Inspection Scope

Engineering Controls: The inspectors reviewed the use of temporary and permanent engineering controls to mitigate airborne radioactivity during U1R14. 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. The monitors' alarm setpoints were verified to account for alpha emitting nuclides.

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 during different jobs associated with outage U1R14. 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 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 (including medical qualifications) 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 monitoring and controls were evaluated against details and requirements documented in the UFSAR Chapters 9 and 12; TS Sections 3.7.10 and 5.7; 10 CFR Part 20; Regulatory Guide (RG) 8.15, "Acceptable Programs for Respiratory Protection," and approved licensee procedures.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (Five Inspection Samples Completed)

a. Inspection Scope

Source Term Characterization: The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) being monitored and verified 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 (NVLAP) 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 reviewed as part of IP 71124.01.

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 and reviewed in vivo bioassay results, and in vitro sample information for personnel involved in recent diving activities. The inspectors also 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 October 2015 through 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). The inspectors also reviewed contamination logs and evaluated events with the potential for SDE.

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

Inspection Criteria: The licensee's occupational dose assessment activities were evaluated against the requirements of UFSAR Chapter 12; TS Section 5.7; 10 CFR Parts 19 and 20; and approved licensee procedures.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (Three Inspection Samples Completed)

a. Inspection Scope

Walkdowns and Observations: During tours of the auxiliary building and RCA exit points, 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:

- U1 upper containment high-range area radiation monitor (1-RE-90-272)
- U1 lower containment high-range area radiation monitor (1-RE-90-273)
- U1 sample room area radiation monitor (1-RE-90-7)
- U2 sample room area radiation monitor (2-RE-90-7)
- Main control room area radiation monitor (0-RE-90-135)

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"; FSAR Chapter 12; TS Section 3.3; and applicable licensee procedures.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

40A1 Performance Indicator (PI) Verification

.1 Cornerstone: Mitigating Systems

a. Inspection Scope

The inspectors sampled licensee submittals for the three PIs listed below. To verify the accuracy of the PI data reported from April 1, 2016 through March 31, 2017, PI definitions and guidance contained in NEI 99-02, Regulatory Assessment Indicator Guideline, Revision 6, were used to verify the basis in reporting for each data element. This activity constituted three performance indicator samples, as defined in IP 71151.

- Heat removal MSPI
- RHR MSPI
- Emergency AC Power MSPI

b. Findings

No findings were identified.

.2 Cornerstone: Public Radiation Safety

a. Inspection Scope

Occupational Radiation Safety Cornerstone: The inspectors reviewed the occupational exposure control effectiveness PI results for the Occupational Radiation Safety Cornerstone from August 2016 through March 2017. For the assessment period, the inspectors reviewed electronic dosimeter alarm logs and CRs related to controls for exposure significant areas.

Public Radiation Safety Cornerstone: The inspectors reviewed the radiological control effluent release occurrences PI results for the Public Radiation Safety Cornerstone from August 2016 through March 2017. 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 radiological effluent technical specifications/offsite dose calculation manual (ODCM) issues. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data. The inspectors completed two of the required samples, as specified in IP 71151.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Review of Items Entered into the Corrective Action Program

As required by IP 71152, Problem Identification and Resolution, 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 corrective action program. This review was accomplished by reviewing daily CR summary reports and attending daily CR review meetings.

.2 Annual Sample: Review of Licensee Response to Multiple Issues caused by Inadequate Procedure Use and Adherence that have occurred over the last year

a. Inspection Scope

Over the last year, the inspectors have noted plant events and issues related to procedure use and adherence and human performance behaviors. In conducting the review, the inspectors assessed:

- Whether the licensee had completely and accurately identified the issues in a timely manner commensurate with the safety significance and ease of discovery;
- The licensee's consideration of the extent of condition, generic implications, and previous occurrences;
- The licensee's classification and prioritization of the resolution of the problem commensurate with the safety significance;
- Where applicable, the adequacy of the licensee's causal analyses for the problem;
- Whether the licensee's corrective actions were appropriately focused to correct the problem;

- Whether the corrective actions were performed in a timely manner commensurate with the safety significance of the issue; and
- Whether the licensee had taken into account applicable operating experience and appropriately communicated lessons learned both internally and externally.

The inspectors reviewed the following condition reports:

- CR1297261; WBN Elevation Letter – Clearance and Tagging; May 18, 2017
- CR1297271; WBN Elevation Letter – Operations Leadership Formality and Rigor; May 18, 2017
- CR1294133; 1-ISV-63-527 Was Found Shut; May 12, 2017
- CR1291140; Unit 1 Reactor Trip Due to Number 3 Reactor Coolant Pump Fail to Transfer; May 9, 2017
- CR1292720; During Post Walkdown of U1C14 Outage Found 1-ISV-26-595 for 1-FCV-26-82 Unlocked and Closed; May 6, 2017
- CR1290992; Potential trend for configuration control issues during U1R14; May 2, 2017
- CR1291132; 1-PT-1-73 found isolated; May 2, 2017
- CR1253313; Negative trend, Procedure Use and Adherence non-compliance contributing to preventable HU errors; January 23, 2017
- CR1248402; Cognitive Potential Trend Operations Procedure Use and Adherence; January 6, 2017
- CR1284674; HURB Being Initiated for WO Process and Clearance Issues; April 16, 2017
- CR1219936; WBN Site Stand Down; October 5, 2016
- CR1213063; Hold order on valve said closed and the valve was found open; September 16, 2016

This review constituted a single follow-up inspection sample for in-depth review as defined in IP 71152-05.

b. Observations and Findings

During the review, the inspectors noted that the licensee had recently developed numerous actions associated with Procedure Use and Adherence (PU&A), Clearance and Tagging, and Operations Leadership and Formality. These plans were in response to these events at Watts Bar Nuclear Plant and other TVA nuclear plants.

The plans and actions were recently developed and the site has started implementation or the initial actions. The plans for the PU&A improvement were developed by individuals from across various organizations, sites, and levels in the organizations. All the plans included continuous monitoring and effectiveness reviews after completion of the actions in order to adjust or develop new actions if it was concluded expected improvement was not seen. The plans included evaluation of personnel behavior by corporate managers and industry peers, high impact training (HIT), identifying fundamental expectations for performance and affirmation by personnel to those standards, identifying fundamental behavior standards, emphasizing engaged behavior rather than compliant behavior, and additional field oversight of specific activities such as applying clearances, and specific communication plans. The actions were scheduled to be completed by September 2017, commensurate with the safety significance of potential issues and events resulting from continued human performance errors.

Personnel accountability was recognized as a significant weakness by all levels of the organization. Plans for reinforcing accountability included communication of the consequences of human performance errors, comparisons to industry peers, and personnel actions to be expected when individuals violate the identified fundamental behavior expectations. Inspectors will monitor these aspects of accountability as they relate to the chilled work environment letter dated March 23, 2016.

The inspectors concluded the actions and monitoring plans addressed the behaviors resulting in the issues identified in the CRs selected for inspection. The inspectors will continue to monitor the progress and results of these actions, in particular the conclusions of the continuous monitoring and effectiveness reviews.

.3 Annual Sample: Review of licensee response to main control board alarm 15E

a. Inspection Scope

The inspectors reviewed the licensee's process and procedures for addressing equipment failures that result in challenges to the operating crew, such as failures that result in lit annunciators on the main control board or result in additional action for the operating crew that could represent a distraction to plant monitoring activities. The inspectors focused on the licensee's response to lit annunciator 15E. The inspectors reviewed processes contained in the licensee's Conduct of Operations procedure (OPDP-1), On Line Work Management Procedure (NPG-SPP-07.1), and Corrective Action Program (NPG-SPP-22.300).

b. Observations and Findings

During a routine review of main control board annunciators on Unit 1, the inspectors noted that alarm 15-E, PNL 1-M-7 Breaker Trip was lit, yet none of the breakers in panel 1-M-7 were tripped. The lit annunciator was documented in the annunciator verification sheet kept in the main control room, but was not entered into the licensee's corrective action program until the issue was identified to the licensee by the inspectors. The annunciator became lit during the Unit 1 refueling outage, and the unit was started up before the reason for the lit annunciator was corrected. Once the licensee investigated the alarm inputs, the breaker causing the alarm was identified. However, because the breaker could not be worked in mode 1, the licensee established an action for a main control room operator to go behind the main control board and check the breaker status three times a shift. This shift check will have to remain in place for the entire refueling cycle. The inspectors reviewed the three times a shift check against OPDP-1, Conduct of Operations, revision 38 requirements and found the procedure lacked specificity that would have resulted in this issue being classified as an operator burden. The residents were concerned that multiple similar issues could cause an aggregate distraction to operators without appropriate procedural guidance in place. The residents provided feedback to the licensee and they wrote CR 1321384 to consider the NRC feedback in a planned fleet level action to revise and enhance OPDP-1.

4OA3 Event Follow-up (71153).1 (Closed) Licensee Event Report (LER) 05000391/2016-001-00, Loss of Automatic Containment Isolation for the Steam Generator Blowdown Sampling Linesa. Inspection Scope

This LER discussed the improper use of electrical jumpers that led to a loss of automatic containment isolation for the steam generator chemistry sampling lines. From March 18, 2016, through April 14, 2016, the automatic and manual closure of the containment isolation valves and the sample isolation valves were disabled due to improperly installed jumpers in the valve control circuits. The cause of the improperly installed jumpers was an inadequate procedure, 2-CM-6.60, Steam Generator Sampling in the Hot Sample Room (Modes 2 -6). The inspectors reviewed the LER associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The inspectors reviewed CR 1160910 that was initiated for this event. Corrective actions included procedure 2-CM-6.60 was changed to install the correct jumper configuration after performing the required reviews. Additional corrective actions included review of the corresponding Unit 1 chemistry sampling procedure and ensuring chemistry staff training included training on procedure writing.

b. Findings

Introduction: A severity level (SL) IV non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was self-revealed when implementing a procedure inadequate for the circumstances during steam generator sampling activities. Electrical jumpers installed in accordance with procedure 2-CM-6.60 to obtain steam generator chemistry samples resulted in disabled automatic and manual closure functions of the containment isolation valves and the sample isolation valves, thus rendering the containment isolation valves inoperable.

Description: On April 14, 2016, while performing maintenance associated with the steam generator chemistry sampling lineup, it was revealed that the automatic and manual functions of the containment isolation valves had been disabled because of misplaced jumpers installed in accordance with procedure 2-CM-6.60, Steam Generator Sampling in the Hot Sample Room (Modes 2-6). This rendered the containment isolation valves inoperable from March 18, 2016, when the plant entered mode 4, through April 14, 2016.

The licensee initiated CR 1160910 and determined procedure 2-CM-6.60 was inadequate because it was created and revised without evaluation and technical reviews as required by NPG-SPP-09.5, Temporary Modifications; and NPG-SPP-09.4, 10CFR50.59 Evaluations. The licensee changed procedure 2-CM-6.60 to install the correct jumper configuration after performing the required reviews. Additional corrective actions included review of the corresponding Unit 1 chemistry sampling procedure and ensuring chemistry staff training included training on procedure writing.

Analysis: The inspectors determined that the use of an inadequate procedure that rendered the containment isolation valves inoperable was a performance deficiency. Unit 2 was in the construction power ascension testing phase during this timeframe;

therefore, this performance deficiency was evaluated in accordance with IMC-2517. The performance deficiency was determined to be more than minor in accordance with IMC-2517, Appendix C, because the use of an inadequate procedure represented an improper work practice that impacted safety-related structures, systems, or components (SSCs). The inspectors determined this finding to be of very low safety significance, (i.e., SL-IV), in accordance with Section 6.5 of the Enforcement Policy because it did not represent a breakdown of the licensee's quality assurance program.

This finding had a cross-cutting aspect in the Human Performance cross-cutting area, as defined in IMC 0310, regarding work management. The organization did not implement a process of planning, controlling, and executing of the work activities, such that nuclear safety was the overriding priority. The work process did not include the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities (H.5).

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires that activities affecting quality shall be prescribed by documented instructions and procedures of a type appropriate to the circumstances. Procedure 2-CM-6.60, allowed electrical jumpers to be installed for steam generator chemistry samples while the auxiliary feedwater system was in operation. Contrary to the above, from March 18, 2016, through April 14, 2016, this procedure was not appropriate for the circumstance since it rendered the associated containment isolation valves inoperable. The licensee entered this issue into their corrective action program as CR 1160910. Completed corrective actions were to change procedure 2-CM-6.60 to install the correct jumper configuration after performing the required reviews. This violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. This NCV is identified as 05000391/2017002-01, Inadequate Chemistry Procedure Results in Inoperable Containment Isolation Valves.

.2 (Closed) Licensee Event Report (LER) 05000390/2017-001-00, Failure of Emergency Raw Cooling Water Pump Reverse Rotation Keys Represents Potential Common Cause Inoperability

a. Inspection Scope

This LER discusses the failure of the non-reverse clutch key on emergency raw cooling water (ERCW) pump motor B-A and how it may represent a common mode failure affecting the other ERCW pump motors. Failure of the motor non-reverse clutch key may allow the motors to rotate in the reverse direction after a pump trip which could cause the motors to develop a higher than normal starting current if the pump was restarted.

In Inspection Report (IR) 05000390/2016004, 05000391/2016004 (ML17040A027), the NRC discussed NCV 05000390, 391/2016004-01, Inadequate Immediate Determination of Operability for Essential Raw Cooling Water Pumps. Subsequently, the licensee completed prompt determination of operability (PDO) documentation for CRs 1236767 and 1231774. The PDO included vendors' analysis that determined the peak reverse rotational speed of 580 rpm was achieved 11.1 seconds after pump trip. The licensee concluded the mechanical pump (shafts/coupling assemblies) would withstand a start from reverse rotation. The electrical protective relay settings for the ERCW pump motors and the diesel generator loading were evaluated. The analysis demonstrated there were no electrical aspects to limit an ERCW pump's ability to start during reverse

rotation. Therefore, failure of the motor non-reverse clutch keys did not affect the operability of the ERCW pumps.

The inspectors reviewed the LER and associated analysis associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The inspectors reviewed the analysis and found it acceptable. Therefore, failure of the non-reverse clutch keys did not result in inoperability of the ERCW pumps. This LER is closed.

b. Findings

No additional findings were identified.

.3 (Closed) Licensee Event Report (LER) 05000391/2016-003-01, Turbine Driven Auxiliary Feedwater Pump Inoperable for Longer than Allowable Outage Time Due to Governor Valve Spring Over-Tension

a. Inspection Scope

This LER discusses the failure of the turbine driven auxiliary feedwater pump (TDAFWP) and subsequent determination of inoperability. Specifically, on May 28, 2016, the TDAFWP tripped due to inadequate maintenance performed on March 30, 2016, when maintenance personnel over-tensioned the governor valve spring. The NRC issued a severity level IV (SL) IV violation, 05000391/2016002-08, Failure to Follow Maintenance Procedure Results in Overspeed Trip of the 2C-S Turbine Driven Auxiliary Feedwater Pump, in IR 05000390, 391/2016002.

The inspectors reviewed the LER associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The licensee changed procedure 0-MI-1.003, Disassembly, Inspection, and Reassembly of Auxiliary Feedwater Pump Turbine, to ensure the as left spring gap is specified and recorded. Mechanical Maintenance personnel were briefed on this issue and the changes to the procedure. All corrective actions were completed at the time of this inspection report. This LER is closed.

b. Findings

No additional findings were identified.

.4 (Closed) Licensee Event Report (LER) 05000391/2016-005-00, Main Feedwater Pump Trip on Loss of Condenser Vacuum Leads to Turbine Trip and Reactor Trip

a. Inspection Scope

The inspectors reviewed LER 050003910/2016-005-00, dated August 19, 2016. This LER discussed a reactor trip due to low water level in steam generator 4. On June 20, 2016, 2B main feedwater pump (MFP) condenser lost vacuum causing the 2B MFP to trip resulting in the loss of normal feedwater and the trip of the main turbine. The loss of vacuum in the 2B MFP condenser occurred during the drain of the 2A MFP condenser, which was out of service, when an air path was created between the MFP A and MFP B

condensers. Operator actions to maintain steam generator water level by reducing power and manually controlling auxiliary feedwater were not successful to prevent the automatic reactor trip.

The inspectors reviewed the LER associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The inspectors' concerns were focused on the operator actions after the turbine trip to keep the reactor online instead of manually tripping the reactor based on indications that a reactor trip was likely. The inspectors reviewed the corrective action documents, the trip report, and the performance analysis worksheet. Corrective actions included a communication issued to all licensed operators on the lessons learned from this event and reinforcing conservative decision making regarding expectations that operators take conservative actions to trip the reactor prior to an automatic trip. This included adding this philosophy to continuing training simulator scenarios. The System Operating Instructions, 1-SOI-2&3.01 and 2-SOI-2&3.01, Condensate and Feedwater System, were revised to prevent recurrence of this condition. Engineering also completed a water hammer walkdown with no issues identified. All corrective actions were completed at the time of this inspection report. This LER is closed.

b. Findings

No findings were identified.

5. (Closed) Licensee Event Report (LER) 05000390/2017-002-00, Incorrectly Hung Clearance Leads to a Condition Prohibited by the Technical Specifications

a. Inspection Scope

The inspectors reviewed LER 05000390/2017-002-00, dated February 22, 2017. This LER discussed a condition prohibited by TS 3.6.3, for containment purge system penetration 10B being inoperable longer than the four-hour required action statement. This occurred when a clearance intended to remove fuses associated with valve 1-FCV-30-17, Containment Purge Supply Inboard Containment Isolation, incorrectly remove the fuses for another valve leaving valve 1-FCV-30-17 energized. When the local leak rate test (LLRT) was conducted on 1-FCV-30-17, opening this valve would create a containment bypass through the LLRT test valve. The LLRT test valve was open for longer than four hours.

The inspectors reviewed the LER associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The cause of the event was human error when the clearance orders were applied to the wrong valve. The inspectors reviewed the corrective action documents and the prompt investigation form. Corrective actions are discussed in the violation included below.

b. Findings

Introduction: A self-revealed finding of very low safety significance (Green) and associated NCV of TS 3.6.3, "Containment isolation Valves," was identified for a failure

to properly implement a clearance for containment isolation valve (CIV) surveillance testing. Fuses were removed from a different valve than the one specified in the clearance.

Discussion: On December 22, 2016, clearance 1-30-1011-WW was implemented to remove fuses from valve 1-FCV-30-17. The clearance was required for containment isolation valve TS surveillance testing for penetration X-10B. On December 24, 2016, after completion of the testing personnel determined that the clearance was hanging on the wrong component. The clearance was intended to remove power to the circuit for associated containment isolation, for both testing configuration control and TS compliance. On December 24, 2016, after the testing had been completed, it was found that the clearance had actually removed power from part of a steam generator MSIV circuit. Due to a redundant circuit, the MSIV was unaffected by the error.

Inspectors reviewed TVA procedure, NPG-SPP-10.2, Clearance Procedure to Safely Control Energy, Revision 17. Section 3.1.2.B, Qualified Employee Responsibilities, that a qualified employee hangs tags and applies restraining devices as specified in the clearance and a second, independent qualified employee is required to verify components are tagged in the position specified. Inspectors determined that both the qualified employee who hung the clearance and the qualified employee who performed the concurrent verification of the clearance failed to comply with these steps.

The TS bases for TS 3.6.3, Containment Isolation Valves, stated normally closed containment isolation valves are considered OPERABLE when automatic valves are deactivated and secured in their closed position. Therefore, due to the error, 1-FCV-30-17 did not meet TS 3.6.3 requirements because the associated containment penetration was not isolated by at least one closed and deactivated automatic valve as required. TS 3.6.3 Condition A has a 4 hour completion time. The incorrect clearance was in place for over 60 hours before the error was discovered.

Analysis: The failure to comply with NPG-SPP-10.2 Steps 3.1.2.B.5 and 6 was a performance deficiency. The performance deficiency was more than minor because it adversely affected the configuration control attribute of the Barrier Integrity Cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the incorrectly placed clearance resulted in the inoperability of the containment isolation valve for longer than its TS allowed outage time, reducing assurance that the containment function assumed in the safety analyses will be maintained. The inspectors performed an initial screening of the finding in accordance with IMC 0609, Appendix A, "The Significance Determination Process for (SDP) for Findings At-Power". Using IMC 0609 Appendix A, Exhibit 3 – Barrier Integrity Screening Questions, the inspectors determined that this finding was of very low safety significance (Green) because the finding did not represent an actual open pathway in the physical integrity of reactor containment and did not involve an actual reduction in function of hydrogen igniters. The finding has a cross-cutting aspect in the Avoid Complacency component of the Human Performance area as defined in NRC IMC 0310, because multiple personnel failed to recognize and plan for the possibility of mistakes and error reduction tools, such as concurrent verification, were not appropriately implemented. [H.12].

Enforcement: Technical Specification 3.6.3, "Containment Isolation Valves" action A.1 requires, in part, that penetration flow paths with one containment isolation valve inoperable be isolated by use of at least one closed and deactivated automatic valve

with a required completion time of 4 hours. Action F.1 requires the unit to be in mode 3 in six hours if the required action and associated completion time for action A.1 is not met. Contrary to the above, between December 23, 2016, and December 24, 2016, penetration X-10B was not isolated by use of at least one closed and deactivated automatic valve within 4 hours and the unit was not taken to mode 3 within 6 hours. Compliance was restored on December 24, 2016, at 1345 upon completion of the testing when the test valve was closed. The licensee entered this issue into their corrective action program as CR 1245529. This violation is being treated as an NCV consistent with Section 2.3.2 of the Enforcement Policy. This violation is identified as NCV 05000390/2017002-02, Failure to Implement Clearance on Containment Isolation Valve Results in TS 3.6.3 Violation.

.6 Unit 1 Manual Reactor Trip due to Failure of RCP #3 to Transfer to its Normal Power Supply on May 2, 2017 and May 4, 2017

a. Inspection Scope

The inspectors responded to two Unit 1 manual reactor trips that occurred on May 2, 2017 and May 4, 2017, due to failure of RCP #3 to transfer to its normal power supply. The unit was at approximately 26 percent power in mode 1 at the time of each event. For the first event, the cause was incorrectly attributed to a high resistance contact resulting in the normal feeder breaker failing to close. In the investigation following the second event, a relay associated with the RCP #3 Board 1C control circuit was found incorrectly configured due to a human performance issue, which resulted in a standing trip signal on the RCP normal feeder breaker. In each case when the RCP tripped, site procedures required operators to manually trip the unit.

The inspectors discussed the preliminary cause of the trip with the licensee and reviewed unit parameters and system response to verify that equipment responded to the reactor trip as designed. The inspectors also reviewed parts of the licensee's post-trip review and the licensee's authorization for re-start. The inspectors reviewed the licensee's investigation into the cause of the two manual trips.

b. Findings

Introduction: The inspectors reviewed a self-revealed Green finding for the failure to follow procedure NPG-SPP-22.207 "Procedure Use and Adherence" Revision 4, which requires that applicable procedures are used for all activities controlled by a written procedure. The inspectors found that NPG-SPP-04.3 Rev. 4, "Material Storage and Handling" was not used for the handling of a reactor coolant pump relay, resulting in a misconfigured relay being installed in the plant. The misconfigured relay led to number three reactor coolant pump (RCP #3) failing to transfer to its normal power source during power ascension and therefore required a manual reactor trip. This failure to transfer occurred on May 2, 2017, and again on May 4, 2017, resulting in manual trips in each case.

Description: On May 2, 2017, Watts Bar Nuclear Plant unit 1 was in mode 1 with the main generator synchronized to the grid. The operating crew reached the point where, by procedure, the reactor coolant pumps were to be transferred from the startup bus to the normal source. During this transfer, RCP #3 failed to transfer to its normal source and unit 1 was manually tripped. Troubleshooting was conducted and the licensee determined that the cause was a failure of normal supply breaker to close due to a high

resistance contact. The normal supply breaker was replaced, and unit 1 proceeded with a reactor startup and synchronization to the grid on May 4, 2017. During this startup, RCP #3 failed for a second time to transfer to the normal source and unit 1 was tripped again. The licensee performed trouble shooting and determined that the cause of both failures to transfer was an incorrectly configured relay contact associated with the RCP #3 electrical board transfer logic.

The licensee investigated the relay misconfigurations and found that the relay was bench tested in the shop on April 6, 2017, and all acceptance criteria was met. The licensee also found that the relay was not installed in the plant until April 13, 2017, and that during the time between testing and installation, the relay was left in an uncontrolled area, unmarked, and with no work order documentation to identify its intended use in the plant. The investigation determined that this failure to properly store issued material until installation most likely resulted in the relay being misconfigured after testing, since there was no programmatic control over the relay and it was left unmarked on a work bench. Inspectors reviewed NPG-SPP-04.3 Rev. 4, "Material Storage and Handling", which required in Section 2.0 that the organization that received issued material is responsible for proper storage until the material is installed in the plant. Procedure NPG-SPP-22.207, "Procedure Use and Adherence" Revision 4, requires that applicable procedures, including NPG-SPP-04.3 Rev 4, are used for all activities controlled by a written procedure.

Analysis: The failure to follow procedure NPG-SPP-22.207 "Procedure Use and Adherence" Revision 4 was a performance deficiency. Specifically, NPG-SPP-22.207 requires that that applicable procedures are used for all activities controlled by a written procedure. The applicable procedure in this instance was NPG-SPP-04.3, "Material Storage and Handling", Revision 4, which required in Section 2.0 that the organization that received issued material is responsible for proper storage until the material is installed. The licensee failed to properly store the RCP #3 relay in that they left it in an uncontrolled area, unmarked, and with no work order documentation to identify its intended use in the plant.

The finding was more than minor because it affected the Initiating Events Cornerstone attribute of Human Performance and affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions in that it resulted in a reactor trip. The inspectors performed the significance determination using IMC 0609. Because the finding affected the initiating events cornerstone while the plant was at power, Attachment 0609.04 "Initial Characterization of Findings," dated October 7, 2016, evaluates the finding using Appendix A. Using Appendix A, Exhibit 1, Transient Initiators question, the finding was determined to be of very low safety significance (Green) because it did not cause a reactor trip and the loss of mitigation equipment. The finding was not assigned a cross-cutting aspect since none of the CCAs described in IMC 0310 corresponded to an apparent cause or most significant causal factor of the performance deficiency.

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. The licensee entered this issue into their corrective action program as CR 1291140. Because this finding does not involve a violation, and is of very low safety significance, it is identified as FIN 05000390/2017002-03, Failure to Follow Procedure Results in Reactor Coolant Pump Failure to Transfer and Unit 1 Reactor Trip.

4OA5 Other Activities.1 TI-190 completion for Unit 2Temporary Instruction 2515/190 – Inspection of the Proposed Interim Actions Associated with Near-Term Task Force Recommendation 2.1 Flooding Hazard Evaluations

The inspectors independently verified that the licensee's proposed interim actions would perform their intended function for flooding mitigation.

- Visual inspection of the flood protection feature was performed if the flood protection feature was relevant. External visual inspection for indications of degradation that would prevent its credited function from being performed was performed.
- Reasonable simulation was performed, if applicable to the site
- Flood protection feature functionality was determined using both visual observation and review of other documents.

The inspectors completed the required inspections for this temporary instruction and verified that issues identified were entered into the licensee's corrective action program. This completion was completed for Unit 1 as well as Unit 2 but was documented in report 05000390/2015003 for Unit 1 only since Unit 2 did not have an operating license at that time.

.2 Failure to Report Multiple Examples of a Loss of Safety Function in Accordance with 10 CFR 50.72 and 50.73

Introduction: The inspectors identified multiple examples of a Severity Level IV NCV of 10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," and 10 CFR 50.73, "Licensee Event Report System." Specifically, over the last three years, the licensee failed to report multiple conditions that, at the time of discovery, could have prevented fulfillment of a safety function.

Description: On April 6, 2017, the control room emergency ventilation system (CREVS) pressure decreased below the TS 3.7.10 operability limit when a CREVS boundary door was not closed by personnel during ingress/egress. The licensee declared the CREVS boundary inoperable and entered TS 3.7.10.B for the time period the door was unsecured. The licensee reported the condition in accordance with 50.72(b)(3)(v)(D). Past practice had always been to not report similar occurrences, but licensee internal reviews and discussions with inspectors had brought this practice into question. The inspectors reviewed NUREG 1022, Event Report Guidelines 10 CFR 50.72 and 50.73, Revision 3. Section 3.2.7, Event or Condition that Could Have Prevented the Fulfillment of a Safety Function, stated:

As a result, for SSCs within the scope of this criterion, a report is required when 1) there is a determination that the SSC is inoperable in a required mode or other specified condition in the TS Applicability, 2) the inoperability is due to one or more personnel errors, including procedure violations; equipment failures; inadequate maintenance; or design, analysis, fabrication, equipment qualification, construction, or procedural deficiencies, and 3) no redundant equipment in the same system was operable.

The inspectors concluded, based on the above guidance and discussions with subject matter experts in NRC headquarters, that this condition was reportable as a condition that could have prevented fulfillment of a safety function under 50.72 and 50.73. The licensee indicated it was past practice not to report this condition because it took a simple action (closing the boundary door) to return CREVS pressure above the TS limit. Subsequently, on May 13, 2017, the licensee decided not to report an identical condition on the same door that caused entry into TS 3.7.10.B. The licensee later retracted the April 6, 2017, report on May 18, 2017. Based on the reporting guidance in NUREG 1022, the inspectors determined the licensee improperly retracted this report. The inspectors reviewed station narrative logs and CRs (List of Documents Reviewed: Section 4OA5) from January 1, 2014, through May 31, 2017, and identified 43 examples, including the two mentioned above, where CREVS pressure below the TS operability limit was not reported as required by NRC regulations.

The inspectors also reviewed other CRs (List of Documents Reviewed: Section 4OA5) and found twelve additional examples associated with both units where the conditions were not reported as required by NRC regulations. These included:

- Refueling water storage tank (RWST) inoperable due to level, TS 3.5.4.B, (three examples)
- Shield building inoperable due to pressure, TS 3.6.15.B, (seven examples)
- Containment inoperable due to pressure, TS 3.6.4.A, (two examples)

Altogether, the inspectors identified 55 examples of failure to report conditions which could have prevented fulfillment of a safety function as required by both 10 CFR 50.72(b)(3)(v)(C)/(D) and 10 CFR 50.73(a)(2)(v)(C)/(D) in the last three years. The inspectors concluded the failure to report was due to improper understanding and application of NRC reporting requirements and NUREG 1022 reporting guidance.

Analysis: The inspectors determined that the licensee's failure to make the required eight-hour, non-emergency notification and submit an LER to the NRC within 60 days of discovery of a condition that could have prevented fulfillment of a safety function, was a performance deficiency. This performance deficiency was dispositioned under traditional enforcement because it impacted the ability of the NRC to perform its regulatory oversight function. The performance deficiency was assessed using Sections 2.2.4 and 6.9.d.9 of the NRC's Enforcement Policy and each example was determined to be a SL IV violation. Traditional enforcement violations are not assessed for cross-cutting aspects.

Enforcement: Title 10 CFR 50.72(a)(1)(ii) requires, in part, that the licensee shall notify the NRC Operations Center via the Emergency Notification System of those non-emergency events specified in paragraph (b) that occurred within three years of the date of discovery. Title 10 CFR Part 50.72(b)(3)(v)(C) and 50.72(b)(3)(v)(D) require, in part, the licensee shall notify the NRC as soon as practical and in all cases within eight hours of the occurrence of any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of the structures or systems that are needed to control the release of radioactive material and mitigate the consequences of an accident, respectively.

Title 10 CFR Part 50.73(a)(1) requires, in part, that the licensee submit an LER for any event of the type described in this paragraph within 60 days after the discovery of the event. Lastly, 10 CFR Part 50.73(a)(2)(v)(C) and 50.73(a)(2)(v)(D) require, in part, that the licensee report any condition that could have prevented the fulfillment of the safety function of systems that are needed to control the release of radioactive material and mitigate the consequences of an accident, respectively.

Contrary to the above, from January 1, 2014, through May 31, 2017, the licensee failed to timely report multiple examples, as described in the Description section, of a condition that could have prevented the fulfillment of the safety function of systems that are needed to control the release of radioactive material and mitigate the consequences of an accident and submit a LER within 60 days. Corrective action taken by the licensee to restore compliance included submitting the required LER for these examples, LER 390/391-2017-007-00, on August 8, 2017. This violation was placed in the licensee's CAP as CR 1310096. This violation is being treated as an NCV, with multiple examples, consistent with Section 2.3.2 of the NRC Enforcement Policy. This violation is identified as NCV 05000390/391, 2017002-04, Failure to Report Multiple Examples of a Loss of Safety Function in Accordance with 10 CFR 50.72 and 50.73.

40A6 Meetings, including Exit

On July 14, 2017, the resident inspectors presented the quarterly inspection results to members of the licensee staff. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

40A7 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 meet the NRC Enforcement Policy criteria for being dispositioned as non-cited violations (NCVs).

- Watts Bar Nuclear Plant TS 5.7.1.1 states, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures in Regulatory Guide (RG) 1.33, Revision 2, Appendix A, February 1978. Procedures for surveillance tests are applicable procedures under RG 1.33 Appendix A, 8.b. Contrary to this requirement, on April 4, 2017, surveillance procedure 0-SI-82-4, 18 Month Loss of Offsite Power with Safety Injection Test – DG 1B-B, Revision 63, was not implemented as written. Specifically, Step 3.1 [3] was not followed when the 1B-B safety injection pump discharge isolation valve was closed but not tagged as directed by the procedure. As a result of not being tagged, there was no programmatic control in place to return the valve to the open position upon completion of 0-SI-82-4. Therefore, the valve was left in the closed position, causing the B train of safety injection to be inoperable from April 11, 2017, until May 10, 2017, when the valve was discovered to be closed during operator rounds. Because the 1B safety injection pump was inoperable for longer than its TS allowed outage time of 72 hours, a regional senior reactor analyst conducted a detailed risk evaluation using SAPHIRE (Version 8.1.5) and the standard model for Watts Bar (SPAR Version 8.50). The resulting change in core damage frequency was less than 1E-6; therefore, the finding was determined to be of very low safety significance (Green). The licensee entered this issue into their corrective action program as CR 1294133.

- Title 10 CFR 50.72(b)(3)(v)(C) requires, in part, that the licensee shall notify the NRC as soon as practical and in all cases within eight hours of the occurrence of any event or condition that, at the time of discovery, could have prevented the fulfillment of the safety function of structures or systems or components that are needed to control the release of radioactive material. Contrary to the above, on March 9, 2017, the licensee failed to notify the NRC that reactor containment was inoperable, resulting in a condition that could have prevented fulfillment of a safety function. Specifically, an inner containment door equalizing valve was not fully shut when the outer containment door was open for entry into upper containment, thereby resulting in a direct patch from containment to the auxiliary building. This failure to report was assessed using Section 2.2.4 of the NRC's Enforcement Policy using the example listed in Section 6.9.d.9, "A licensee fails to make a report required by 10 CFR 50.72 or 50.73," and the issue was determined to be a SL IV violation. The licensee entered this issue into their corrective action program as CR 1273873.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

- G. Arent, Director, Watts Bar Site Licensing
- B. Belvin, RP and Chemistry Director
- M. Casner, Director, Engineering
- S. Connors, Plant Manager
- L. Cross, Manager, Electrical Systems
- T. Detchemendy, Manager, Site Emergency Preparedness
- E. Ellis, Senior Manager, Nuclear Site Security
- D. Erb, Operations Director
- K. Hulvey, Manager, Watts Bar Licensing
- J. James, Director, Maintenance
- B. Jenkins, Director, Plant Support
- A. Pate, Watts Bar Licensing
- C. Rice, Operations Superintendent
- R. Rouse, ALARA Support Superintendent
- P. Simmons, Site Vice President
- A. White, Senior Manager, Site Quality Assurance

LIST OF REPORT ITEMS

Opened and Closed

NCV 05000391/2017002-01	Inadequate Chemistry Procedure Results in Inoperable Containment Isolation Valves (Section 4OA3.1)
NCV 05000390/2017002-02	Failure to Implement Clearance on Containment Isolation Valve Results in TS 3.6.3 Violation (Section 4OA3.5)
FIN 05000390/2017002-03	Failure to Follow Procedure Results in Reactor Coolant Pump Failure to Transfer and Unit 1 Reactor Trip (Section 4OA3.6)
NCV 05000390, 391/2017002-04	Failure to Report Multiple Examples of a Loss of Safety Function in accordance with 10 CFR 50.72 and 50.73 (Section 4OA5.2)

Closed

LER 05000391/2016-001-00	Loss of Automatic Containment Isolation for the Steam Generator Blowdown Sampling Lines (Section 4OA3.1)
LER 05000390/2017-001-00	Failure of Emergency Raw Cooling Water Pump Reverse Rotation Keys Represents Potential Common Cause Inoperability (Section 4OA3.2)
LER 05000391/2016-003-01	Turbine Driven Auxiliary Feedwater Pump Inoperable for Longer than Allowable Outage Time Due to Governor Valve Spring Over-Tension (Section 4OA3.3)
LER 05000391/2016-005-00	Main Feedwater Pump Trip on Loss of Condenser Vacuum Leads to Turbine Trip and Reactor Trip (Section 4OA3.4)
LER 05000390/2017-002-00	Incorrectly Hung Clearance Leads to a Condition Prohibited by the Technical Specifications (Section 4OA3.5)
TI 2515/190 (Unit 2)	Inspection of the Proposed Interim Actions Associated with Near-Term Task Force Recommendation 2.1 Flooding Hazard Evaluations (Section 4OA5.1)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

0-TI-12.15, Offsite Power Requirements, Rev. 0002
TVA-SPP-10.010, NERC Standard Compliance Processes Shared by TVA's Nuclear Power Group and Transmission and Power Supply, Rev. 0005
Power Systems Operations CR 1301564
CR 1302767

Section 1R04: Equipment Alignment

Procedures

0-SOI-31.01, Control building HVAC system, Rev. 9
System health report for main control room chiller dated April 4, 2017
2-SOI-74.01 ATT-2V, Residual Heat Removal System Valve Checklist 2-74.01-2V, Rev. 0000
0-PI-OPS-17.0, 18 Month Locked Valve Verification, Rev. 0081
1-SOI-74.01 ATT 3V, Residual Heat Removal System Valve Checklist 1-74.01-3V, Rev. 0000
1-SOI-74.01 ATT 2V, Residual Heat Removal System Valve Checklist 1-74.01-2V, Rev. 0000
2-SOI-74.01 ATT-3V, Residual Heat Removal System Valve Checklist 2-74.01-3V, Rev. 0000
1-PI-OPS-1-PE, Protected Equipment, Rev. 0020
SDD-N3-3B-4002, Auxiliary Feedwater System, Unit 1 / Unit 2, Rev. 0026

Drawings

Drawing 0-47W803-2, Rev. 1

Section 1R05: Fire Protection

Fire Protection Report Vol 1, Rev. 51
G-Spec 98, Installation, modification, and maintenance of electrical raceway fire barrier systems (ERFBS), Rev. 12
CR 1280944
0-AOI-30.1, Plant Fires, Rev. 0003
WBN-Prefire Plan CON-0-692-01, Rev. 2
Fire Protection Instruction FPI-0131, Smoke Removal, Rev. 5
TI-64, Breaching Hazard Barriers, Rev. 0011

Section 1R06: Flood Protection Measures

PM 600107659, UNID: 1E Sumps, Rev. 13B

Section 1R07: Heat Sink Performance

Heat exchanger visual inspection and evaluation form for CCS Hx C dated April 1, 2017
PM M4049F, Heat exchanger support for performance of inspections by maintenance instructions, Rev. 9
0-TI-119, Maintenance rule performance indicator monitoring, trending, and reporting – 10CFR50.65, Rev. 0007
0-MI-70.002, Component cooling heat exchanger maintenance and testing, Rev. 0004
Eddy Current inspection results for CCS Hx C from March 2017
WO 117725774

Section 1R08: Inservice Inspection Activities**Procedures**

0-TI-32.09, Monitoring of Reactor Head Canopy Seal Welds for Leakage, Rev. 0
 0-TI-31.032, Boric Acid Corrosion Control Program, Rev. 1
 1-SI-68-907, Steam Generator Tubing Inservice Inspection and Augmented Inspections,
 Rev. 31
 MRS-SSP-3407, Tubesheet Examinations – Watts Bar Unit 1, Rev. 0
 MRS-GEN-1127, Guideline for Steam Generator Eddy Current Data Quality Requirements,
 Rev. 12
 N-UT-64, Generic Procedure for the Ultrasonic Examination of Austenitic Pipe Welds, Rev. 16
 NPG-SPP-09.7, Corrosion Control Program, Rev. 6
 NPG-SPP-09.7.4, Boric Acid Corrosion Control Program, Rev. 2
 PDI-UT-2, Generic Procedure for the Ultrasonic Examination of Austenitic Pipe Welds, Rev. 42

Calculations

DCN66517, Repair or Replace WBN-1-DRV-68-67, 3/28/17

Drawings

47W435-200, System-N3-63-1A, Analysis for SIS Pump Suction, Rev. 10
 ISI-0005-C-01, Chemical and Volume Control System Weld Locations, Rev 9
 ISI-0005-C-01, Chemical and Volume Control System Weld Locations, Rev. 10
 ISI-0026-C-01, Chemical and Volume Control System Support Locations, Rev. 7
 ISI-0421-C-05, High Pressure Safety Injection System, Rev. 4

Self-Assessments

CRP-ENG-F-13-031, Boric Acid Corrosion Control Program, 7/23/13
 CRP-ENG-FSA-16-005, Watts Bar Inservice Inspection Program, 6/17/16
 WBN-ENG-FSA-16-005, Steam Generator Program, 7/1/16

Work Orders/Work Requests

117339974, Replace Eye bolt with plug on Rod Drive Mechanism, 11/18/15
 117526801, Replace Containment Upper Cooler 1A Coils, 5/30/2016
 117590370, Leaking Component WBN-1-VTV-063-0661-B, 3/9/16
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NPG-SPP-22.000, Performance Improvement Program, Rev. 0006
 NPG-SPP-22.002, PI Health Monitor, Rev. 0006
 NPG-SPP-22.003, Performance Monitoring Program, Rev. 0002
 Plant operator logs
 MSPI Derivation Report Heat Removal (AFW), March 2017, Unavailability Index
 MSPI Derivation Report Heat Removal (AFW), March 2017, Unreliability Index
 Plant operator logs
 MSPI Derivation Report Residual Heat Removal, March 2017, Unavailability Index
 MSPI Derivation Report Residual Heat Removal, March 2017, Unreliability Index
 System Performance Report, Residual Heat Removal, January 2017-March 2017
 System Performance Report, Residual Heat Removal, April 2016-May 2016
 Plant operator logs
 MSPI Derivation Report Emergency AC, March 2017, Unavailability Index
 MSPI Derivation Report Emergency AC, March 2017, Unreliability Index
 System Performance Report Emergency AC, April 2016-March 2017

Data and Records

Batch Gaseous Release, U1 RM-119, Effluent Permit No. 160222.061.005.G, 12/30/2016
 Batch Liquid Release, U1 Monitor Tank, Effluent Permit No. 160219.011.070.L, 12/30/2016
 Continuous Gaseous Release, U1 Auxiliary Building Exhaust, Effluent Permit
 No.160231.050.053.G, 12/31/2016
 Continuous Gaseous Release, U2 Shield Building Exhaust, Effluent Permit
 No.160223.100.041.G, 12/31/2016
 Continuous Liquid Release, U1 Groundwater Sump, Effluent Permit No.160220.041.010.L,
 12/31/2016
 List of Dose and Dose Rate Alarms August 2016 to January 2017
 Monthly Gaseous Dose Report, September 2016
 Monthly Liquid Dose Report, September 2016
 Self-Assessment, WBN-RP-SSA-17-006, IP 71151, Performance Indicator Verification,
 1/12/2017
 Watts Bar Nuclear Plant Open EMS Liquid and Gas Maximum Dose Report [month, quarter,
 and annual], Unit 1, Unit 2, and Site, 4/12/2017
 Watts Bar Nuclear Trimester Performance Assessment for 3rd Trimester FY 2016, 10/24/2016
 Watts Bar Nuclear Radiation Protection Department Performance Assessment Data for 4th
 Trimester FY 2016, Undated
 WBN Radiation Protection Monthly Performance Assessment, August 2016 through
 December 2016, Various dates
 2015 Watts Bar Nuclear Plant Annual Radioactive Effluent Report, 4/29/2016
 CRs 1199557, 1230886, 1231439, 1235343, 1250754, 1253956, 1258723

Section 40A1: Performance Indicator Verification

Heat Removal AFW Derivation Report, UAI March 2017
 Heat Removal AFW Derivation Report, URI March 2017
 AFW Unavailability Log

DHR (RHR) Derivation Report, UAI March 2017
 DHR (RHR) Derivation Report, URI March 2017
 ECCS Unavailability Log
 EAC Derivation Report, URI March 2017
 EAC Derivation Report, UAI March 2017
 EDG Unavailability Log

Section 40A2: Problem Identification and Resolution

NPG-SPP-22.300, Corrective Action Program, Rev. 0009
 NPG-SPP-07.1, On Line Work Management, Rev. 0018
 OPDP-1, Conduct of Operations, Rev. 0038
 1-PI-OPS-ANN, Annunciator Verification, Rev. 0003
 CR 1302101, 1303186

Section 40A3: Followup of Events and Notices of Enforcement Discretion

1-CM-6.60, Steam Generator Sampling in Hot Sample Room (Modes 2-6), Rev. 0003
 2-CM-6.60, Steam Generator Sampling in Hot Sample Room (Modes 2-6), Rev. 0007
 2-CM-6.60, Steam Generator Sampling in Hot Sample Room (Modes 2-6), Rev. 0006
 2-SOI-2&3..1, Condensate and Feedwater System, Rev 15
 1-SOI-2&3..1, Condensate and Feedwater System, Rev 20
 MPR Associates, Inc., letter dated March 9, 2017 (2048-0033-LTR-01, Rev. 0)
 CR 1245529 and Prompt Investigation Form for CR 1245529
 CR 1175968
 0-MI-1.0003, Disassembly, Inspection, and Reassembly of Auxiliary Feedwater Pump Turbine,
 Rev. 0003
 PRA Evaluation Response: WBN-2-16-062 R0 dated 6/8/16
 CRs 1160919, 1183877, 1236767, 1288471
 Watts Bar Nuclear Plant Unit 2 Trip Report, June 20, 2016
 Performance Analysis Worksheet, initiation date 07/11/2016

Section 40A5: Other Activities

1-ARI-102-108, HVAC & CVCS, Revs. 0006, 0007
 NPG-SPP-01.2, Administration of Site Technical Procedures, Rev. 0014
 Operations Logs dated May 19, 2017 and March 21, 2017
 TS Bases B 3.7.10, Control Room Emergency Ventilation System, Rev. 91
 WO 118617862
 SDD-N3-30CB-4002, Control Building Heating, Ventilating, Air conditioning, and Air Cleanup
 System, Unit 1 / Unit 2, Rev. 0018
 1-SI-70-908-B, Component Cooling System Valve Position Indication Verification (Train B),
 Appendix G, Rev. 0016
 WO 118392690
 WO 118603853
 Drawing 2-47W866-1, Heating and Ventilation Air Flow, Rev. 42
 WO 117851834
 Watts Bar – Unit 2 TS Bases 3.6.4, Containment Pressure
 0-SI-30-7-B, Auxiliary Building Gas Treatment System Pressure Test Train B, Rev. 0034
 WO 118110306
 TI-65, Breaching the Containment Annulus, ABSCE, or MCRHZ Pressure Boundaries, Rev.
 0027
 TS Bases B 3.7.12, Auxiliary Building Gas Treat System (ABGTS), Rev. 119

CRs

TS 3.7.10.B for CREVS inoperable: 862708, 866226, 894134, 899633, 903067, 909000, 910194, 912154, 948571, 967964, 979264, 985860, 986637, 988464, 1000413, 1040054, 1061510, 1071973, 1092726, 1099526, 1099592, 1104089, 1112234, 1121123, 1127775, 1128181, 1129073, 1129477, 1137634, 1162773, 1170567, 1187273, 1197627, 1225143, 1274363, 1281767, 1295376, 1326447 (six examples)

TS 3.5.4.B for RWST inoperable: 864251, 907544, 1317307 (one example)

TS 3.6.15.B for Shield Building inoperable: 998890, 1177619, 1272224, 1317307 (two examples), 1326447 (two examples)

TS 3.6.4.A for Containment inoperable: 1272164, 1317307 (one example)