UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

February 9, 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 05000390/2016004, 05000391/2016004, 05000390/2016501, AND 05000391/2016501

Dear Mr. Shea:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Bar Nuclear Plant, Units 1 and 2. On January 20, the NRC inspectors discussed the results of this inspection with Mr. Connors and other members of the Watts Bar staff. Inspectors documented the results of this inspection in the enclosed inspection report.

NRC inspectors documented three findings of very low safety significance (Green) in this report. All of these findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violation or significance of this NCV, 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.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390, “Public Inspections, Exemptions, Requests for Withholding,” of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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 Inspection Report 05000390/2016004, 05000391/2016004, 05000390/2016501, 05000391/2016501
w/Attachment: Supplemental Information

cc Distribution via ListServ

WATTS BAR NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT
05000390/2016004, 05000391/2016004, 05000390/2016501, AND 05000391/2016501,
FEBRUARY 9, 2017

Distribution via ListServ

*See previous concurrence
ADAMS ACCESSION NUMBER: ML17040A027

■SUNSI Review			■Non-Sensitive □Sensitive		■Publicly Available □Non-Publicly Available		
OFFICE	RII:DRS	RII:DRS	RII:DRS	RII:DRS	RII:DRS	RII:DRS	
SIGNATURE	/RA via Email/	/RA via Email/	/RA via Email/	/RA via Email/	/RA via Email	/RA via Email/	
NAME	DSimpkins	CFontana	SShah	MMeeks	GCallaway	SSanchez	
DATE	1/25/2017	1/25/2017	1/23/2017	1/26/2017	1/20/2017	1/27/2017	
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
OFFICE	RII: DRS	RII:DRS	RII: DRP	RII:DRP			
SIGNATURE	/RA via Email/	/RA via Email/	/RA via Email/	/RA/			
NAME	RBaldwin	JNadel	CKontz	ABlamey			
DATE	2/1/2017	1/19/2017	2/8/2017	2/8/2017			
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	

OFFICIAL RECORD COPY

Letter to Joseph Shea from Alan Blamey dated February 9, 2017

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT 05000390/2016004, 05000391/2016004, 05000390/2016501, AND 05000391/2016501

Distribution w/encl:
M. Kowal, RII
K. Sloan
OE Mail
RIDSNRRDIRS
PUBLIC
RidsNrrPMWattsBar Resource

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	50-390, 50-391
License No.:	NPF-90, NPF-96
Report No.:	05000390/2016004, 05000391/2016004, 05000390/2016501, 05000391/2016501
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Watts Bar Nuclear Plant, Units 1 and 2
Location:	Spring City, TN 37381
Dates:	October 1 through December 31, 2016
Inspectors:	J. Nadel, Senior Resident Inspector J. Hamman, Resident Inspector J. Jandovitz, Senior Resident Inspector R. Baldwin, Senior Operations Engineer G. Callaway, Reactor Technology Instructor C. Fontana, Emergency Preparedness Inspector M. Meeks, Senior Operations Engineer S. Sanchez, Senior Emergency Preparedness Inspector D. Simpkins, Technical Training Program Specialist R. Stone, Project Engineer S. Shah, Operations Engineer
Approved by:	Alan Blamey, Chief Reactor Projects Branch 6 Division of Reactor Projects

Enclosure

SUMMARY

IR 05000390/2016-004; 05000391/2016-004; October 1, 2016 – December 31, 2016; Watts Bar, Units 1 and 2; Operability Evaluations, Emergency Response Organization Staffing and Augmentation System

The report covered a three-month period of inspection by the resident inspectors and announced inspections by region-based inspectors. Three Green non-cited violations were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, “Aspects Within Cross Cutting Areas,” dated December 04, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC’s Enforcement Policy, dated August 1, 2016. The NRC’s program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, “Reactor Oversight Process” Revision 6.

A. NRC-Identified Findings and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green: The NRC identified a non-cited violation (NCV) of 10 *Code of Federal Regulations* (CFR) 50 Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to base an immediate determination of operability (IDO) for essential raw cooling water (ERCW) pumps on information sufficient to conclude that a reasonable expectation of operability existed. The licensee restored compliance on November 30, 2016, when they documented an IDO that met the requirements of OPDP-8. The violation was entered into the licensee’s CAP as CR 1237178.

  The performance deficiency was more than minor because it adversely affected the equipment performance attribute of the Mitigating Systems Cornerstone. Specifically, reasonable assurance of operability did not exist for the ERCW pumps from November 29, 2016 until November 30, 2016. The inspectors determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function for at least a single train for longer than its technical specification allowed outage time. The cause of this finding had a cross cutting aspect of Teamwork in the Human Performance area, because individuals and work groups failed to communicate and coordinate their activities within and across organizational boundaries such that nuclear safety is the overriding priority. [H.4]. (Section 1R15.1)

Cornerstone: Barrier Integrity

- Green: The NRC identified a non-cited violation (NCV) of 10 *Code of Federal Regulations* (CFR) Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to address all the design criteria for check valve, 1-CHV-31-3407, in the basis of the immediate determination of operability (IDO) for containment penetration X-65 to conclude that a reasonable expectation of operability existed. On September 19, Technical Specification (TS) compliance was restored when Penetration X-65 returned to operable when it was isolated and

drained. The violation was entered into the licensee's corrective action program as condition report (CR) 1216892.

The performance deficiency was more than minor because it adversely affected the design control attribute of the barrier integrity system cornerstone. Specifically, reasonable assurance of operability did not exist for containment penetration X-65 from September 18, 2016, until September 19, 2016. The inspectors performed an initial screening of the finding and 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 (valves, airlocks, etc.), containment isolation system (logic and instrumentation), and heat removal components; and hydrogen igniters are not applicable. The cause of this finding had a cross-cutting aspect of Evaluation in the area of Problem Identification and Resolution, because the licensee did not consider all functions of check valve 1-CKV-31-3407 when performing the IDO after the valve failed to pass the surveillance instruction. [P.2]. (Section 1R15.2)

Cornerstone: Emergency Preparedness

- Green: The NRC identified a non-cited violation (NCV) of 10 *Code of Federal Regulations* (CFR) 50.47(b)(2) for the licensee's failure to maintain the effectiveness of its emergency plan, when on more than one occasion, the number of control room operators fell below minimum staffing, as required by Appendix C of NP-REP Tennessee Valley Authority (TVA) Nuclear Power Radiological Emergency Plan (E-Plan). The licensee's corrective actions included entering the issue into their corrective action program as CR 1233650.

  The performance deficiency was more than minor because it was associated with the emergency response organization readiness attribute of the Emergency Preparedness cornerstone and adversely impacted the cornerstone objective of ensuring that the licensee is capable of implementing adequate measures to protect the health and safety of the public in the event of a radiological emergency. The inspectors assessed the finding in accordance with Inspection Manual Chapter 0609, Appendix B, Emergency Preparedness Significance Determination Process, and using Table 5.2-1 – Significance Examples for 50.47(b)(2), determined that this finding represented an example of a staffing process that would permit a shift to go below E-Plan minimum staffing requirements. The inspectors determined that the licensee's process, on more than one occasion, failed to ensure that on-shift staffing met E-Plan minimum staffing requirements between March 20 and May 6, 2016. The cause of the finding was determined to be associated with the cross-cutting aspect of thorough evaluation of problems in the corrective action component of the Problem Identification and Resolution area because the organization failed to periodically analyze information from the corrective action program and other assessments in the aggregate to identify programmatic and common cause issues [P.4]. (Section 1EP3)

B. Licensee-Identified Violations

None.

REPORT DETAILS

Summary of Plant Status

Unit 1 started the reporting period at or near 100 percent rated thermal power and remained there through the end of the reporting period.

Unit 2 started the reporting period at 54 percent rated thermal power following the 50 percent load rejection startup test. The unit returned to near 100 percent rated thermal power on October 2, 2016. The unit remained at or near 100 percent rated thermal power until October 22, 2016, when the reactor was manually shut down due to indications of a problem with the 2A main bank transformer. The unit remained shut down in mode 3 while repairs to the transformer were completed and the reactor was restarted on October 29, 2016. Subsequently, the unit was synchronized to the grid on October 31, 2016, and returned to near 100 percent rated thermal power on November 2, 2016. The unit remained at or near 100 percent rated thermal power until November 28, 2016, when the unit reduced power to 77 percent for repairs to the 2A and 2B #3 heater drain tank pumps. The unit returned to near 100 percent rated thermal power on November 29, 2016, 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)

Seasonal Readiness Reviews for Cold Weather

a. Inspection Scope

The inspectors reviewed licensee actions taken in preparation for low temperature weather conditions to limit the risk of freeze-related initiating events and to adequately protect mitigating systems from its effects. The inspectors reviewed licensee procedure 1-PI-OPS-1-FP, Freeze Protection, including associated checklist 1, Freeze Protection. Inspectors walked down the intake pumping station, Unit 1 and Unit 2 main steam valve vault rooms, Unit 1 and Unit 2 refueling water storage tanks, and external portions of main feed and main steam piping to evaluate implementation of plant freeze protection, including the material condition of insulation, heat trace elements, and temporary heated enclosures. Corrective actions for items identified in relevant condition reports (CRs) and work orders (WOs) were assessed for effectiveness and timeliness. Documents reviewed are listed in the Attachment. This activity constituted one Adverse Weather inspection sample, as defined in Inspection Procedure (IP) 71111.01.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

Partial System Walkdowns

a. 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. Documents reviewed are listed in the Attachment. This activity constituted two inspection samples, as defined in IP 71111.04.

- Train A of the auxiliary control air system while train B was out of service for maintenance
- 2A-A emergency diesel generator while the 2B-B emergency diesel generator was out of service for maintenance

b. Findings

No findings were identified.

.2 Complete Walkdown

The inspectors performed a complete system walkdown of the Unit 1 and Unit 2 emergency diesel generators and support systems to verify proper equipment alignment, to identify any discrepancies that could impact the function of the system and increase risk, and to verify that the licensee properly identified and resolved equipment alignment problems that could cause events or impact the functional capability of the system.

The inspectors reviewed the UFSAR, system procedures, system drawings, and system design documents to determine the correct lineup and then examined system components and their configuration to identify any discrepancies between the existing system equipment lineup and the correct lineup. During the walkdown, the inspectors reviewed the following:

- Valves were correctly positioned and did not exhibit leakage that would impact the functions of any given valve
- Electrical power was available as required
- Major system components were correctly labeled, lubricated, cooled, ventilated, etc.
- Hangers and supports were correctly installed and functional
- Essential support systems were operational
- Ancillary equipment or debris did not interfere with system performance
- Valves were locked as required by the locked valve program
- Visible cabling appeared to be in good material condition

In addition, the inspectors reviewed outstanding maintenance work requests and design issues on the system to determine whether any condition described in those work requests could adversely impact current system operability. Documents reviewed are

listed in the Attachment. This activity constituted one complete system walkdown inspection sample, as defined in IP 71111.04.

1R05 Fire Protection (71111.05AQ)

Fire Protection Tours

a. 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. Documents reviewed are listed in the Attachment. This activity constituted five inspection samples, as defined in IP 71111.05AQ.

- Auxiliary building elevation 713 general area
- Auxiliary building elevation 713 Unit 1 penetration room
- Auxiliary building elevation 713 Unit 2 penetration room
- Auxiliary building elevation 676 general area
- Auxiliary building elevation 692 general area

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification and Performance (71111.11)

.1 Licensed Operator Requalification Review

a. Inspection Scope

On November 21, 2016, the inspectors observed the simulator requalification exam 3-OT-SRE-106, Revision 8. The exam scenario consisted of a loss of a heater drain pump followed by isolation of reactor water cleanup, loss of the A main feed pump, and a steam generator A tube rupture.

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. Documents reviewed are listed in the Attachment. 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 utilized 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.

.3 Biennial Licensed Operator Requalification Inspection

a. Inspection Scope

The inspectors reviewed the facility operating history and associated documents in preparation for this inspection. During the week of November 28 – December 2, 2016, the inspectors reviewed documentation, interviewed licensee personnel, and observed

the administration of operating tests associated with the licensee's operator requalification program. Each of the activities performed by the inspectors was done to assess the effectiveness of the licensee in implementing requalification requirements identified in 10 *Code of Federal Regulations* (CFR) Part 55, Operators' Licenses. The evaluations were also performed to determine if the licensee effectively implemented operator requalification guidelines established in NUREG-1021, Operator Licensing Examination Standards for Power Reactors, and IP 71111.11, Licensed Operator Requalification Program. The inspectors also evaluated the licensee's simulation facility for adequacy for use in operator licensing examinations using ANSI/ANS-3.5-1985, American National Standard for Nuclear Power Plant Simulators for Use in Operator Training and Examination. The inspectors observed two crews during the performance of the operating tests. Documentation reviewed included written examinations, job performance measures, simulator scenarios, licensee procedures, on-shift records, simulator modification request records, simulator performance test records, operator feedback records, licensed operator qualification records, remediation plans, watchstanding records, and medical records. The records were inspected using the criteria listed in IP 71111.11. Documents reviewed are listed in the Attachment. This activity constituted one biennial inspection sample, as defined in IP 71111.11

b. Findings

No findings were identified.

.4 Annual Review of Licensee Requalification Examination Results

a. Inspection Scope

On December 23, 2016, the licensee completed the comprehensive biennial requalification written examinations and the annual requalification operating examinations required to be administered to all licensed operators in accordance with 10 CFR 55.59(a)(2), Requalification Requirements, of the NRC's Operators' Licenses. The inspectors performed an in-office review of the overall pass/fail results of the individual operating examinations, written examinations, and the crew simulator operating examinations in accordance with IP 71111.11, Licensed Operator Requalification Program. These results were compared to the thresholds established in Section 3.02, Requalification Examination Results, of IP 71111.11. This activity constituted one annual inspection sample, as defined in IP 71111.11

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors reviewed the performance-based problem 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. Documents reviewed are listed in the Attachment. This activity constituted three Maintenance Effectiveness inspection samples, as defined in IP 71111.12.

- CR 1210518, Cause determination evaluation 1478, low oil level on unit 1 turbine-driven auxiliary feedwater pump due to oil leakage at the seal pressure controller
- CR 1233641, 1B-B charging pump room cooler placed in maintenance rule (a)(1) status due to the number of fan bearing failures resulting in functional failures exceeding the MR criteria
- CR 1203415, Cause determination evaluation 1476, EDG 1B-B experienced load swings during monthly surveillance test on August 16, 2016

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. Documents reviewed are listed in the Attachment. This activity constituted four Maintenance Risk Assessment inspection samples, as defined in IP 71111.13.

- Risk assessment for work week 1114 with B train auxiliary control air system out of service for maintenance and troubleshooting
- Risk assessment for work week 1107 with WO 117734204, emergent work due to control room spurious indications of permissive status and reactor protection bistables, including one train of the solid state protection system out of service for troubleshooting
- Risk assessment for WO 117734204, emergent work on B-A essential raw cooling water pump
- Risk assessment for work week 1128 with increased loss of offsite power risk due to tornado watch and tornado warning issued for Rhea County

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. The inspectors verified that the operability evaluations were performed in accordance with NPG-SPP-03.1, Corrective Action Program. Additional documents reviewed are listed in the Attachment. This activity constituted four Operability Evaluation inspection samples, as defined in IP 71111.15.

- Prompt determination of operability (PDO) for CR 1135820, Emergency core cooling system nitrogen accumulation due to Unit 1 cold leg accumulator check valve leakage
- Immediate determination of operability (IDO) for CR 1221797, 1A-A emergency diesel generator breaker 1912 tripped open during 24-hour run
- IDO and PDO for CR 1236767, Emergency raw cooling water pump clutch key found damaged
- IDO for CR 1214250, 1-CHV-31-3407 would not pass flow during surveillance instruction 1-SI-31-902, Chilled Water System Thermal Relief Check Valve Open Testing with Flow

b. Findings

.1 Inadequate Immediate Determination of Operability for Essential Raw Cooling Water Pumps

Introduction: The NRC identified a Green non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to follow TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23. Specifically, the licensee failed to base an IDO for essential raw cooling water (ERCW) pumps on information sufficient to conclude that a reasonable expectation of operability existed.

Discussion: The shared ERCW system consists of eight 50 percent ERCW pumps. Each pump is equipped with an anti-reverse rotation clutch assembly on the motor to prevent pump shaft reverse rotation due to either back leakage through its associated discharge check valve or expected reverse flow through the pump assembly after a pump stop due to the vertical deep draft design.

On November 10, 2016, during planned motor maintenance for the B-A ERCW pump motor, the anti-reverse rotation clutch key was found catastrophically damaged and would not prevent reverse rotation. The licensee documented the issue in CR 1231774. The key had been replaced under planned maintenance approximately three months prior; however, the licensee did not address the operability of the other ERCW pumps as required by TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23. The inspectors determined two additional clutch key failures occurred within the last year, no cause evaluations were performed for the failures, and the status of the other pumps' clutch keys were unknown. The inspectors were concerned because of the potential that a running pump could fail to perform its safety function if it tripped due to a loss of offsite power (LOOP), causing it to auto sequence onto a emergency diesel generator (EDG), and then potentially trip on overcurrent if restarted with a reverse rotating shaft due to a failed clutch key.

The licensee documented the condition of the ERCW pumps in CR 1236767 and performed an IDO which concluded the pumps were operable on November 29, 2016. The inspectors determined that the IDO did not appropriately consider the LOOP concern and therefore did not provide sufficient information to conclude that the ERCW pumps were operable. Procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Rev. 23, section 3.3.6.F, Immediate Determination of Operability, states that the IDO, "should be based on information sufficient to conclude that a reasonable expectation of operability exists by considering attributes such as… (4) Technical Specification (TS) specified safety function and events protected against, and (9) quipment failure modes." The licensee also determined that the IDO failed to include the required information due to miscommunications across operating shifts.

The licensee revised the IDO and determined that a PDO would be required. The PDO was completed on December 1, 2016. The PDO concluded that a compensatory measure was required to restore operability of the ERCW pumps and assure they could perform their design function. The compensatory measure was necessary to ensure the two required pumps per train would be operable following a LOOP. The PDO also included a monitoring action to verify and log that no reverse rotation occurs for every normal pump shutdown. This ensures the clutch key is still performing its design function and is not failed. By early January 2017, all eight pumps had been verified at least once under the monitoring action. This confirmed that ERCW safety function was not lost during the period prior to implementation of the compensatory measure, from November 29, 2016 through December 1, 2016, because each pump's clutch key would have performed its design function to prevent reverse rotation at least once.

Analysis: The failure to document an IDO on November 29, 2016, based on information sufficient to conclude that a reasonable expectation of operability existed, as required by OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23, was a performance deficiency. The performance deficiency was more than minor because it affected the equipment performance attribute of the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, reasonable assurance of operability did not exist for the ERCW pumps from November 29, 2016, until November 30, 2016, and they, therefore, should have been declared inoperable.

The inspectors characterized the finding using IMC 0609, Appendix A, Significance Determination Process, Exhibit 2, Mitigating Systems, dated June 19, 2012. The inspectors determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function for at least a single train for longer than its technical specification allowed outage time.

The cause of this finding had a cross cutting aspect of Teamwork in the Human Performance area, because individuals and work groups failed to communicate and coordinate their activities within and across organizational boundaries such that nuclear safety is the overriding priority. Specifically, the operations department failed to communicate the concerns associated with the ERCW clutch key failures across shifts and the documented IDO subsequently was inadequate as a result. [H.4].

Enforcement. Title 10 CFR, Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings", states, in part that, "activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances, and shall be accomplished in accordance with these instructions, procedures, or drawings." This requirement is implemented, in part, by TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23. OPDP-8 section 3.3.6.F, Immediate Determination of Operability, states that the IDO, "should be based on information sufficient to conclude that a reasonable expectation of operability exists by considering attributes such as… (4) Technical Specification (TS) specified safety function and events protected against, and (9) Equipment failure modes." Contrary to the above, between November 29, 2016 and November 30, 2016, the IDO for Essential Raw Cooling Water (ERCW) pumps was not "based on information sufficient to conclude that a reasonable expectation of operability exists" and did not consider "attributes such as… (4) Technical Specification (TS) specified safety function and events protected against, and (9) Equipment failure modes." The licensee restored compliance on November 30, 2016, when they documented an IDO that met the requirements of OPDP-8. The violation was entered into the licensee's corrective action program as CR 1237178. This violation is being treated as an NCV consistent with Section 2.3.2.a of the NRC's Enforcement Policy. This violation is identified as NCV 05000390, 391/2016004-01, Inadequate Immediate Determination of Operability for Essential Raw Cooling Water Pumps.

.2 Inadequate Immediate Determination of Operability for Containment Penetration X-65

Introduction: The NRC identified a Green NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the licensee's failure to follow TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 21. Specifically, the licensee failed to address all the design criteria for check valve, 1-CHV-31-3407, in the basis of the immediate determination of operability for containment penetration X-65 to conclude that a reasonable expectation of operability existed.

Discussion: On September 18, 2016, the licensee wrote CR 1214250 to document that 1-CHV-31-3407, the Incore Instrument Room Air Handling Unit 1A Cooling Water Supply Leak Rate Check Valve, would not pass flow during surveillance instruction (SI) 1-SI-31-902, Chilled Water System Thermal Relief Check Valve Open Testing with Flow, Revision 3. Check valve, 1-CHV-31-3407, serves two functions. It is a containment isolation valve for Penetration X-65. Secondly, the check valve is designed to pass flow

back into containment to relieve pressure in the penetration piping when the penetration is isolated and heats up during accident conditions. This design function is described in Calculation EPMDS061892, Evaluation of Containment Penetrations for Overpressure Protection Due to Thermal Expansion of Trapped Fluid during Post HELB, Revision 5. The IDO only addressed the closed function to isolate containment and did not address the open function to relieve pressure in the penetration piping.

The inspectors determined the IDO should address the open function of 1-CHK-31-3407. Upon discussions with the licensee, the licensee initiated CR 1216892 on September 30, 2016 documenting the missed operability determination. The licensee concluded that the IDO in CR 1214250 should have declared penetration X-65 inoperable and actions taken in accordance with TS. Technical Specification Limiting Condition for Operation, LCO 3.6.1 (Containment) Condition A (Containment Inoperable) should have been entered on September 18 when the check valve did not pass flow. The Action A.1 requirement to restore containment to operable within 1 hour was not met. Therefore Action B.1, place the plant in mode 3, was required and also not met. The penetration was isolated and drained approximately 36 hours after the check valve failed to open which restored TS compliance and containment to operable.

On October 10, 2016, WO 118174574, 1-CHK-031-3407 Failed to Pass Flow, was completed. This pressure test used air as the test medium to ensure the differential pressure could be adjusted and monitored more precisely than the original surveillance instruction which used water. This test found that the check valve did open and passed flow at about a 60 psi differential pressure. This met the acceptable criteria to open at 125psig and penetration X-65 was then determined to have met the operability requirements at all times. Procedure OPDP-8, section 3.3.2.A, requires, in part that, “the scope of an IDO must be sufficient to address the capability of TS components to perform specified safety functions.” The inspectors determined that the scope of the IDOs associated with CRs 1214250 and 1214580 were not sufficient to address the capability of 1-CHV-31-3407 to perform all of its specified safety functions.

Analysis: The failure to document an IDO on September 18 and 19, 2016, based on information sufficient to address the capability of TS components to perform specified safety functions, as required by OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 21, was a performance deficiency. The performance deficiency was more than minor because it affected the design control attribute of the barrier integrity system cornerstone to provide reasonable assurance that physical design barriers (containment) protect the public from radionuclide releases caused by accidents or events. Specifically, reasonable assurance of operability did not exist for containment penetration X-65 from September 18, 2016 until September 19, 2016. The inspectors characterized the finding using IMC 0609, Appendix A, "The Significance Determination Process 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 (valves, airlocks, etc.), containment isolation system (logic and instrumentation), and heat removal components; and hydrogen igniters are not applicable.

The cause of this finding had a cross-cutting aspect of Evaluation in the area of Problem Identification and Resolution, because the organization did not thoroughly evaluate issues to ensure that resolutions address causes and extent of conditions

commensurate with their safety significance. Specifically, the licensee did not consider all functions of check valve 1-CKV-31-3407 when performing the IDO after the valve failed to pass the surveillance instruction. [P.2].

Enforcement: Title 10 CFR, Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings", states, in part that, "activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances, and shall be accomplished in accordance with these instructions, procedures, or drawings." This requirement is implemented, in part, by TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 21. OPDP-8, Section 3.3.2.A, requires, in part, "the scope of an IDO must be sufficient to address the capability of TS components to perform specified safety functions." Contrary to the above, between September 18, 2016, and September 19, 2016, the IDO completed after check valve 1-CKV-31-3407 failed the acceptance criteria of surveillance instruction 1-SI-31-902 did not contain a scope sufficient to address the capability of the check valve to perform its specified safety functions. Specifically, the scope of the IDO only addressed the safety function of check valve, 1-CHV-31-3407, to close for containment isolation and did not consider the safety function of the check valve to open to provide relief from the thermal effects on the fluid trapped between the Containment Isolation Valves. This violation is being treated as an NCV consistent with Section 2.3.2 of the Enforcement Policy. The violation was entered into the licensee's CAP as CR 1216892. On September 19, TS compliance was restored when Penetration X-65 returned to operable when it was isolated and drained. This violation is identified as NCV 05000390/2016004-02, Inadequate Immediate Determination of Operability for Containment Penetration X-65.

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. Documents reviewed are listed in the Attachment. This activity constituted five Post Maintenance Testing inspection samples, as defined in IP 71111.19.

- WO 118250384, 0-SI-32-902-B, Auxiliary Air Compressor Cooling Water Inlet Valve Full Cycle Exercising During Normal Operation - Train B, following valve maintenance
- WO 118299401, 0-SI-67-901-A, Essential Raw Cooling Water Pump B-A Performance Test, following reverse rotation clutch key replacement

- WO 118263700, In service leak test on 2A-A emergency diesel generator starting air line coupling following leak repair
- WOs 117814647, 117814647, and 117071208, Residual heat removal pump 1B-B room cooler planned maintenance and handswitch replacement
- WOs 118278474 and 117844763, Lost indication on solid state protection system (SSPS) 1-XX-55-5 on 1-M-5, replaced A406, A108, A305 circuit boards as corrective maintenance and performed 1-SI-99-10-A, 62 Day Functional Test of SSPS Train A and Reactor Trip Breaker Train A

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. Documents reviewed are listed in the Attachment. This activity constituted five Surveillance Testing inspection samples; two in-service; two routine; and one containment isolation valve, as defined in IP 71111.22.

In-Service Test:
- WO 117817366, 2-SI-74-901-A, Residual Heat Removal (RHR) Pump 2A-A Quarterly Performance Test
- WO 117830089, 2-SI-3-901-B, 2B-B Auxiliary Feedwater Pump Quarterly Performance Test

Other Surveillances
- WO 117817596, 2-SI-0-53.1-B, 18 month Remote Shutdown Transfer Switch Verification Pre-Outage Performance - Train B, for 2B-B RHR pump suction valve.
- WO 117163957, 0-SI-215-44-B, Emergency Diesel Generator 2B-B 18 month Service Test and Battery Charger Test

Containment Isolation Valve
- WO 117829311, 2-SI-30-701, Containment Isolation Valve Local Leak Rate Test Purge Air

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP2 Alert and Notification System Evaluation

a. Inspection Scope

The inspectors evaluated the adequacy of the licensee's methods for testing and maintaining the alert and notification system in accordance with IP 71114.02, Alert and Notification System Evaluation. The applicable planning standard, 10 CFR Part 50.47 (b)(5), and its related 10 CFR Part 50, Appendix E requirements were used as reference criteria. The criteria contained in NUREG-0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, Revision 1, were also used as a reference.

The inspectors reviewed various documents which are listed in the Attachment and interviewed personnel responsible for system performance. This inspection activity satisfied one inspection sample for the alert and notification system on a biennial basis.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation System

a. Inspection Scope

The inspectors reviewed the licensee's emergency response organization (ERO) augmentation staffing requirements and process for notifying the ERO to ensure the readiness of key staff for responding to an event and timely facility activation. The qualification records of key position ERO personnel were reviewed to ensure all ERO qualifications were current. A sample of problems identified from augmentation drills or system tests performed since the last inspection was reviewed to assess the effectiveness of corrective actions. The inspection was conducted in accordance with IP 71114, Attachment 03, Emergency Response Organization Staffing and Augmentation System. The applicable planning standard, 10 CFR 50.47(b) (2), and its related 10 CFR 50, Appendix E requirements were used as reference criteria.

Documents reviewed are listed in the Attachment. This inspection activity satisfied one inspection sample for the ERO staffing and augmentation system on a biennial basis.

b. Findings

Introduction: The inspectors identified a Green non-cited violation (NCV) of 10 CFR, Part 50.47(b)(2), for the licensee's failure to maintain the effectiveness of its emergency plan, when on more than one occasion, the number of control room operators fell below minimum staffing, as required by Appendix C of NP-REP Tennessee Valley Authority (TVA) Nuclear Power Radiological Emergency Plan (E-Plan).

Description: During a review of emergency preparedness (EP) related corrective action program documents, the inspectors identified that during the period from March 20, 2016, to May 6, 2016, there were several instances of the licensee failing to meet minimum staffing requirements. The inspectors determined that the licensee failed to recognize that not meeting the staffing requirements of the E-Plan was not optional regardless of whether the TS were being met. Also, the licensee did not recognize that a process/programmatic problem existed and should have warranted a trend condition

report to evaluate and correct. Technical Specification requirements for licensed reactor operators continued to be met because this requirement differs from the E-Plan requirement. The licensee recognized that on the March 20, 2016, nightshift, the April 29, 2016, nightshift, the May 1, 2016, dayshift, and the May 6, 2016, nightshift, the main control room reactor operator's position fell below minimum staffing. Operations procedure OPDP-1, Conduct of Operations, states that the minimum on shift staffing level be the same as described in TS (i.e., three reactor operators for a shared control room). However, the E-Plan required four reactor operators to meet minimum staffing requirements. The licensee entered this issue into their corrective action program as CR 1233650.

Analysis: The licensee's failure to maintain plant staffing levels in accordance with Appendix C of NP-REP, Tennessee Valley Authority Nuclear Power Radiological Emergency Plan, was a performance deficiency. Specifically, the licensee's process for maintaining minimum emergency response shift staffing failed to ensure that on-shift emergency response responsibilities are staffed and assigned, and that the process for timely augmentation of on-shift staff is established and maintained. The inspectors determined that the performance deficiency was more than minor because it was associated with the response organization readiness attribute of the EP cornerstone and adversely impacted the cornerstone objective of ensuring that the licensee is capable of implementing adequate measures to protect the health and safety of the public in the event of a radiological emergency. Specifically, the failure to maintain required emergency response staffing levels reduced the licensee's capabilities to respond to an emergency. The inspectors assessed the finding in accordance with Inspection Manual Chapter 0609, Appendix B, Emergency Preparedness Significance Determination Process, and using Table 5.2-1 – Significance Examples for 50.47(b)(2), determined that this finding represented an example of a staffing process that would permit a shift to go below E-Plan minimum staffing requirements. Specifically, the inspectors determined that the licensee's process, on more than one occasion, failed to ensure on-shift staffing met E-Plan minimum staffing requirements between March 20 and May 6, 2016. The cause of the finding was determined to be associated with the cross-cutting aspect of thorough evaluation of problems in the corrective action component of the Problem Identification and Resolution area because the organization failed to periodically analyze information from the corrective action program and other assessments in the aggregate to identify programmatic and common cause issues. [P.4]

Enforcement: Title 10 CFR 50.54(q)(2) requires that a holder of a nuclear power reactor operating license under this part shall follow and maintain the effectiveness of an emergency plan that meets the requirements in Appendix E to this part and the planning standards of 10 CFR 50.47(b). Title 10 CFR 50.47(b)(2) requires, in part, that adequate staffing to provide initial facility accident response in key functional areas is maintained at all times and that timely augmentation of response capabilities is available. Contrary to the above, from March 20, 2016, to May 6, 2016, the licensee failed to maintain the effectiveness of their emergency plan, when on more than one occasion, the number of main control room reactor operators fell below minimum staffing, as required by Appendix C of the E-Plan. The licensee's corrective actions included entering the issue into their corrective action program as CR 1233650, to review the minimum regulatory staffing requirements as called out in procedure OPDP-1, the TS, and Appendix C of the E-Plan, to ensure there is clear and consistent guidance regarding actions that will be taken in the event minimum staffing falls below the required levels. Because this failure is of very low safety significance (Green) and has been entered into the corrective action

program, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. NCV 05000390, 05000391/2016501-01, Failure to Maintain Minimum On-Shift Emergency Response Staffing Levels.

1EP4 Emergency Action Level and Emergency Plan Changes

a. Inspection Scope

Since the last NRC inspection of this program area, three changes were made to the Radiological Emergency Plan and two changes were made to the emergency action levels, along with changes to several implementing procedures. The licensee determined that, in accordance with 10 CFR 50.54(q), the plan continued to meet the requirements of 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50. The inspectors reviewed these changes to evaluate for potential reductions in the effectiveness of the plan. However, this review was not documented in a safety evaluation report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety.

The inspection was conducted in accordance with IP 71114, Attachment 04, Emergency Action Level and Emergency Plan Changes. The applicable planning standards of 10 CFR 50.47(b), and its related requirements in 10 CFR 50, Appendix E, were used as reference criteria. Documents reviewed are listed in the Attachment. This inspection activity satisfied one inspection sample for the emergency action level and emergency plan changes on an annual basis.

b. Findings

No findings were identified.

1EP5 Maintenance of Emergency Preparedness

a. Inspection Scope

The inspectors reviewed the corrective actions identified through the EP program to determine the significance of the issues, the completeness and effectiveness of corrective actions, and to determine if issues were recurring. The licensee's post-event after action reports, self-assessments, and audits were reviewed to assess the licensee's ability to be self-critical, thus avoiding complacency and degradation of their EP program. Inspectors reviewed the licensee's 10 CFR 50.54(q) change process, personnel training, and selected screenings and evaluations to assess adequacy. The inspectors toured facilities and reviewed equipment and facility maintenance records to assess licensee's adequacy in maintaining them. The inspectors evaluated the capabilities of selected radiation monitoring instrumentation to adequately support Emergency Action Level (EAL) declarations.

The inspection was conducted in accordance with NRC IP 71114, Attachment 05, Maintenance of Emergency Preparedness. The applicable planning standards, related 10 CFR 50, Appendix E requirements, and 10 CFR 50.54(q) and (t) were used as reference criteria. Documents reviewed are listed in the Attachment. This inspection activity satisfied one inspection sample for the maintenance of emergency preparedness on a biennial basis.

b. Findings

No findings were identified.

4OA1 Performance Indicator (PI) Verification (71151)

The inspectors sampled licensee submittals relative to the PIs listed below for the period October 1, 2015, through September 30, 2016. To verify the accuracy of the PI data reported during that period, PI definitions and guidance contained in Nuclear Energy Institute 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 7, was used to confirm the reporting basis for each data element.

Emergency Preparedness Cornerstone

- Drill/Exercise Performance
- Emergency Response Organization (ERO) Readiness
- Alert and Notification System Reliability

For the specified review period, the inspectors examined data reported to the NRC, procedural guidance for reporting PI information and records used by the licensee to identify potential PI occurrences. The inspectors verified the accuracy of the PI for ERO drill and exercise performance through review of a sample of drill and event records. The inspectors reviewed selected training records to verify the accuracy of the PI for ERO drill participation for personnel assigned to key positions in the ERO. The inspectors verified the accuracy of the PI for alert and notification system reliability through review of a sample of the licensee's records of periodic system tests. The inspectors also interviewed the licensee personnel who were responsible for collecting and evaluating the PI data. Licensee procedures, records, and other documents reviewed within this inspection area are listed in the Attachment. This inspection satisfied three inspection samples for PI verification on an annual basis.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Review of Items Entered into the Corrective Action Program

a. Inspection Scope

As required by Inspection Procedure 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. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.2 Semiannual Trend Review

a. Inspection Scope

As required by Inspection Procedure 71152, the inspectors performed a review of the licensee's corrective action program and other associated programs and documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment issues but also included licensee trending efforts and licensee human performance results. The inspectors' review nominally considered the six-month period of April 2016 through September 2016, although some examples expanded beyond those dates when the scope of the trend warranted. Inspectors reviewed licensee trend reports for the period in order to determine the existence of any adverse trends that the licensee may not have previously identified. The inspectors' review also included the licensee's integrated trend reports. The inspectors verified that adverse or negative trends identified in the licensee's problem evaluation reports, periodic reports, and trending efforts were entered into the corrective action program. This inspection satisfied one inspection sample for Semiannual Trend Review.

b. Findings and Observations

No findings were identified. In general, the licensee had identified trends and appropriately addressed them in their corrective action program. The inspectors observed that the licensee had performed a detailed review. The licensee routinely reviewed cause codes and utilized key words and system links to identify potential trends in their data. The NRC identified a trend relating to adverse weather preparations. Adverse weather preparations is addressed by TVA procedure NPG-SPP-07.1.7 which defines specific roles, responsibilities, and standard programmatic controls for seasonal readiness to ensure reliable operations during summer and winter periods. The inspectors focused their review on winter preparations since the winter preparation period begins 36 to 38 weeks prior to the winter period defined in procedure NPG-SPP-07.1.7. Winter 2016 readiness preparations began in late March 2016 and continued into December 2016. During this time the inspectors noted several condition reports relating to winter readiness in their daily review. Some of the trends identified by inspectors included heat trace equipment failures, work management issues relating to winter readiness work orders, and missed winter readiness milestones. The heat trace equipment failures did not result in the failure of any safety-related equipment, were entered into the corrective action program, and then repaired under work orders. The work management issues included four winter readiness work orders removed from the work week and placed in backlog and one work order that did not have the correct focus code for winter readiness. Given the trends noted by the inspectors, the inspectors performed a detailed review of preparations for forecasted cold weather in the local area November 18–21, 2016. Watts Bar procedure 0-PI-OPS-1-FP, Freeze Protection, directs, in part, that when outside air temperature is, or is projected to be, less than 25 degrees F then compensatory freeze protection measures are taken for the refueling water storage tank (RWST) and main feed water (MFW) sensing lines. The inspectors walked down the Unit 1 and Unit 2 RWSTs and MFW sensing lines on November 18, 2016, and noted that the associated freeze protection measures were not complete. The inspectors brought this to the attention of the operating shift, who knew of the procedural requirement and the possibility of freezing conditions, but, at that time, did not respond to the inspectors with an implementation plan. On November 21, 2016, the

inspectors walked down the same areas and noted that the freeze protection measures for the RWST and MFW sensing lines were complete. The inspectors reviewed meteorological data that showed site temperature did not go below 30 degrees between November 18 and 21, 2016. On November 24, 2016, Watts Bar quality assurance (QA) wrote CR 1235239. CR 1235239 states that station personnel implementing winter readiness requirements demonstrated weaknesses associated with assessing aggregate impact of equipment deficiencies, adherence to procedures, review and scheduling of work orders, and implementing Significant Operating Experience Report (SOER) recommendations. This resulted in potential freezing of a critical component, failure to meet multiple procedural requirements, challenged timely review and scheduling of work, and an SOER recommendation not being implemented. Condition Report 1235239 has an action item to assign E Level CRs for winter readiness milestones and assign actions to milestone owners to ensure timely milestone completion. Work cycle management is also being reviewed under an action item to ensure adequate execution of seasonal readiness. During their review the inspectors did not identify any adverse weather impacts on safety-related equipment; therefore, no findings were identified.

.4 Annual Sample: Review of CR 1125623, Required measurements not taken on 1A safety injection pump seal replacement WO 116050574

a. Inspection Scope

The inspectors conducted a review of the implementation of corrective actions from CR 1125623 which was written due to required measurements of thrust collar squareness and axial end play that were not recorded as required during the replacement of the outboard mechanical seal on the 1A safety injection pump under WO 116050574 for high seal leak-off. The inspectors reviewed the CR to ensure that the licensee planned and/or implemented corrective actions commensurate with the safety significance of the issue.

b. Findings

No findings were identified.

4OA3 Event Follow-up (71153)

(Opened) Emergency Diesel Generator 1A-A Inoperable for Longer Than Allowed by Technical Specifications and Notice of Enforcement Discretion 16-2-01

Introduction: The inspectors opened an unresolved item associated with a potential noncompliance with TS 3.8.1 that occurred on October 15, 2016. Notice of Enforcement Discretion 16-2-01 was granted by the NRC staff agreeing not to enforce compliance with the TS completion time for an additional 130 hours.

Description: At 6:32 a.m. on October 12, 2016, Watts Bar operations staff declared the 1A-A EDG inoperable when the output breaker to the 1A shutdown board opened unexpectedly due to phase overcurrent during performance of the load test required by procedure 0-SI-82-13, 24 Hour Load Run - DG 1A-A. The 1A-A emergency diesel generator was operating normally prior to the opening of the breaker. The licensee's initial assessment determined the likely cause of the breaker trip was operation of the tap changer associated with the offsite power supply transformer. A subsequent 24 hour

EDG load test was started at 12:35 a.m. on October 13, 2016. At 6:45 p.m. on October 13, 2016, operations staff noted mega volt amps (reactive) swings. During subsequent troubleshooting activities, it was determined that the mega volt amps (reactive) variance could be consistently reproduced by slight movement of a potentiometer on the 1A-A EDG voltage regulator. The licensee determined that an issue in the voltage regulator circuit was the most likely cause of the output breaker trip, and made preparations to replace and calibrate the voltage regulator on which the potentiometer was located. The licensee determined that it would require more than 72 hours to complete the removal and replacement of the voltage regulator and post-maintenance testing. The licensee requested a notice of enforcement discretion and an additional 144 hours to restore EDG 1A-A.

A notice of enforcement discretion for an additional 130 hours was granted by the NRC staff at 9:30 p.m. on October 14, 2016. Consistent with NRC policy, the NRC agreed not to enforce compliance with the specific TSs in this instance, but will further review the cause(s) that created the apparent need for enforcement discretion to determine if there is a performance deficiency, if the issue is more than minor, or if there is a violation of requirements. This issue will be tracked as an unresolved item. (URI 05000390, 391/2016004-03, Notice of Enforcement Discretion 16-2-01 for Emergency Diesel Generator 1A-A Inoperable for Longer Than Allowed by Technical Specifications)

This activity constitutes completion of one event follow-up sample, as defined in IP 71153.

4OA5 Other Activities

(Closed) Unresolved Item 05000390/2016001-09: Appropriateness of Corrective Actions Associated with Safety-Related Pump Mechanical Seal Issues and the Effect on Plant Response

a. Inspection Scope

An unresolved item (URI), previously documented in NRC Integrated Inspection Report 05000390/2016001 (Agencywide Documents Access and Management System [ADAMS] Accession Number ML16098A323) was opened regarding the corrective actions associated with an adverse trend in safety-related pump performance, including mechanical seal degradation and failure. During the Unit 1 2015 fall outage, the 1A safety injection (SI) pump mechanical seal was replaced. The mechanical seal had degraded to a point at which the leakage was greater than the TS limit for emergency core cooling system (ECCS) leakage outside of containment. The inspectors identified several issues during a review of the prompt determination of operability for CR 1125623 and WO 116050574 to replace the seal. Specifically, inspectors found that non-QA1 parts were being used for seal replacement, the seal was the original equipment manufacturer part from startup, the failure mechanism was not clearly understood, and an extent of condition review was not performed. Additional inspection was required to determine if the licensee's evaluations and corrective actions properly addressed the issues and whether the pump mechanical seal modification from QA1 to QA3 resulted in more than a minimal increase in the likelihood of occurrence of a malfunction of SSCs important to safety previously evaluated in the UFSAR.

The inspectors reviewed other safety-related pumps' mechanical seal performance and corrective action program entries. The inspectors also reviewed the licensee's evaluation to determine the extent of condition and compliance with plant procedures and TS relative to pump operability and availability and ECCS leakage limits outside containment. The inspectors determined that Watts Bar pump mechanical seal replacement timelines were within those recommended by the vendor and plant procedures. Watts Bar provided an engineering work request which documented the critical thinking associated with substituting a QA1 seal with a QA3 seal within safety-related pumps. The inspectors found the replacement of a QA1 seal with a QA3 seal within safety-related pumps to be acceptable since the failure of the seal does not prevent the pump from providing the adequate forward flowrate to fulfill its safety function. The gland installed over the pump seal retains the leakage to an absolute value by creating a fixed leakage path. The inspectors found that the worst case allowed gland plate leakage provided sufficient margin to ensure that safety-related pumps were able to meet their safety function.

The licensee determined that RHR pumps' mechanical seal failure resulted from high seal temperature causing heavy grooves on seal faces and distortion of the carbon face. The licensee upgraded the RHR seal design to a cartridge seal design on both Unit 2 pumps and added procedure steps to perform a complete fill and vent of the system. Component cooling pump seal failure was caused due to higher than normal flow rates during pump testing. Safety injection pump seal leakage cause was indeterminate. The licensee did not find any common causes for the different pump seal leakage issues.

The inspectors evaluated the dose consequences from the seal leaks against the Watts Bar LOCA dose analysis. The postulated catastrophic failure of a SI pump mechanical seal is considered a passive failure, and the plant auxiliary building gas treatment system (ABGTS) provided the engineered safety feature atmospheric filtration system in the areas of potential leakage from the gross failure of passive components. The inspectors determined that the ABGTS takes suction from plant areas that could contain leakage, such as ECCS pump rooms, such that accident dose limits are met. The inspectors reviewed the functional evaluations performed by the licensee for ECCS leakage outside of containment and concluded that an ECCS leak within the auxiliary building would not exceed the main control room and offsite dose limit during a LOCA. Additionally, the inspectors determined that the impact on time-critical operator actions required to be performed in the vicinity of the leaking seal(s) during accident conditions, considering the work load and environment, to be minimal.

The inspectors evaluated the Watts Bar pumps' seal performance against the requirements of the maintenance rule (MR) program. The inspectors found that the plant MR program was function-based. The inspectors reviewed the pump unavailability times resulting from seal leakages and related maintenance. There were no MR failures resulting from seal leakage. In January and February 2016, Unit 2 RHR decay heat removal function unavailability criteria was exceeded due to planned seal replacement outages. This function was evaluated by the plant MR expert panel and determined that the function could remain in MR a(2) status. The inspectors determined that Watts Bar plant procedures require monitoring of MR a(3) when a function is placed in MR a(1) status. Since no functions were placed in MR a(1) status, Watts Bar did not apply any corrections to their maintenance strategy.

The inspectors reviewed the results of the licensee's evaluation related to the pump seal leakage issues. The inspectors also reviewed specific inputs, operator actions, assumptions, calculations, and evaluation methodology. Based on the additional review, the inspectors did not identify any performance deficiencies.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

On January 20, 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.

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

G. Arent, Director, WBN Site Licensing
L. Belvin, Senior Manager, Site Quality Assurance
M. Bottorff, Operations Superintendent
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
W. Hooks, Manager, Radiation Protection
J. James, Director, Maintenance
J. Policikoski, Senior Corporate Licensing Project Manager
J. Pope, Senior Manager, Site Systems Engineering
G. Pry, Director, Plant Support

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000390, 391/2016004-01	NCV	Inadequate Immediate Determination of Operability for Essential Raw Cooling Water Pumps (Section 1R15.1)
05000390/2016004-02	NCV	Inadequate Immediate Determination of Operability for Containment Penetration X-65 (Section 1R15.2)
05000390, 391/2016501-01	NCV	Failure to Maintain Minimum On-Shift Emergency Response Staffing Levels (Section 1EP3)

Opened

05000390, 391/2016004-03	URI	Notice of Enforcement Discretion 16-2-01 for Emergency Diesel Generator 1A-A Inoperable for Longer Than Allowed by Technical Specifications (Section 4OA3)

Closed

05000390/2016001-09	URI	Appropriateness of Corrective Actions Associated with Safety-Related Pump Mechanical Seal Issues and the Effect on Plant Response (Section 4OA5)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection
NPG-SPP-07.1.7, Station Seasonal Readiness, Rev. 5
0-PI-OPS-1-FP, Freeze Protection, Rev. 12
Operators Logs, November 18-21, 2016

Section 1R04: Equipment Alignment
Procedures
1-PI-OPS-1-PE, Protected Equipment, Rev. 0020
2-PI-OPS-1-PE, Protected Equipment, Rev. 0004
0-AOI-10, Loss of Control Air, Rev. 0005
CR 1232762
SDD-N3-32-4002, Compressed Air System Unit 1 / Unit 2 (QA Record), Rev. 13
System Health Report – Emergency Diesel Generators 01-JUN-2016 – 30-SEP-2016
0-SOI-82.02, Diesel Generator (DG) 1B-B, Diesel Generator 1A-A Valve Checklist 82.01-1V
FSAR 8.3.1.1
TS 3.8, Electrical Power Systems
N3-82-4002, System Description for Standby Diesel Generator
N3-30DB-4002, System Description for Diesel Generator Building Ventilation System

Drawings
0-47W848-1, R0
45N724-1, 45W727, 45W732, 45W760-18-1, 45W60-30-22, 45W60-30-23, 45W760-82, 45W760-211-4, 47W839-1, 47W/40-1, 47W866-9

Section 1R05: Fire Protection
WBN Prefire Plan AUX-0-713-01, Rev. 1
WBN Prefire Plan AUX-0-713-02, Rev. 3
WBN Prefire Plan AUX-0-713-03, Rev. 4
CR 1233844
PFP AUX-0-676-01, Rev. 03
PFP AUX-0-692-01, Rev. 04

Section 1R11: Licensed Operator Requalification Program
Requalification Exam 3-OT-SRE-106, Rev. 8
Records
Condition Reports (Nine CRs Reviewed).
License Reactivation Packages (Two Records Reviewed).
LORP Training Attendance records (10 Records Reviewed).
Medical Files (12 Records Reviewed).
Remedial Training Records (Three Records Reviewed).
Remedial Training Examinations (Two Records Reviewed).
Simulator Deficiency Reports (DR) (Reviewed 22 open DRs and 121 closed DRs covering the time frame from 12/30/2104 to 12/01/2016).
CRP-TRN-FSA-16-001, WBN 71111.11 Pre-Inspection Assessment.
Licensee Proficiency LMS report

Written Examinations
2015 BRE 5S (SRO), Revision 0, 08/21/2015.

Procedures
NPG-SPP-17.0, Training, Revision 0007, 05/18/2016
NPG-SPP-17.4.1, Exam Security and Exam Database Management, Revision 0008, 10/13/2015.
NPG-SPP-17.5, Implementation Phase, Revision 0014, 04/11/2016
NPG-SPP-17.6, Evaluation Phase, Revision 0011, 03/08/2016.
NPG-SPP-17.8.1, Licensed Operator Requalification Examination Development and Implementation, Revision 0014, 06/22/2016.
NPG-SPP-17.8.2, Job Performance Measures Development, Administration, and Evaluation; Revision 0004, 03/08/2016.
NPG-SPP-17.8.3, Simulator Exercise Guide Development and Revision, Revision 0006, 03/08/2016.
TRN-12, Simulator Regulatory Requirements, Revision 0011, 11/02/2011.
TPD-LOR, Fleet Licensed Operator Requalification TP-LOR Training Program Description, Revision 7, 08/19/2016

Simulator Steady State Tests
Simulator Real Time Test; tests performed on June 22, 2015, and June 10, 2016
Simulator Steady-State Drift Test; tests performed on May 04, 2015, and June 10, 2016
100% Power Steady-State Test; tests performed on September 01, 2015, and June 24, 2016
75% Power Steady-State Test; tests performed on September 01, 2015, and June 24, 2016
50% Power Steady-State Test, tests performed on September 01, 2015, and June 24, 2016

Simulator Malfunction Tests (ANSI 3.5, 1985 Standard)
FW09 – Loss of Vacuum; tests performed on April 19, 2011, and September 02, 2015
FW20 – Main Feedwater Line Break Outside Containment; tests performed on April 19, 2011, and September 02, 2015
IA02 – Loss of Non Essential Control Air; tests performed on April 19, 2012, and June 10, 2016
IA03 – Loss of Essential Control Air; tests performed on April 25, 2011, and September 02, 2015
TH09 – Fuel Cladding Failure; tests performed on April 25, 2011, and September 2, 2015

Simulator Transient Tests
Transient Test 6 – Manual Turbine Trip Without Reactor Trip; tests performed March 16, 2015, and June 10, 2016
Transient Test 7 – Maximum Rate Power Ramp; tests performed March 16, 2015, and June 10, 2016
Transient Test 9 – Maximum Size Main Steam Line Break; tests performed March 16, 2015, and June 10, 2016
Transient Test 10 – Primary System Depressurization Using Pressurizer Relief Valve; tests performed March 16, 2015, and June 10, 2016

Scenario Packages
3-OT-SRE-1010; PZR Pressure Transmitter Failure, MFWP trip, SGTR; Revision 14, 09/20/2016.
3-OT-SRE-1011; VCT Level Transmitter Failure, Loss of 120vac to Eagle Rack 4, ATWS with PZR Safety Valve Failure; Revision 09, 09/20/2016.
3-OT-SRE-1012; Pressure Transmitter Failures, CCP trip, MSLB inside Containment; Revision 13, 09/22/2016.
3-OT-SRE-1018; S/G Level Transmitter Failure, CCP trip, MSLB inside Containment with LOOP and D/G failures; Revision 06, 09/22/2016.

3-OT-SRE-1039; S/G Pressure Transmitter Failure, SBLOCA to LBLOCA to ECA-1.1; Revision 13, 09/08/2016.
3-OT-SRE-1052; Primary Water Pump trip, LCO 3.0.3 entry, MSLB to Loss of Secondary Heat Sink; Revision 00, 09/29/2016.

JPM Packages
3-OT-J0N-1-1SI-O852, Perform Movable Control Assemblies Surveillance, Revision 1, 09/09/2016
3-OT-J2A-0-1AR-O021, Calculate QPTR and Evaluate Results to Determine if Acceptance Criteria are Met, Revision 2, 09/14/2016.
3-OT-J2A-0-1AS-R2, Classify the Event per the REP – Tornado, Revision 0, 09/14/2016.
3-OT-J2A-1-1SI-S82.2, Synchronizing DG 1B-B from the MCR Per 0-SOI-82.02, Revision 5, 11/10/2014.
3-OT-J2B-0-1AR-S6802, Determine RCP Start Requirements, Revision 2, 09/14/2016.
3-OT-J2B-0-1CB-E1, Restore Power to Cold Leg Accumulator Isolation Valves Per 1-E-1, Revision 0, 09/28/2016.
3-OT-J2B-1-1DG-S8201, 1A-A Diesel Generator Idle Start for Warm Up Per 0-SOI-82.01, Revision 0, 09/28/2016.
3-OT-J2B-1-1SI-FI1, Respond to Pressurizer High Level Per 1-FR-I.1, Revision 4, 10/23/2014.
3-OT-J2E-0-1AS-R2-1, Classify the Event per the REP – High RCS Iodine, Revision 0, 09/14/2016.
3-OT-J2F-1-1SI-E1.3, Transfer Containment Spray Suction to RHR Containment Sump Per 1-ES-1.3, Revision 10, 11/06/2014.

Section 1R12: Maintenance Effectiveness
CDE 1478
CR 1210518

Section 1R13: Maintenance Risk Assessments and Emergent Work Control
Operators Risk Evaluation for Unit 1, November 14-17, 2016
0-AOI-30.1, Plant Fires, Rev. 0002
0-AOI-30.2, Fire Safe Shutdown, Rev. 0000
0-AOI-30.2 APP B, Fire Safe Shutdown Elevation Diagrams, Rev. 0001
NPG-SPP-07.3, Work Activity Risk Management Process, Rev. 0019
WO 118278474
Operator's Risk Evaluation for Unit 1, November 29-30, 2016
Unit 1 and Unit 2 Operator's Logs, November 29-30, 2016
0-AOI-8, Tornado Watch or Warning, Rev. 0015
NPG-SPP-09.11.1, Equipment Out of Service Management, Rev. 0012
NPG-SPP-01.12, TVA Nuclear Event Response Process, Rev. 0006
CR 1236807

Section 1R15: Operabiltiy Determinations and Functionality Assessments
CR 1135820
WO 117590518
WO 117593592
WO 118114486
WO 117760791
CR 1222574
CRs 1229103, 1229105, 1229110, Extent of Condition for CR 1221797
MWO#118229166, 1A-A DG Breaker 1912 tripped open during 24-hour run

MWO#117663554, 0-SI-82-13, 24-hour loaded run – DG 1A-A
WO 118299401
Work Instruction for UNID: 0-MTR-067-0032-A, Replacement of ERCW pump motor clutch, key, and torque arm insulated stops, Attachments A and B
PDO for PER 1236767
Unit 1Operations Log dated 11/30/16
OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Rev. 0023
WBN-VTM-B260-0010, Sulzer Pumps (US) Inc. TVA WBN ERCW Pumps
WBN-VTD-B260-0020, Sulzer Pumps Installation, General Operation & Maintenance Manual for TVA WBN ERCW Pumps
WBN-VTM-S106-0010, Siemens Energy & Automation Systems ERCW Pump Motors
WBN-SDD-N3-67-4002, Essential Raw Cooling Water System, System 67, Rev. 0034
WBN-VTM-S106-0020, Instruction Book for Siemens Energy & Automation Systems Essential Raw Cooling Water Pump Motors
WBN-VTD-FR03-0010, Formsprag Installation Instructions General Purpose Overrunning Clutches FSO 300 thru 700, FSO 750 thru 1027, FS 750thru 1027. [Bulletin # 2219]
CRs 1104777, 1108157, 1117187, 1135397, 1153642, 1231774, 1236767
Drawings 1-47W845-1, Rev. 77; 1-47W845-5, Rev. 23

Section 1R18: Plant Modifications

Section 1R19: Post Maintenance Testing

WO 118250384, 0-SI-32-902-B, Aux air compressor cooling water inlet valve full cycle exercising during normal operation following valve maintenance
WO 118263700
Drawing 2-47W839-1B
WOs 117071208, 117814647, 117814647
PM 600101749A, Rev. 1
WOs 117844763, 118278474
1-SI-99-10-A, 62 Day Functional Test of SSPS Train A and Reactor Trip Breaker A, Rev. 0064
1-PNL-99-R47-A, Attachments B, C, D
IMI-99.030, Solid State Protection System Universal Logic Board Test, Rev. 0002
IMI-99.033, Solid State Protection System Isolation Board Test, Rev. 3

Section 1R22: Surveillance Testing

WO 117817596
CR 1234004
WO 118311584
2-SI-0-53.1-B, 18 Month Remote Shutdown Transfer Switch Verification Pre-Outage Performance – Train B, Rev. 0006
WO 117817366
2-SI-74-901-A, Residual Heat Removal Pump 2A-A Quarterly Performance Test, Rev. 0005
WO 117830089
2-SI-3-901-B,Motor Driven Auxiliary Feedwater Pump 2B-B Quarterly Performance Test, Rev. 0006
WO 117829311
2-SI-30-701, Containment Isolation Valve Local Leak Rate Test Purge Air, Rev. 0001
CR 1231740
CR 1231741
CR 1231306

TVA 40897 NPG Pre-Job briefing checklist, dated 11/16/2015
TVA 40928, Foreign material control requirements and pre-job briefing, dated 5/20/2016
MWO#117163957, PM # P1039
MWO#117212030 – 0-SI-215-24-B, Diesel generator 2B-B battery quarterly inspection
MWO#117212073 – 0-SI-215-24-B, Diesel generator 2B-B battery quarterly inspection
TVA 40681 Chronological Test Log
0-SI-215-44-B, Diesel generator 2B-B 18 Month Service Test and Battery Charger Test, Rev. 0016, 8/23/2016
Tool Room Issue Ticket #30735032

Section 1EP2: Alert and Notification System Evaluation

Procedures and Reports

EPDP-10, Facilitation of the Alert and Notification System and Pager Tests, Rev. 7
EPDP-14, Evaluation of Changes to Alert and Notification System, Rev. 1
EPFS-9, Inspection, Service, and Maintenance of the Prompt Notification System (PNS) at Browns Ferry, Sequoyah, and Watts Bar Nuclear Plants, Rev. 9 and Rev. 10
FEMA REP-10 A&NS Design Report, Rev. 3
FEMA approval letters, dated 11/30/2012 & 4/24/2013
TVA Nuclear Power Radiological Emergency Plan, Generic, Revision 106
TVA Nuclear Power Radiological Emergency Plan, Appendix C, Watts Bar Nuclear Plant, Rev. 110
Evaluation and Analysis of the ANS for WBN Plant, Volumes 1 and 2, dated 9/2014
Description of Acoustic Modeling Practices for Sirens Sighting for TVA WBN A&NS, Blue Ridge Research and Consulting, LLC, Technical Report, dated 5/8/2014
TVA WBN ANS Upgrade Comparison, dated 2014
TVA WBN Plant Siren Locations and Sound Coverage, dated 2014

Records and Data

Monthly and Bi-weekly Activation Results, dated October 1, 2014 – September 30, 2016

Corrective Action Documents (Condition Reports)

1064216, Failure of ANS Siren WBN-0-PNS-901-070 during silent test
1070888, WBN-0-PNS-901-100 failed to rotate, closed to corporate CR 1077805
1077805, A&NS Siren Rotation Failures
1091482, WBN ANS siren WBN-0-PNS-901-222 failed to activate
1122282, WBN ANS siren WBN-0-PNS-901-047 failed to rotate
1123580, WBN ANS siren WBN-0-PNS-901-047 failed to rotate again
1177167, WBN ANS siren WBN-0-PNS-901-069 failed to rotate during monthly activation test
1177168, WBN ANS siren WBN-0-PNS-901-067 failed to rotate during monthly activation test
1177169, WBN ANS siren WBN-0-PNS-901-071 failed to rotate during monthly activation test
1177170, WBN ANS siren WBN-0-PNS-901-041 failed to rotate during monthly activation test
1188976, WBN ANS siren WBN-0-PNS-901-006 failed to rotate during monthly activation test
1188982, WBN ANS siren WBN-0-PNS-901-020 failed to rotate during monthly activation test
1188986, WBN ANS siren WBN-0-PNS-901-073 failed to rotate during monthly activation test

Section 1EP3: Emergency Response Organization Staffing and Augmentation System

Procedures

TRN-30, Radiological Emergency Preparedness Training, Rev. 35
TVN Emergency Plan, Appendix C, Rev. 110
EPDP-1, Procedures, Maps and Drawings, Rev. 12

EPDP-2, Emergency Duty Officer, EP Staff and Operations Duty Specialist Notifications Procedure, Rev. 7
EPDP-11, Emergency Preparedness Performance Indicators, Rev. 7

Records and Data
2015 and 2016 ERO Augmentation after-hours drill reports
2015 and 2016 ERO Notification System call-out test results
McGuire Nuclear Station On-Shift Staffing Analysis Report, dated 12/13/12
Selected employee training records
Emergency Response Organization current duty roster

Corrective Action Documents
0975457, SR to document Licensed Operator Requal 2014 Annual Operating exam failures
0985863, WBN ERO Duty Roster/REP Truck
0994002, REP drill issues
1081796, Adverse Trend in RP Response to TEENS Tests
1151681, OPS below minimum REP and OPDP-1 staffing on 3/20/2016 nightshift.
1165982, OPS below minimum REP and OPDP-1 staffing on 4/29/2016 nightshift
1166176, OPS below minimum REP and OPDP-1 staffing on 5/1/2016 dayshift
1168424, Operations below minimum REP and OPDP-1 staffing on Nightshift 5/6/16
1186684, REP TEENS test, Assistant Chem. Mgr. non-response (CHEM)
1209641, RP fell below minimum REP staffing (less than 1 hr. CTIA)
1220051, Chemistry REP Coverage 10-6-16 below minimum
1220115, Fire Brigade dropped below minimum staffing due to medical emergency

Section 1EP4: Emergency Action Level and Emergency Plan Changes
Procedures
TVA Nuclear Power Radiological Emergency Plan, Generic Part, Rev. 106
TVA Nuclear Power Radiological Emergency Plan, Appendix C, Watts Bar Nuclear Plant, Rev. 108, 109, and 110
EPDP-17, NPG Emergency Plan Effectiveness Review [10 CFR 50.54(q)], Rev. 5
EPIP-1, Emergency Plan Classification Logic, Rev. 44, 45, & 46

Change Packages
CECC 2015-039, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Rev. 109, dated 12/8/15
CECC 2015-039, EPDP-17, Attachment 4 Effectiveness Evaluation Form for REP Appendix C, Rev. 109, dated 12/8/15
CECC 2015-040, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Rev. 108, dated 11/25/15
CECC 2015-040, EPDP-17, Attachment 4 Effectiveness Evaluation Form for REP Appendix C, Rev. 108, dated 11/25/15
CECC 2015-062, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Rev. 109, dated 12/8/15
CECC 2015-063, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Section C.5.1, dated 12/8/15
CECC 2015-063, EPDP-17, Attachment 4 Effectiveness Evaluation Form for REP Appendix C, Section C.5.1, dated 12/8/15
CECC 2016-009, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Rev. 110, dated 5/23/16

CECC 2016-010, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Rev. 110, dated 5/24/16
CECC 2016-010, EPDP-17, Attachment 4 Effectiveness Evaluation Form for REP Appendix C, Rev. 110, dated 5/24/16
CECC 2016-019, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Figure 6-C, dated 2/24/16
CECC 2016-020, EPDP-17, Attachment 2 Screening Evaluation Form for REP Appendix C, Rev. 110, dated 5/24/16
CECC 2016-020, EPDP-17, Attachment 4 Effectiveness Evaluation Form for REP Appendix C, Rev. 110, dated 5/24/16
WBN 2015-020, EPDP-17, Attachment 2 Screening Evaluation Form for EPIP-1, Rev. 45, dated 11/25/15
WBN 2015-020, EPDP-17, Attachment 4 Effectiveness Evaluation Form for EPIP-1, Rev. 45, dated 11/25/15
WBN 2016-008, EPDP-17, Attachment 2 Screening Evaluation Form for EPIP-1, Rev. 46, dated 6/6/16
WBN 2016-0008, EPDP-17, Attachment 4 Effectiveness Evaluation Form for EPIP-1, Rev. 46, dated 6/6/16
WBN 2016-009, EPDP-17, Attachment 2 Screening Evaluation Form for EPIP-1, Rev. 46, dated 6/6/16
WBN 2016-009, EPDP-17, Attachment 4 Effectiveness Evaluation Form for EPIP-1, Rev. 46, dated 6/6/16
WBN 2016-010, EPDP-17, Attachment 2 Screening Evaluation Form for EPIP-1, Rev. 46, dated 6/6/16
WBN 2016-010, EPDP-17, Attachment 4 Effectiveness Evaluation Form for EPIP-1, Rev. 46, dated 6/6/16
Calculation #WBNTSR115, NPG Calculation for REP Effluent Radiation Monitor EALs & Radiation Alert Levels, Rev. 12, dated 10/8/15

Corrective Action Documents
0979327, Procedure revision EPIP-6
1108612, REP Appendix C, Table 7-2 inaccuracies
1093414, Discrepancy in REP App. C for AFW flow (Basis for U2 FR-H.1 20gpm more than Unit1)
1095906, WBN EAL Setpoint change
1115510, PCR REP Appendix C for corrections

Section 1EP5: Maintenance of Emergency Preparedness

Procedures
NPG-SPP-03.18, Conduct of Quality Assurance Assessments, Rev. 4
NPG-SPP-18.3.5, Equipment Important to Emergency Response, Rev. 5
NPG-SPP-18.3.7, Alternate Facility Activation and Operation, Rev. 2
NPG-SPP-22.102, NPG Self-Assessment & Benchmarking Programs, Rev. 2
NPG-SPP-22.300, Corrective Action Program, Rev. 7
NPG-SPP-22.600, Issue Resolution, Rev. 2
EPDP-3, Emergency Plan Exercises & Preparedness Drills, Rev. 14
EPIP-2, Notification of Unusual Event, Rev. 37
EPIP-6, Activation and Operation of the Technical Support Center, Rev. 49
EPIP-7, Activation and Operation of the Operations Support Center, Rev. 37
EPIP-12, Emergency Equipment and Supplies, Rev. 33

Records and Data
Audit SSA 1501, Watts Bar Nuclear Plant REP Audit Report, dated 3/6/15
Drill Report Watts Bar Integrated Training Drill, dated 8/26/15
Drill Report Watts Bar Training Drill, dated 3/9/15, 5/15/15, 12/17/15, 3/21/16, 6/22/16
Drill Report Watts Bar Graded Exercise, dated 12/2/15
Event Report Watts Bar NOUE 3/9/16, dated 3/21/16
Event Report Watts Bar NOUE 8/30/16, dated 9/2/16
Exercise Report Watts Bar Medical Drill, dated 12/30/15
Exercise Report Watts Bar Off Year Report, dated 8/24/16
Exercise Report Watts Bar PASS Drill, dated 12/23/15
QA-WB-15-001, QA Oversight Report for Period of Sept. 1 – Dec. 31, 2014, dated 1/30/15
QA-WB-15-010, QA Oversight Report for Period of Jan. 1 – Apr. 30, 2015, dated 5/28/15
SSER for Watts Bar Nuclear Unit 2, dated August 2015
WBN-EP-SSA-16-002, EP Review of IER 13-10 Response Summaries, dated 4/29/16

Corrective Action Documents
0987655, NRC Identified NCV in 2014501-001 4Q2014 Integrated Inspection Report
0995859, WBN Feb REP Drill Lessons Learned
1018209, April 2015 WBN REP Drill- Failed drill objective with OSC position not filled
1019463, Activation of TSC needlessly delayed 12 minutes.
1041343, CR created for tracking actions related to a negative trend in REP classifications
1076143, WBN REP ITD 8-26-15 Failed Objective E.2
1106227, WBN 2015 REP Graded Exercise General Emergency basis
1106370, WBN 2015 REP Graded Exercise current procedure revision
1106464, WBN 2015 REP Graded Exercise (NRC identified) Plan time for debrief
1106470, WBN 2015 REP Graded Exercise (NRC identified)- CAS control cell discussions
1106467, WBN 2015 REP Graded Exercise (NRC identified) Debrief comments
1106471, WBN 2015 REP Graded Exercise (NRC identified)- Participating in drill critique
1106472, WBN 2015 REP Graded Exercise (NRC identified)- ICP Liaison performance
1106473, WBN 2015 REP Graded Exercise (NRC identified)- NRC Notification forms
1106474, WBN 2015 REP Graded Exercise (NRC identified)- CAS Drill cell location
1111825, REP Drill shortfalls
1111888, WBN 12/2/2015 REP Training Drill insufficient NRC notifications
1123207, REP Truck #4 operation impaired (Facilities Management had it repaired)
1145877, March 2016 WBN Team A REP Drill Objective D.2 Failure
1145879, March 2016 WBN Team A REP Drill Objective J.2 Failure (PAR call)
1147297, Electrical fire on Motor for 2B HWP. NOUE
1147304, REP equipment did not function as required. (ECNS and REP Fax- fixed same day)
1180837, Deficiencies discovered during monthly inspection/inventory of REP Van #1
1189083, Loss of majority of MET Tower indications
1201693, REP Truck #4 failed to start due to dead battery

Section 4OA1: Performance Indicator Verification

Procedures
EPDP-11, Emergency Preparedness Performance Indicators, Rev. 7

Records and Data
DEP opportunities documentation for 4th quarter 2015; 1st, 2nd, and 3rd quarters 2016
Siren test data for 4th quarter 2015; 1st, 2nd, and 3rd quarters 2016

Drill and exercise participation records of ERO personnel for 4th quarter 2015; 1st, 2nd, and 3rd quarters 2016

Corrective Action Documents
0975475, SR to document Licensed Operator Requal 2014 Annual Operating Exam Failures
0992382, WBN REP Drill 2-20-2015 NRC Notification form
0994852, EP Trend of decreasing secondary PI
0998276, Failed DEP opportunity during Licensed Operator Requal Cycle 1502 training
1018203, April 2015 WBN REP Drill- Failed DEP opportunity
1041343, CR created for tracking actions related to a negative trend in REP classifications
1145879, March 2016 WBN Team A REP Drill Objective J.2 Failure (PAR call)
1155401, Incorrect (DEP) performance indicator reported for December 2015
1161204, March 9 NOUE DEP not included in March PI's

Section 4OA2: Problem Identification and Resolution
0-FOR-70-2, Component Cooling System Pump 2B-B Quarterly Performance Test, Rev. 20
50.59 screening for DCN 64013, Safety related makeup for CCS surge tank
Calculation EPM-RM-022389, Loss of volume from CCS surge tank
Calculation WBNAPS3802, Mission dose to connect spool piece between the CCS surge tank and ERCW system after a LOCA
Case CS00001442, Chesterton CCS Pump Seal Product Analysis, dated April 12, 2016
CR 1072853, Excessive seal leakage on 2A-A CS pump, dated August 9, 2015
CR 1108304, 2A SIP seal leakage, dated November 24, 2015
CR 1108717, 2B CCS pump seal leakage, dated November 25, 2015
CR 1111833, Duplicate of CR 1043242 (Potential adverse trend on U2 RHR mechanical seal leakage), dated December 4, 2015
CR 1120034, Pump leak off, dated December 30, 2015
CR 1122228, Boron leakage on shaft seals
CR 1125623, Required measurements not taken on 1A Safety Injection Pump seal replacement WO 116050574, dated January 15, 2016
CR 1130500, Mechanical seal pipe weepage, dated January 28, 2016
CR 1131211, Create WO to re-torque aux gland screws on 2A-A SI pump outboard seal, dated January 29, 2016
CR 1137691, Boron accumulation on 1A SIP inboard seal, dated February 15, 2016
CR 1140303, 2B CCS pump seal leakage, dated February 21, 2016
CR 1140758, Create WO to save the mechanical seal on the 2A-A SI pump, dated February 22, 2016
CR 1142428, CCS Pump seal concerns, dated February 22, 2016
CR 1150478, U2 RHR pump 2B-B may have a seal leak, dated March 17, 2016
CR 1164162, 2-PMP-72-27 2A Containment Spray pump has an outboard pump seal leak while running, dated April 25, 2016
CR 1165929, Calc WBNAPS3082 does not include the operator action to open ½-ISV-70-544B, dated May 18, 2016
CR 1170288, Extent of condition review of pump mechanical seal leaks
CR 1170288, This CR is written to capture a Procurement Engineering Group (PEG) review of listed TE for QA3, dated June 2, 2016
CR 1170604, 2A Containment Spray pump mechanical seal replacement failed PMT, dated May 13, 2016
CR 1171660, 2-PMP-74-20 has dried boron deposits on the top of the pump, dated May 16, 2016

CR 1208632, CR 1164162 (Mnt CMO) level 2 analysis MRC rejection 8/30/16, dated August 30, 2016
CR 980144, Increased leakage from 1A SI Pump Mechanical Seal, dated January 22, 2015
Equipment Apparent Cause Evaluation (EACE) Report, CCS Pump 2B-B, WBN-2-PMP-070-0033-B related to CRs 1140303 and 1142428
EWR-16-MEC-063-211, Technical evaluation white paper for quality level QA3 pump mechanical seal (Safety Injection (SI) pump), dated March 3, 2013
Functional Evaluation (FE) for CRs 116872 and 717540
Functional Evaluation for PER 116872, CCP Pump 1B-B Seal Leak, dated December 20, 2006
Functionality Evaluation Documentation for CR 1030462, dated June 13, 2015
PDO for CRs 980144, 1030462 and 10304625
Prompt Determination of Operability Documentation for PER 1125623, dated January 16, 2016
Prompt Determination of Operability Documentation for PER 980144, dated June 2, 2015
Test summary report for 2-PTI-070-03, Component Cooling System (CCS) Dual Unit Shutdown Flow Test, Rev. 0
TI-126, Post maintenance testing matrices, Rev. 14
Watts BAR UFSAR Section 6.3 and 15.5
WO 112238591, WBN 2B CCS pump exhibits excessive outboard seal leakage (one drop every 3-5 seconds), dated February 13, 2016
WO 116050574, 1A SIP: High Quantity of Seal Leak Off, dated September 8, 2015
WO 116537362, WBN SUT sys 074 CR 104324 2-PMP-074-0020-B replace leaking seal, dated January 24, 2016
WO 116635576, WBN SUT sys 074 CR 1043242 2-MTR-074-0010-A-2A-A RHR oil leak, dated January 31, 2016
WO 116727747, WBN PER 1016459 SUT sys 072 WBN-2-PMP-072-0010-B install a new flexible coupling, dated May 11, 2015
WO 116904879, WBN SUT sys 074 2B-B RHR pump seal is leaking, dated July 17, 2015
WO 117101491, WBN excessive seal leakage on 2A-A CS pump, dated February 19, 2016
WO 117379956, WBN 2A SIP seal leakage, dated March 13, 2016
WO 117379956, WBN 2A SIP seal leakage, dated March 13, 2016
WO 117555674, WBN mechanical seal pipe weepage, dated February 13, 2016
WO 117557722, WBN create WO to re-torque aux gland screws on 2A-A SI pump outboard seal, dated February 22, 2016
WO 117615320, Save the old seal and send it to a vendor for failure mode analysis
WO 117775807, WBN 2-PMP-72-27 2A Containment Spray pump has an outboard pump seal leak while running, dated May 13, 2016
NPG-SPP-07.1.7, Station Seasonal Readiness, Rev. 5
0-PI-OPS-1-FP, Freeze Protection, Rev. 12
CR 1197153
CR 1135129
CR 1135142
CR 1175780
CR 1147432
CR 1214592
CR 1235239
CR 1235253
Operators Logs, November 18 – 21, 2016

Section 4OA5: Other Activities

0-FOR-70-2, Component Cooling System Pump 2B-B Quarterly Performance Test, Rev. 20
50.59 screening for DCN 64013, Safety related makeup for CCS surge tank

Calculation EPM-RM-022389, Loss of volume from CCS surge tank
Calculation WBNAPS3802, Mission dose to connect spool piece between the CCS surge tank and ERCW system after a LOCA
Case CS00001442, Chesterton CCS Pump Seal Product Analysis, dated April 12, 2016
CR 1072853, Excessive seal leakage on 2A-A CS pump, dated August 9, 2015
CR 1108304, 2A SIP seal leakage, dated November 24, 2015
CR 1108717, 2B CCS pump seal leakage, dated November 25, 2015
CR 1111833, Duplicate of CR 1043242 (Potential adverse trend on U2 RHR mechanical seal leakage), dated December 4, 2015
CR 1120034, Pump leak off, dated December 30, 2015
CR 1122228, Boron leakage on shaft seals
CR 1125623, Required measurements not taken on 1A Safety Injection Pump seal replacement WO 116050574, dated January 15, 2016
CR 1130500, Mechanical seal pipe weepage, dated January 28, 2016
CR 1131211, Create WO to re-torque aux gland screws on 2A-A SI pump outboard seal, dated January 29, 2016
CR 1137691, Boron accumulation on 1A SIP inboard seal, dated February 15, 2016
CR 1140303, 2B CCS pump seal leakage, dated February 21, 2016
CR 1140758, Create WO to save the mechanical seal on the 2A-A SI pump, dated February 22, 2016
CR 1142428, CCS Pump seal concerns, dated February 22, 2016
CR 1150478, U2 RHR pump 2B-B may have a seal leak, dated March 17, 2016
CR 1164162, 2-PMP-72-27 2A Containment Spray pump has an outboard pump seal leak while running, dated April 25, 2016
CR 1165929, Calc WBNAPS3082 does not include the operator action to open ½-ISV-70-544B, dated May 18, 2016
CR 1170288, Extent of condition review of pump mechanical seal leaks
CR 1170288, This CR is written to capture a Procurement Engineering Group (PEG) review of listed TE for QA3, dated June 2, 2016
CR 1170604, 2A Containment Spray pump mechanical seal replacement failed PMT, dated May 13, 2016
CR 1171660, 2-PMP-74-20 has dried boron deposits on the top of the pump, dated May 16, 2016
CR 1208632, CR 1164162 (Mnt CMO) level 2 analysis MRC rejection 8/30/16, dated August 30, 2016
CR 980144, Increased leakage from 1A SI Pump Mechanical Seal, dated January 22, 2015
Equipment Apparent Cause Evaluation (EACE) Report, CCS Pump 2B-B, WBN-2-PMP-070-0033-B related to CRs 1140303 and 1142428
EWR-16-MEC-063-211, Technical evaluation white paper for quality level QA3 pump mechanical seal (Safety Injection (SI) pump), dated March 3, 2013
Functional Evaluation (FE) for CRs 116872 and 717540
Functional Evaluation for PER 116872, CCP Pump 1B-B Seal Leak, dated December 20, 2006
Functionality Evaluation Documentation for CR 1030462, dated June 13, 2015
PDO for CRs 980144, 1030462 and 10304625
Prompt Determination of Operability Documentation for PER 1125623, dated January 16, 2016
Prompt Determination of Operability Documentation for PER 980144, dated June 2, 2015
Test summary report for 2-PTI-070-03, Component Cooling System (CCS) Dual Unit Shutdown Flow Test, Rev. 0
TI-126, Post maintenance testing matrices, Rev. 14
Watts BAR UFSAR Section 6.3 and 15.5

WO 112238591, WBN 2B CCS pump exhibits excessive outboard seal leakage (one drop every 3-5 seconds), dated February 13, 2016
WO 116050574, 1A SIP: High Quantity of Seal Leak Off, dated September 8, 2015
WO 116537362, WBN SUT sys 074 CR 104324 2-PMP-074-0020-B replace leaking seal, dated January 24, 2016
WO 116635576, WBN SUT sys 074 CR 1043242 2-MTR-074-0010-A-2A-A RHR oil leak, dated January 31, 2016
WO 116727747, WBN PER 1016459 SUT sys 072 WBN-2-PMP-072-0010-B install a new flexible coupling, dated May 11, 2015
WO 116904879, WBN SUT sys 074 2B-B RHR pump seal is leaking, dated July 17, 2015
WO 117101491, WBN excessive seal leakage on 2A-A CS pump, dated February 19, 2016
WO 117379956, WBN 2A SIP seal leakage, dated March 13, 2016
WO 117379956, WBN 2A SIP seal leakage, dated March 13, 2016
WO 117555674, WBN mechanical seal pipe weepage, dated February 13, 2016
WO 117557722, WBN create WO to re-torque aux gland screws on 2A-A SI pump outboard seal, dated February 22, 2016
WO 117615320, Save the old seal and send it to a vendor for failure mode analysis
WO 117775807, WBN 2-PMP-72-27 2A Containment Spray pump has an outboard pump seal leak while running, dated May 13, 2016

LIST OF ACRONYMS

ABGTS	auxiliary building gas treatment system
ACAS	auxiliary control air system
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
CFR	*Code of Federal Regulations*
CR	condition report
CS	containment spray
EAL	emergency action level
ECCS	emergency core cooling system
EDG	emergency diesel generator
EP	emergency preparedness
ERCW	essential raw cooling water
ERO	emergency response organization
IDO	immediate determination of operability
IMC	Inspection Manual Chapter
IP	inspection procedure
LCO	limiting condition for operation
LOCA	loss of coolant accident
MFW	main feedwater
MR	maintenance rule
NCV	non-cited violation
NPG-SPP	nuclear power group standard programs and processes
NRC	Nuclear Regulatory Commission
PDO	prompt determination of operability
PI	performance indicator
QA	quality assurance
RHR	residual heat removal
RWST	refueling water storage tank
SDP	Significance Determination Process
SI	safety injection
SSC	structures, systems, or components
TDAFW	turbine-driven auxiliary feedwater
TS	technical specifications
TVA	Tennessee Valley Authority
UFSAR	Updated Final Safety Analysis Report
URI	unresolved item
WBN	Watts Bar Nuclear Plant
WO	work order