



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

May 12, 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
05000390/2017001, 05000391/2017001

Dear Mr. Shea:

On March 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Bar Nuclear Plant, Unit 1 and Unit 2. On April 20, 2017, the NRC inspectors discussed the results of this inspection with Mr. Sean Connors and other members of your staff. The results of this inspection are documented in the enclosed inspection report.

NRC inspectors documented two findings of very low safety significance (Green) in this report which involved violations of NRC requirements. Further, inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating these violations as noncited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest these violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Watts Bar Nuclear Plant.

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

J. Shea

2

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

Sincerely,

/RA/

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

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

Enclosure:
NRC IIR 05000390/2017001, 05000391/2017001
w/Attachment: Supplemental Information

cc Distribution via ListServ

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT
05000390/2017001, 05000391/2017001 May 12, 2017

DISTRIBUTION:

M. Kowal, RII
K. Sloan, RII
OEMAIL
RIDSNNRRDIRS
PUBLIC
RidsNrrPMWattsBarResource

ADAMS Accession No. ML17132A004

OFFICE	RII:DRP	RII:DRP	RII:DRP	RII:DRP	RII:DRP	
NAME	JNadal	JHamman	JJandovitz	JSeat	ABlamey	
DATE	5/9/2017	5/9/2017	5/9/2017	5/9/2017	5/12/2017	

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-390, 50-391

License No.: NPF-90, NPF-96

Report No.: 05000390/2017001, 05000391/2017001

Licensee: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Units 1 and 2

Location: Spring City, TN 37381

Dates: January 1 through March 31, 2017

Inspectors: J. Nadel, Senior Resident Inspector
J. Hamman, Resident Inspector
J. Jandovitz, Senior Resident Inspector
J. Seat, Project Engineer

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

Enclosure

SUMMARY

IR 05000390/2017-001; 05000391/2017-001; January 1, 2017 – March 31, 2017; Watts Bar Nuclear Plant; Readiness for Impending Adverse Weather Conditions, Equipment Alignment.

The report covered a three-month period of inspection by the resident inspectors. There are two NRC-identified and one self-revealing violations documented in this report. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP) dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects within the Cross-Cutting Areas" dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Revision 6. Documents reviewed by the inspectors not identified in the Report Details are listed in the Attachment.

Cornerstone: Initiating Events

- Green. An NRC-identified non-cited violation (NCV) of Technical Specification (TS) 5.7.1.1.a, "Procedures," was identified for a failure to maintain procedure 0-AOI-8, Tornado Watch or Warning. The entry criteria were inadequate to ensure that the required actions for a tornado watch or warning would be performed in a manner such that potential plant impact from a tornado would be mitigated or prevented. The violation was entered into the licensee's corrective action program (CAP) as condition report (CR) 1280644. The licensee's immediate corrective action was to install a weather radio in a continually manned security area with instructions for the security personnel to notify the control room for any tornado watch or warning declaration in Rhea County, TN.

The failure to maintain procedure 0-AOI-8 was a performance deficiency. The performance deficiency was more than minor because it adversely affected the procedure quality attribute of the Initiating Events Cornerstone objective, in that failure to take required actions in accordance with 0-AOI-8 after a tornado watch is issued could result in the inability to perform those actions if the watch is upgraded to a warning resulting in potential equipment failure. The inspectors determined that this finding was of very low safety significance (Green) because the finding did not cause a reactor trip, involve the complete or partial loss of mitigation or support equipment, or impact the frequency of a fire or internal flooding event. The finding has a cross-cutting aspect in the Identification component of the Problem Identification and Resolution area because the licensee had not identified procedure 0-AOI-8 inadequate entry criteria despite past issues with timely entry. [P.1]. (Section 1R01)

Cornerstone: Mitigating Systems

- Green. An NRC-identified finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings" was identified for the failure to follow TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23. Specifically, the licensee failed to address the seismic design bases impacts and structural integrity of the 2A-A essential raw cooling water (ERCW) strainer flush valve, 2-FCV-67-9B-A, in the basis of the immediate determination of operability (IDO).

The failure to document an IDO on January 16, 2016, based on information sufficient to address the capability of TS components to perform specified safety functions was a performance deficiency. The performance deficiency was more than minor because it affected the equipment performance attribute of the Mitigating Systems Cornerstone. Using IMC 0609 Appendix A, Exhibit 2 – Mitigating Systems Screening Questions, the inspectors determined that this finding was of very low safety significance (Green) because the finding did not represent an actual loss of function of a single train for greater than its TS allowed outage time. The finding has a cross cutting aspect in the Identification component of the Problem Identification and Resolution area as defined in NRC IMC 0310, because the organization failed to identify issues completely, accurately, and in a timely manner. Specifically, the Operations and Engineering department failed to fully and accurately identify the impact of the through wall flaw on 2-FCV-67-9B-A. [P.1]. (Section 1R04)

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

REPORT DETAILS

Summary of Plant Status

Unit 1 started the reporting period at or near 100 percent rated thermal power (RTP) and remained there until March 18, 2017, when the unit was shut down for a planned refueling outage. The unit remained shut down through the end of the inspection period.

Unit 2 started the reporting period at or near 100 percent RTP and remained there until March 20, 2017, when the unit was manually tripped due to a loss of main feedwater. The unit was restarted on March 22, 2017. On March 23, 2017, the Unit 2 turbine tripped due to a loss of condenser vacuum in the B condenser waterbox. Operators stabilized the reactor at approximately 3 percent power. Subsequently, the decision was made to manually trip the reactor and enter mode 3. Shortly afterwards operators entered mode 4 where the unit remained through the end of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors performed a site-specific weather related inspection due to anticipated adverse weather conditions, specifically high winds and a tornado watch, on March 1, 2017. Inspectors reviewed the implementation of procedure 0-AOI-8, Tornado Watch and Warning, Revision 17. Inspectors walked down relevant portions of the main control room and emergency diesel generator buildings where required actions are performed under 0-AOI-8. Inspectors performed a three year backward looking review of the implementation of 0-AOI-8 during actual tornado watch and warning conditions. Corrective actions for items identified in relevant conditions reports (CRs) and work orders (WOs) were assessed for effectiveness and timeliness. This activity constituted one Impending Adverse Weather inspection sample, as defined in Inspection Procedure (IP) 71111.01.

b. Findings

Introduction: An NRC-identified NCV of Technical Specification 5.7.1.1.a, "Procedures," was identified for a failure to maintain TVA procedure 0-AOI-8, Tornado Watch or Warning, Revision 17. The entry criteria were inadequate to ensure that the required actions for a tornado watch or warning would be performed in a timely manner such that potential plant impact from a tornado would be mitigated or prevented.

Discussion: On March 1, 2017, at 1251 the National Weather Service (NWS) issued a tornado watch for Rhea County, TN, where the Watts Bar Nuclear Plant is located. The residents called the main control room to determine if they were taking the required actions for a declared tornado watch. The licensee was not aware that a tornado watch had been issued. They confirmed the tornado watch, entered 0-AOI-8, and implemented the required actions for a tornado watch. These actions included dispatching an operator to the emergency diesel generator (EDG) building for the

duration of the tornado watch. The operator is then required to complete a procedure attachment which manipulates local EDG ventilation hand switches to ensure combustion and cooling air will remain available to the EDGs during a tornado.

The licensee indicated that notification by the operations duty specialist (ODS) in Chattanooga was their normally expected method of notification. However, initially it was thought that the ODS procedure only required notification to the site in the case of a tornado warning. Subsequently, it was discovered that no written procedural guidance for tornado watch or warning notification by the ODS existed, despite 0-AOI-8 indicating that notification by the ODS was one of the entry criteria for the abnormal procedure.

The residents performed a review of past issued NWS tornado watches and warnings in Rhea County and found four additional instances within the last three years where control room operators failed to enter 0-AOI-8 in a timely manner after the issuance of a tornado watch by the NWS. Therefore, procedure 0-AOI-8 had not been adequately maintained to ensure that actions necessary under a tornado watch would be carried out in a manner such that potential impact to important plant equipment would be appropriately mitigated or prevented.

Analysis: The failure to maintain procedure 0-AOI-8 was a performance deficiency. The performance deficiency was more than minor because it adversely affected the procedure quality attribute of the Initiating Events Cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operation. Specifically, failure to take required actions in accordance with procedure or delays before taking actions when a tornado watch is issued could result in the inability to perform those actions if weather conditions worsen, potentially resulting in equipment failure. The inspectors performed an initial screening of the finding in accordance with NRC Inspection Manual Chapter (IMC) 0609, Appendix A, "The Significance Determination Process for (SDP) for Findings At-Power". Using IMC 0609 Appendix A, Exhibit 1 – Initiating Events Screening Questions, the inspectors determined that this finding was of very low safety significance (Green) because the finding did not cause a reactor trip, involve the complete or partial loss of mitigation or support equipment, or impact the frequency of a fire or internal flooding event. The finding has a cross-cutting aspect in the Identification component of the Problem Identification and Resolution area as defined in NRC IMC 0310, because the organization failed to identify issues completely, accurately, and in a timely manner. Specifically, the organization had not identified or questioned 0-AOI-8 entry criteria despite past issues with timely entry and significant differences between sites in the fleet. [P.1].

Enforcement: Technical Specification 5.7.1.1.a, "Procedures," requires, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide (RG) 1.33, Revision 2, Appendix A. RG 1.33, Appendix A lists safety-related activities that should be covered by written procedures. Section 6 identifies procedures for combating emergencies and other significant events among which is 6.w "Acts of Nature (e.g., tornado, flood, dam failure, earthquakes)." This requirement is implemented, in part, by TVA procedure 0-AOI-8, Tornado Watch or Warning, Revision 17. Contrary to the above, prior to March 1, 2017, TVA did not maintain procedure 0-AOI-8 to respond to acts of nature, specifically tornadoes. The violation was entered into the licensee's corrective action program (CAP) as CR 1280644. The licensee's immediate corrective action was to

install a weather radio in a continually manned security area with instructions for the security personnel to notify the control room for any tornado watch or warning declaration in Rhea County, TN. 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 1280644. This violation is identified as NCV 05000390, 391/2017001-01, Failure to Maintain the Abnormal Operating Instruction for Tornadoes.

1R04 Equipment Alignment (71111.04)

.1 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. This activity constituted five inspection samples, as defined in IP 71111.04.

- 2A-A safety injection (SI) pump while 2B-B SI pump room cooler inspection was in progress
- 1A and 1C charging pumps while the 1B charging pump auxiliary oil pump was being replaced
- A train essential raw cooling water (ERCW) while a prompt determination of operability for ERCW pump clutch key failures was in effect with compensatory measures required
- 1A-A emergency diesel generator (EDG) while the 1B-B EDG was inoperable due to an ERCW B train outage
- 2A-A EDG while the 2B-B EDG was inoperable due to an ERCW B train outage

b. Findings

Introduction. An NRC identified finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, was identified for the failure to follow TVA procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23. Specifically, after identifying a through wall flaw in 2A-A essential raw cooling water (ERCW) strainer flush valve 2-FCV-67-9B-A, the licensee failed to address the valve's seismic design bases impacts and structural integrity in the basis of the immediate determination of operability (IDO).

Discussion. On January 4, 2017, the resident inspectors performed a walkdown of the A train of ERCW at the intake pumping station. The residents identified a stream of water from a through wall flaw on the valve body of 2-FCV-67-9B-A, the 2A-A ERCW strainer flush valve. Upon further review, the residents determined that the licensee had

previously written CR 1131468 on January 16, 2016, for the condition. The NRC's review of CR 1131468 identified that the IDO for CR 1131468 determined the valve was operable solely because it could be isolated for maintenance and the loss of ERCW flow due to the leak was minimal. The IDO did not identify the valve as an ASME code class 3 component. Although engineering added a log note to the CR indicating the degradation was a code class 3 leak over two weeks later, the structural integrity of the valve or its ability to maintain the design function of ERCW in a design bases earthquake was not considered. Additionally, failing to identify the ASME code class 3 component in the IDO resulted in no past operability evaluation being requested from Engineering by Operations.

The inspectors reviewed licensee procedure OPDP-8, Operability Determination Process and Limiting Conditions for Operation Tracking, Revision 23 and concluded that the IDO did not meet procedural requirements. 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."

The licensee wrote CR 1247701 to capture the inadequacies with the IDO identified by the inspectors. The shift manager declared 2-FCV-67-9B-A inoperable in response to the inspector-identified concerns after he conferred with Engineering and concluded that sufficient information was not available, and could not be obtained with the valve in service, to provide reasonable assurance that the valve would perform its safety function for all design bases events. The applicable 72 hour TS LCO was entered on January 4, 2017. The system was declared operable after a replacement valve was installed on January 5, 2017, within the LCO allowed outage time. A subsequent finite element analysis performed on the removed valve determined that it maintained its structural integrity and therefore the condition was not reportable under 10 CFR 50.73, licensee event reporting system, as a condition prohibited by TS.

Analysis. The failure to document an IDO on January 16, 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 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 2-FCV-67-9B-A from January 16, 2016, until January 5, 2017, and it therefore should have been declared inoperable. The inspectors performed an initial screening of the finding in accordance with NRC IMC 0609, Appendix A, "The Significance Determination Process for (SDP) for Findings At-Power". Using IMC 0609 Appendix A, Exhibit 2 – Mitigating Systems Screening Questions, the inspectors determined that this finding was of very low safety significance (Green) because the finding did not represent an actual loss of function of a single train for greater than its TS allowed outage time. The finding has a cross cutting aspect in the Identification component of the Problem Identification and Resolution area as defined in NRC IMC 0310, because the organization failed to identify issues completely, accurately,

and in a timely manner. Specifically, the Operations and Engineering organizations failed to fully and accurately identify the impact of the through wall flaw on 2-FCV-67-9B-A. [P.1].

Enforcement. Title 10 CFR Part 50, Appendix B to 10 CFR Part 50, 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. Contrary to the above, between January 16, 2016, and January 5, 2017, the IDO for 2-FCV-67-9B-A did not meet the requirements of OPDP-8 section 3.3.6.F. Specifically, the IDO 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 violation was entered into the licensee’s CAP as CR 1247701. Immediate corrective actions included declaring the valve inoperable, entering the applicable TS LCO, and replacing the degraded valve. 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 1247701. This violation is identified as NCV 05000391/2017001-02, Inadequate Immediate Determination of Operability for Essential Raw Cooling Water Flush Valve.

.2 Complete Walkdown

a. Inspection Scope

The inspectors performed a complete system walkdown of the ERCW system train A 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. This activity constituted one inspection sample, as defined in IP 71111.04.

b. Findings

No findings were identified.

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. This activity constituted eight inspection samples, as defined in IP 71111.05AQ.

- ERCW pump room, A train
- ERCW pump room, B train
- ERCW strainer room, A train
- ERCW strainer room, B train
- CR 1248968; Masking condition on Panel L622, Fire Protection Plan requirement not met
- CR 1250743; Missed entry into OR14-10 when closing power-operated relief valve (PORV) block valve 1-PCV-68-334
- Auxiliary building elevation 757
- Unit 1 containment

b. Findings

There was one licensee-identified violation identified which is documented in Section 4OA7 of this report.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

.1 Internal Flooding

The inspectors reviewed related flood analysis documents and walked down the area listed below containing risk-significant structures, systems, and components susceptible

to flooding. The inspectors verified that plant design features and plant procedures for flood mitigation were consistent with UFSAR design requirements and the internal flooding analysis assumptions. The inspectors assessed the condition of flood mitigation features such as drains, barriers, curbs, and door seals. In addition, the inspectors verified the licensee was identifying and properly addressing internal flooding issues in the corrective action program. This inspection constituted one inspection sample, as defined in IP 71111.06.

- ERCW strainer room, A train

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification and Performance (71111.11)

.1 Licensed Operator Regualification Review

a. Inspection Scope

On February 14, 2017, the inspectors observed the simulator evaluation for Operations Crew 4 per scenario 3-OT-SRT-FR-C2-1, LOCA and Degraded Core Cooling. The inspectors specifically evaluated the following attributes related to the operating crews' performance:

- Clarity and formality of communication
- Ability to take timely action to safely control the unit
- Prioritization, interpretation, and verification of alarms
- Correct use and implementation of abnormal operating instructions and emergency operating instructions
- Timely and appropriate Emergency Action Level declarations per emergency plan implementing procedures
- Control board operation and manipulation, including high-risk operator actions
- Command and Control provided by the unit supervisor and shift manager

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

b. Findings

No findings were identified.

.2 Observation of Operator Performance

a. Inspection Scope

Inspectors observed and assessed licensed operator performance in the plant and main control room, particularly during periods of heightened activity or risk and where the

activities could affect plant safety. Inspectors reviewed various licensee policies and procedures such as procedures OPDP-1, Conduct of Operations; NPG-SPP-10.0, Plant Operations; and GO-4, Normal Power Operation. Inspectors used activities such as post maintenance testing, surveillance testing and refueling, and other outage activities to focus on the following conduct of operations as appropriate. This activity constituted one Observation of Operator Performance inspection sample, as defined in IP 71111.11.

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

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

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

- Review of licensee's conclusion to not add the three megawatt 6.9 kilovolt FLEX diesel generators to the maintenance rule scope
- Evaluation of reactor coolant system (RCS) PORV block valve 068-C for (a)(1) status
- 125 VDC vital power system review

b. Findings

No findings were identified.

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

a. Inspection Scope

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

- Risk assessment for January 2, 2017, during emergent work for troubleshooting the Unit 2 trip status light test switch short on the main control board
- Risk assessment for work week 0130 with a yellow risk window for essential raw cooling water train B outage
- Risk assessment for March 7, 2017, during the 2A-A safety injection pump outage
- Risk assessment for work week 0227 with a yellow risk window for essential raw cooling water train B outage
- Risk assessment for March 23, 2017, when unit 1 was in mode 5 with yellow risk due to lowered RCS inventory and unit 2 was in mode 3 after a turbine trip and manual reactor trip

b. Findings

No findings were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

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

- Past operability evaluation (POE) for CRs 1250586 and 1253447 for unit 1 and unit 2 containment penetration X-77 found full of water
- POE for CRs 1255625 and 1255649 for unit 1 containment penetrations X-82 and X-83 found full of water

- Prompt determination of operability (PDO) for CR 1236767, ERCW clutch key failures
- POE for CR 1258568, EDG 2A-A new voltage regulator drifting
- PDO for CR 1265537, 1A safety injection pump discharge relief valve lifted and leaking after pump start

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

a. Inspection Scope

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

- Temporary modification 0-2016-067-002, Supply raw cooling water to essential raw cooling water train B while it is shut down during repairs of 1-FCV-67-24-B and 0-CKV-67-503G-B

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

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

- Work Order (WO) 117598162, 0-FOR-26-3 smoke test of containment purge filter housing 2-PLM-30-1E door following sprinkler system inspection
- WO 118284229 for EDG 1B-B following voltage regulator replacement
- WO 118506872 for essential raw cooling water pump G-B discharge check valve 0-CKV-67-503G following gasket replacement and temporary modification removal
- WO 118134582 for EDG 2B-B crank case pressure alarm modification
- WO 118529908 for auxiliary feedwater level control valve 2-LCV-3-171A following repairs after it failed to close during surveillance
- WO 118231283, 117956889 for ERCW train B restoration from strainer valve 1-FCV-67-24-B maintenance

b. Findings

No findings were identified.

1R20 Refueling and Outage Activities (71111.20)

.1 Unit 1 Refueling Outage Cycle 14

a. Inspection Scope

The inspectors reviewed the outage risk control plan for the Unit 1 Cycle 14 (1R14) refueling outage (RFO) to assess whether the licensee had appropriately considered risk, industry experience, and previous site-specific problems, and to also confirm that the licensee had mitigation/response strategies for losses of key safety functions.

The licensee began its 1R14 refueling outage on March 18, 2017. From that date through the end of this reporting period, the inspectors observed portions of the shutdown, cooldown, defueling, and maintenance activities to verify that the licensee maintained defense-in-depth (DID) commensurate with the outage risk plan and applicable TS.

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

- Licensee configuration management, including daily outage reports, to evaluate DID commensurate with the outage safety plan and compliance with the applicable TS when taking equipment out of service.
- Installation and configuration of reactor coolant instruments to provide accurate indication and an accounting for instrument error
- Controls over the status and configuration of electrical systems and switchyard to ensure that TS and outage safety plan requirements were met
- Decay heat removal processes to verify proper operation and that steam generators, when relied upon, were a viable means of backup cooling
- Controls to ensure that outage work was not impacting the ability to operate the spent fuel pool cooling system during and after core offload

- Reactor water inventory controls including flow paths, configurations, and alternative means for inventory addition, and controls to prevent inventory loss
- Reactivity controls to verify compliance with TS and to verify that activities which could affect reactivity were reviewed for proper control within the outage risk plan

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

b. Findings

No findings were identified.

.2 Unit 2 Forced Outage (March 23 – March 31)

a. Inspection Scope

The licensee entered a forced outage on Unit 2 due to a loss of condenser vacuum on the B condenser waterbox. On March 23, 2017, the unit was manually scrammed following a trip of the main turbine while at low power and entered mode 3. Mode 4 was entered shortly after and the unit remained there for the remainder of the inspection period. The inspectors observed the licensee's mode change and verified that this was performed in accordance with plant TS. The inspectors attended forced outage meetings and reviewed the daily risk assessments and condenser repair plans. This activity constituted one Refueling and Other Outage Activities sample, as defined in Inspection Procedure 71111.20.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors witnessed the surveillance tests and/or reviewed test data of selected risk-significant SSCs listed below, to assess, as appropriate, whether the SSCs met the requirements of the TS; the UFSAR; NPG-SPP-06.9, Testing Programs; NPG-SPP-06.9.2, Surveillance Test Program; and NPG-SPP-09.1, ASME Section XI. The inspectors also determined whether the testing effectively demonstrated that the SSCs were operationally ready and capable of performing their intended safety functions. This activity constituted 10 Surveillance Testing inspection samples; four in-service, four routine, one containment isolation valve, and one RCS leakage as defined in IP 71111.22.

In-Service Test:

- WO 117932285, 1-SI-74-901-A, Residual heat removal (RHR) pump 1A-A quarterly performance test
- WO 118070091, 1-SI-3-901-A, Auxiliary feedwater pump 1A-A quarterly performance test

- WO 118003461, 2-SI-3-901-B, Auxiliary feedwater pump 2B-B quarterly performance test
- WO 117903579, 1-SI-70-914-A, Component cooling system pump 1A-A comprehensive pump test

Routine Surveillances

- WO 117903440, 0-SI-82-11-A, Monthly diesel generator (DG) start and load test DG 1A-A
- WO 117761924, 0-SI-0-53-A, Monthly remote shutdown transfer switch verification, train A
- WO 117761559, 0-SI-82-3, Loss of offsite power - with ESF
- WO 117823677, 2-SI-3-22, 18 month channel calibration AFW pump 2B-B suction header pressure switches

Containment Isolation Valve

- WO 117823804, 2-SI-81-701, Containment isolation valve local leak rate test - primary water system

RCS Leakage

- WO 118454212, 1-SI-68-32, Reactor coolant system water inventory balance

b. Findings

No findings were identified.

4OA1 Performance Indicator (PI) Verification (71151)

a. Inspection Scope

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

- Unplanned scrams
- Unplanned scrams with complications
- Reactor coolant system activity
- Unplanned power changes per 7000 critical hours

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Review of Items Entered into the Corrective Action Program

As required by 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.

.2 Semiannual Trend Review

a. Inspection Scope

The inspectors performed a review of the licensee's CAP 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 October 2016 through March 2017. The inspectors reviewed licensee trend reports and the integrated trend reports from October 2016 to January 2017, in order to determine the existence of any adverse trends that the licensee may not have previously identified. This inspection constituted one Semi-annual Trend Review inspection sample as defined in IP 71152.

b. Observations and Findings

The licensee had identified trends and appropriately addressed them in their CAP. The inspectors observed that the licensee had performed a detailed review. The licensee routinely reviewed cause codes, involved organizations, established key words and system links to identify potential trends in their data. The inspectors compared the licensee process results with the results of the inspectors' daily screening. Trends that have been identified by the inspectors and reported to the licensee were appropriately entered into the licensee's trending program.

Noteworthy Licensee-identified trends included:

- Compliance with site procedures for seasonal weather readiness not meeting standards (CRs 1238661, 1236721, 1231927, 1242648, 1242507, 1242972, 1243114, 1253026)
- Temporary equipment had not been adequately tracked in accordance with the licensee's procedures (CRs 1243565, 1243607, 1232232, 1237561, 1253985, 1254720, 1254428)

Noteworthy NRC-identified adverse trends included:

- Several operability determinations have not been consistently meeting the licensee's required standards for completeness and accuracy (CRs 1252980, 1253305, 1247701, 1237178, 1216892)

- Weaknesses persist in implementation of the CAP, specifically with conditions adverse to quality (CAQ) not being documented and timeliness of CAP identification of conditions adverse to quality (CAQs). (CRs 215501, 1246822, 1250882, 1253313, 1263367, 1272965, 1278309, 1279462, 1268151)
- Issues involving water intrusion (NRC identified) and lighting (licensee identified) in the valve vault rooms near trip sensitive equipment (CRs 1229977, 1242980, 1237195, 1257488)

.3 Annual Sample: CRs 1265537, 85969, 1A safety injection pump (SIP) discharge relief valve lifted and leaking after pump start

a. Inspection Scope

The inspectors conducted a detailed review of the above CRs. This sample was selected considering safety significance and a history of SIP relief valve lifts during surveillance testing at Watts Bar. The inspectors evaluated the following attributes of the licensee's actions:

- complete and accurate identification of the problem in a timely manner
- evaluation and disposition of operability and reportability issues
- consideration of extent of condition, generic implications, common cause, and previous occurrences
- classification and prioritization of the problem
- identification of root and contributing causes of the problem
- identification of any additional condition reports
- completion of corrective actions in a timely manner

This activity constituted one annual follow-up of selected issues sample, as defined in IP 71152.

b. Findings

No findings were identified. The inspectors determined that:

- CRs were of sufficient detail and initiated in a timely manner, and classified properly;
- operability and reportability evaluations were adequate;
- consideration of extent of condition, generic implications, common cause, operating experience and previous occurrences were appropriate;
- the root cause analysis was adequate; and
- corrective actions were appropriate and completed or scheduled in a timely manner.

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153)

.1 (Closed) Licensee Event Report (LER) 05000391/2016-006-00: Turbine-Driven Auxiliary Feedwater Pump Auto Start on Lo-Lo Steam Generator Level Following Planned Unit Trip

a. Inspection Scope

The inspectors reviewed LER 05000391/2016-006-00 dated October 7, 2016. This LER discusses the automatic actuation of the auxiliary feedwater system on August 23, 2016.

Watts Bar Nuclear Plant Unit 2 (WBN2) was being stabilized following a preplanned reactor trip. Both motor-driven auxiliary feed water (MDAFW) pumps and the turbine-driven auxiliary feed water (TDAFW) pump were in operation maintaining steam generator (SG) water level between 6 and 50 percent in accordance with the reactor trip response procedure. After the TDAFW pump was secured by procedure, the SG water level lowered to the Lo-Lo alarm setpoint (17 percent) the TDAFW pump automatically started. WBN2 was at zero percent power and the lowest SG level reached was 15 percent.

The licensee determined the cause of the automatic TDAFW actuation was that the pre-job brief failed to discuss the auto start feature of the TDAFW pump at Lo-Lo SG water level of 17 when discussing the procedure requirements controlling SG water level.

The inspectors reviewed the LER associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The licensee changed procedure 2-SOI-3.02, Auxiliary Feedwater System, to add SG water level values for automatic auxiliary feedwater (AFW) pump start and a note for the operators to control water levels above AFW initiation signals prior to any AFW pump shutdown. Additional corrective actions included the briefing of Operations personnel on this event and licensed operator training on response and assignment of critical parameter trigger values for Unit 2 SGs for the conditions of this event. All corrective actions were completed at the time of this inspection report.

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report (LER) 05000391/2016-004-00, Reactor Trip and Safety Injection (SI) Actuation Caused by Turbine Governor Valve Failure

a. Inspection Scope

The inspectors reviewed LER 05000391/2016-004-00 dated August 4, 2016. This LER discussed safety injection actuation and subsequent automatic reactor trip caused by a turbine governor valve failure. On June 5, 2016, WBN2 was at approximately 12.5 percent power, in power ascension testing, when the #1 high pressure turbine governor valve failed to the open position causing a steam header pressure to decrease to the SI actuation signal setpoint. A bracket for the turbine governor valve linear variable differential transmitter mechanically failed from vibration-induced fatigue resulting in the valve failing open. The safety injection was terminated after approximately 18 minutes.

The inspectors reviewed the LER associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The inspectors also reviewed the corrective actions and found that the licensee fixed the turbine valve components and performed an extent of condition inspection on Unit 1 and Unit 2 turbine valves. The operations procedure 2-GO-3, Unit Startup From Less than 4% Reactor Power to 30% Reactor Power, was revised to include Siemens recommendation to minimize main generator operation when governor valve and turbine valve position is less than 12 percent.

Lastly, a water hammer walkdown was conducted with no significant findings. All these corrective actions were completed at the time of this inspection report.

b. Findings

No findings were identified.

.3 (Closed) Licensee Event Report (LER) 05000391/2016-007-00, Manual Reactor Trip Due to Loss of Main Feedwater

a. Inspection Scope

On August 23, 2016, during power ascension testing, operators manually tripped the Unit 2 reactor due to lowering SG levels caused by a loss of main feedwater (MFW) from the 2A MFW pump. The unit was at approximately 46 percent power in mode 1 at the time of the event. The 2A MFW pump turbine began slowing down due to a loss of control oil from a failed hose connection. The loss of feedwater flow was unrecoverable because it was the only running MFW pump at the time and the operators performed a manual reactor trip. The licensee determined that the hose connection installed was of a different type than required. This was determined by the licensee to be a latent human performance error during the construction process for the 2A MFW pump. This connection was not visible for the construction turnover process and did function for the preoperational testing and during the power ascension testing to this point.

The inspectors reviewed the LER and trip report associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The inspectors also reviewed the corrective actions and found they were adequate for cause of the event. The hose connection was replaced with the proper configuration. Similar connections were inspected for the 2A and 2B MFW pumps with none found. Mechanical procedures and training were evaluated and considered adequate. All these corrective actions were completed at the time of this inspection report.

b. Findings

No findings were identified.

.4 (Closed) Licensee Event Report (LER) 05000391/2016-008-00, Reactor Trip Resulting from Failure of 2B Main Bank Transformer

a. Inspection Scope

The inspectors reviewed LER 05000391/2016008-00 dated October 28, 2016. This LER discussed an automatic reactor trip on WBN2 during power ascension testing. On August 30, 2016, at 9:10 p.m. eastern daylight time (EDT), WBN2 experienced an electrical fault on the low voltage side of the 2B main bank transformer (MBT) caused by an internal fault. The fault caused a turbine trip followed by an automatic reactor trip. The fault also resulted in a fire in the 2B MBT, and the licensee appropriated declared a Notice of Unusual Event (NOUE) at 9:20 p.m. EDT. All control rods fully inserted and no safety or relief valves lifted. All safety systems performed as expected, the AFW system actuated as designed. The MBTs are part of the main generator output power system.

Automatic fire suppression for the 2B MBT operated as expected and a fire fighting team was established by the fire brigade with assistance from local fire departments. The fire was extinguished at 10:30 p.m. EDT. The NOUE was terminated at 11:42 p.m. EDT.

The inspectors reviewed the LER and trip report associated with this event and determined that the report adequately documented the summary of the event including the cause of the event and potential safety consequences. The 2B MBT was sent to a vendor to determine the cause of the event. Their inspection revealed that the most likely cause was inadequate clearance between X1 low voltage bushing braided flex connection and the X3 low voltage bus bar due to a latent design/installation deficiency. The inspectors also reviewed the corrective actions and found they were adequate for cause of the event. Corrective actions included removing the 2B MBT and replacing it with the spare transformer. In addition, substantive inspections of the 2A and 2C MBTs were conducted, although the specific cause was not known at this time. Unit 1 MBTs were not included in the extent of condition evaluation due to their time in service. All these corrective actions were completed at the time of this inspection report.

b. Findings

No findings were identified.

.5 (Closed) 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

a. Inspection Scope

This URI was initiated for the NRC issuance of Notice of Enforcement Discretion (NOED) 16-2-01, dated October 15, 2016, in order to review the circumstances that led to the NOED request to determine if any performance deficiencies or violations contributed to the need for the NOED. The inspectors reviewed the licensee's equipment apparent cause evaluation (EACE), the failure analysis from the vendor, Engine Systems Inc., their corrective actions to address the failure, and information from a subsequent breaker trip on February 3, 2017, during a 2B-B EDG 24-hour run. Previous evaluation of the accuracy and details of the licensee's request for the NRC to exercise discretion not to enforce compliance with the required action completion time for TS LCO 3.8.1 to complete the removal and replacement of the voltage regulator and post-maintenance testing required to restore EDG 1A-A was documented in NRC Integrated Inspection Report 05000390/2016004, 05000391/2016004.

On October 12, 2016, during performance of a 24-hour run on EDG 1A-A, the output breaker opened expectantly. The licensee completed an EACE that identified two potential causes. Initially a grid disturbance associated with the common station service transformer (CSST) that caused mega volt amps [reactive power] (MVAR) oscillations was considered the cause of the breaker trip. However, as part of the troubleshooting plan, during another EDG run the breaker tripped again with no associated grid disturbance. The licensee then concluded a faulty voltage regulator R4 potentiometer caused the breaker to trip.

The licensee sent the voltage regulator to the vendor for failure analysis. Their lab testing concluded the R4 potentiometer caused random setpoint changes that would

cause the breaker trip. There was previous operating experience with these unsealed potentiometers. In response to this experience, the licensee had a preventive maintenance activity to swipe (clean) these potentiometers.

Corrective actions associated with this event included replacing this R4 potentiometer on all four EDGs with a sealed pot design and plans to replace the R4 potentiometer on the remaining three EDGs in the future.

On February 3, during the 24-hour run on EDG 2B-B, the output breaker tripped on overcurrent. This was very similar to the EDG 1A-A trip discussed above. The licensee investigation and troubleshooting of this event concluded this event was a result of grid disturbance. The licensee then issued a supplement to the EACE for the October 2016 EDG 1A-A event and concluded that the initial breaker trip was due to a CSST grid disturbance and that the subsequent trip was due to the faulty R4 potentiometer. The corrective action to replace all the R4 potentiometers is on hold pending further evaluation.

The inspectors verified that the output breaker overcurrent relays that provided the breaker trip signals for the above events are isolated during emergency conditions. Therefore, these output breaker arc current relays will not prevent the emergency start of the EDGs.

This URI is closed.

b. Findings

No findings were identified.

.6 Unit 2 Manual Reactor Trip due to Lowering Steam Generator Levels on March 20, 2017

a. Inspection Scope

The inspectors responded to a Unit 2 manual reactor trip that occurred on March 20, 2017, due lowering steam generator levels caused by a loss of several secondary pumps. The unit was at approximately 91 percent power in mode 1 at the time of the event. The 2A hotwell pump tripped first, resulting in a loss of suction pressure to downstream pumps and the trip of the 2C condensate booster pump, shortly after all three condensate demineralizer pumps tripped. The MCR operators responded in accordance with procedural requirements to rapidly reduce load and attempt to recover steam generator levels due to the lowering feedwater flow. Subsequently, the 2B condensate booster pump tripped resulting in lowering steam generator levels that were not recoverable. The shift manager directed the manual trip of the unit at this time. It was later discovered that the safe stop pushbutton on the 2A hotwell pump was depressed and had been inadvertently bumped by workers in the area.

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

b. Findings

No findings were identified.

.7 Unit 2 Turbine Trip and Subsequent Manual Reactor Trip due to Loss of the B Condenser Waterbox on March 23, 2017

a. Inspection Scope

The inspectors responded to a Unit 2 turbine trip and a subsequent manual reactor trip that occurred on March 23, 2017. The turbine trip was caused by a structural implosion of the B condenser waterbox. The unit was at approximately 16 percent power in mode 1 at the time of the event. Main control room operators responded in accordance with abnormal procedures to reduce reactor power by manually driving rods into the core. These actions stabilized the reactor at approximately 3 percent power. Subsequently on the same day, the decision was made to manually trip the reactor and enter mode 3. Mode 4 was entered later that same day.

The inspectors responded to the event and reviewed unit parameters, main control room command and control, and system response to verify that both operators and equipment responded to the turbine and reactor trips as designed. The inspectors discussed the preliminary cause of the trip with the licensee and noted that a root cause team investigation was still in progress at the end of the inspection period.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA5 Other Activities

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

a. Inspection Scope

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

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

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

b. Findings

No findings were identified.

40A6 Meetings, including Exit

On April 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.

40A7 Licensee-Identified Violation

The following licensee-identified violation of NRC requirements was determined to be of very low safety significance or Severity Level IV and met the NRC Enforcement Policy criteria for being dispositioned as a non-cited violation.

Watts Bar Nuclear Plant (WBN) Unit 1 Operating License Number NPF-90, condition 2.F, requires, in part, that TVA shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in the Fire Protection Report for the facility, as described in NUREG-0847, Supplement 29. The WBN Fire Protection Report was developed for WBN to ensure compliance with the requirements of this licensee condition. Fire Protection Report, Part II, is the Fire Protection Plan (FPP). FPP Section 14, Fire Protection Systems and Features Operating Requirements (ORs), Subsection 14.10(b), Fire Safe Shutdown Equipment, paragraph 14.10.4, requires an hourly roving fire watch be established in auxiliary building rooms 757-A1 and 757-A10 within an hour of closure of pressurizer block valve 1-FCV-68-332-B.

Contrary to the above, on January 11, 2017, the licensee failed to perform a fire watch as required for fire safe shutdown equipment. Specifically, an hourly fire watch was not established or conducted when valve 1-FCV-68-332-B was closed for WO 117615614 for 1-SI-68-93, 18 Month Channel Calibration of PORV 1-PCV-69-334 Cold Overpressure Mitigation System Actuation Channel. The licensee determined valve 1-FCV-68-332-B was closed for about 2.5 hours when it was opened to restore compliance.

This violation is of very low safety significance (GREEN) based on the results of the IMC 0609, Appendix F, "Fire Protection Significance Determination Process," Phase I Screening Approach. The inspectors determined that this issue did not affect the Unit 1 reactor's ability to reach and maintain safe shutdown (either hot or cold) condition. This violation was documented in the licensee's corrective action program as CR 1250743.

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

G. Arent, Director, WBN Site Licensing
L. Belvin, Director, Radiation Protection and Chemistry
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
J. James, Director, Maintenance
B. Jenkins, Director, Plant Support
C. Rice, Operations Superintendent
P. Simmons, Site Vice President
A. White, Senior Manager, Site Quality Assurance

LIST OF REPORT ITEMS

Opened and Closed

NCV 05000390 391/2017001-01

Failure to Maintain the Abnormal Operating Instruction for Tornados (Section 1R01)

NCV 05000391/2017001-02

Inadequate Immediate Determination of Operability for Essential Raw Cooling Water Flush Valve (Section 1R04)

Closed

LER 05000391/2016-006-00

Turbine-Driven Auxiliary Feedwater Pump Auto Start on Lo-Lo Steam Generator Level Following Planned Unit Trip (Section 4OA3.1)

LER 05000391/2016-004-00

Reactor Trip and Safety Injection (SI) Actuation Caused by Turbine Governor Valve Failure (Section 4OA3.2)

LER 05000391/2016-007-00

Manual Reactor Trip Due to Loss of Main Feedwater (Section 4OA3.3)

LER 05000391/2016-008-00

Reactor Trip Resulting from Failure of 2B Main Bank Transformer (Section 4OA3.4)

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 (Section 4OA3.5)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

0-AOI-8, Tornado Watch or Warning, Rev. 0018
Log Entries Report dated 4/3/15 through 12/24/15 and 3/1/2017
0-SOI-82.02 ATT 1V, Diesel Generator (DG) 1B-B Valve Checklist 82.02-1V, Rev. 0000

Section 1R04: Equipment Alignment

WO 117772298
CR 1256733
CR 1262925

Procedures

0-SOI-67.01, Att 1H, Handswitch Checklist, Rev. 0
0-SOI-67.01, Att 1P, Train A Common and IPS Power Alignment Checklist, Rev. 5
0-SOI-67.01, Att 1V, Train A Common Equipment and IPS Valve Alignment Checklist, Rev. 15
0-SOI-67.01, Att 2P, Train B Common and IPS Power Alignment Checklist, Rev. 3
0-SOI-67.01, Att 2V, Train B Common and IPS Power Alignment Checklist, Rev. 5
0-SOI-67.01, Att 3V, Supply Header 1A Valve Alignment Checklist, Rev. 8
0-SOI-67.01, Att 4P, Power Checklist, Rev. 5
0-SOI-67.01, Att 4V, Supply Header 1B Valve Alignment Checklist, Rev. 8
0-SOI-67.01, Att 5V, Supply Header 2A Valve Alignment Checklist, Rev. 13
0-SOI-67.01, Att 6V, Supply Header 2B Valve Alignment Checklist, Rev. 13
MMTP-102, Attachment 6, Site Engineering Scaffold Evaluation, Scaffold No. 118320348
0-TI-100.011, Appendix B, IST Valve Bases
IMC 0326, Operability Determinations and Functionality Assessments for Conditions Adverse to Quality or Safety, Appendix C-9 dated 12/03/15
Equipment Apparent Cause Evaluation Report (EACE), dated 01/31/2016

Drawings

Drawing 0-47W845-1, Mechanical Flow Diagram – Essential Raw Cooling System
Drawing 2-47W911-1, Flow Diagram Safety Injection System, Unit 2
Drawing 0-47W845-1, Mechanical Flow Diagram – Essential Raw Cooling Water System,
Rev. 3

Section 1R05: Fire Protection

IPS-0-711-01, Prefire plan for IPS elevation 711 and 722, Rev. 2
IPS-0-728-01, Prefire plan for IPS elevation 728 and 741, Rev. 2
CR 1248968
CR 1250882
CR 1251416
Part II - Fire Protection Plan, Revision 52
CR 1250743
Reportability Evaluation – CR 1250743, Missed Fire Watch per OR 14.10.4 for 1-FCV-68-332
WBN-Prefire Plan AUX-0-757-01, Rev. 2
PFP No. AUX-0-757-02, Rev. 4
PFP No. AUX-0-757-04, Rev. 3
WBN-Prefire Plan AUX-0-757-04, Rev. 5
Shift Manager's Daily OR Tracking Log dated February 24, 2017

Section 1R06: Flood Protection Measures

CR 1257202

Drawing 34N320

WB-DC-40-29, Flood Protection Provisions

WB-DC-20-28, Intake Pumping Station Watertight Doors at Elevation 722.0, Rev. 6

Section 1R07: Heat Sink Performance

0-TI-79.000 Program for Implementing NRC Generic Letter 89-13 Rev 0000

Section 1R11: Licensed Operator Regualification Program

Simulator Exercise Guide (SEG) # 3-OT-SRT-ECA-0.02, Loss of Offsite Power and Loss of All AC, Rev. 1; and Watts Bar Cycle 16-02 LOR Curriculum

SEG # 3-OT-SRE0003, Loss of Coolant Accident, Rev. 18; and Watts Bar Cycle 16-01 LOR Curriculum

SEG # 3-OT-SRT-OPDP1, Conservative Decision Making, Rev. 0; and Watts Bar Cycle 16-04 LOR Curriculum

SEG # 3-OT-SRD0046, Sim Static, Rev. 0; and Watts Bar Cycle 16-04A LOR Curriculum, Rev. 1

SEG # 3-OT-SRT-FR-C2-1, LOCA & Degraded Core Cooling, Rev. 3

SEG, # 3-OT-SRT-FR-C2-1, LOCA & Degraded Core Cooling, Rev. 3, Attachment 2 WBN Logging Requirements Operating Experience

Scenario Overview for 3-OT-SRD0013; and Watts Bar Cycle 16-03 LOR Curriculum

Screening Review/50.59 Evaluation Coversheet

Training Procedure TRN-12, Simulator Regulatory Requirements, Rev. 0011

WBN Simulator Discrepancy Reports dated 9/22/2015-2/16/2017

ANSI/ANS-3.5-1985

WO 117262544

1-PI-OPS-ANN, Annunciator Verification, Rev. 0002

U.S.NRC 10 CFR 55.45, Operating Tests

Section 1R12: Maintenance Effectiveness

Maintenance rule expert panel meeting 17-01 minutes, January 26, 2017

Maintenance rule expert panel meeting 17-02 minutes

NRC IP 71111, Attachment 12, Maintenance Effectiveness

NUMARC 93-01

CR 1210739

0-TI-110, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting – 10CFR50.65, Rev. 0007

CDE Record 1476 dated August 16, 2016

CDE Record 1466 dated August 03, 2016

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

WO 118388341

CR 1252180

NPG-SPP-22.202, Human Performance Tools, Rev. 0010

NPG-SPP-04.4, Material Issue, Control and Return, Rev. 0004

MMDP-15, Conduct of Maintenance-Expectations and Standards, Rev. 0011

NPG-SPP-07.3, Work Activity Risk Management Process, Rev. 0019

Operator's risk evaluation for Watts Bar Unit 1 2/1/17

Temporary Modification WBN-0-2016-067-002, Rev. 0

Contingencies – Risk Management Actions for WBN-0-2016-067-002, Rev. 0

Technical Product Consequence/Risk factor evaluation for WBN-0-2016-067-002, Rev. 0
 Technical Product Risk Compensating Actions for WBN-0-2016-067-002, Rev. 0
 Probabilistic Risk Assessment for WBN-0-2016-067-002, Rev. 0

Section 1R15: Operability Determinations and Functionality Assessments

WO 117817468

2-SI-59-701, Containment Isolation Valve Local Leak Rate Test Demineralized Water, Rev. 0003

Drawings 2-47W492-209, Rev. 1; 2-47W492-208, Rev. 3

0-SOI-59.01, Demineralized Water System, Rev. 0012

POE for CRs 1255625 & 1255649

POE for PER 1250586 & 1253447

NPG Calculation MDQ1999-980010, Post accident primary containment penetration isolation piping over pressure analysis (GL 96-06 RAI Valve Leakage), Rev. 002

POE Documentation for CR 1258568, dated 2/13/17

PRA Evaluation Response, WBN-0-17-014, R0

Attachment 1, Equipment Apparent Cause Evaluation (EACE) Report, CR 1258568

2048-0033-RPT-001, ERCW pump reverse rotation start analysis, Rev. 1

POE for CR 1236767 and 1231774 dated January 30, 2017

EACE for CR 1231774, Rev. 1

CR 1231774, 0-MTR-67-0032-A ERCW Pump Mtr B-A, dated November 10, 2016

CR 1236767

MPR letter 20148-0033-LTR-01, MPR response to NRC comments on ERCW pump reverse rotation start analysis, Rev. 0

Section 1R18: Plant Modifications

Temporary Modification Control Form, WBN-0-2016-067-002, Supply RCW to ERCW B-Train while the Train is Shutdown During the Repairs of 1-FCV-67-24-B & 0-CKV-67-503G-B, Rev. 0

Technical Evaluation WBN-0-2016-067-002, Supplemental Cooling to the B-Train of ERCW while the system is shutdown to allow for the repairs of 1-FCV-67-24-B and 0-CKV-67-503G-B

Screening Review/50.59 Form, WBN-0-2016-067-002, Rev. 0, dated 12/8/16

Screening Review/50.50 Form, WBN-0-2016-067-002, dated 12/1/16

Drawing Change Authorizations for drawings 0-47W844-4, Rev. 1; 0-47W845-2, Rev. 3; WBN-0-2016-067-002, dated 12/8/16

Technical Product Consequence/Risk Factor Evaluation, WBN-0-2016-067-002, dated 12/8/16

Air Coil Input Data Sheet, WBN-0-2016-067-002 Attachment 1, dated 10/18/2016

PRA Evaluation Responses, WBN-0-16-113 RO; WBN-0-16-127 RO; WBN-0-2016-067-002 Attachment 5, dated 10/4/2016

MAI-4.8, Installation, Modification, and Maintenance of Thermal and Antisweat Insulation, Rev. 0016

WO 114780485, WBN-0-CKV-067-0503G-B, ERCW Pump G-B, PM 600101648

UNID WBN-0-CKV-067-0503G-B, Attachment A, WO 114780485

0-MI-0.0007, Check Valve, Rev. 0011

Vendor Document WBN-VTD-A415-0030, Assembly, Installation and Maintenance for Anderson-Greenwood CV1B Wafer Style Check Valve

Vendor Manual WBN-VTM-A415-0020, Installation and Maintenance Instructions for Anderson-Greenwood Valve

Drawings 0-47W845-1, Rev. 4; 0-47W844-4, Rev. 2; 0-47W845-2, Rev. 3

0-SOI-67.04, Essential Raw Cooling Water – Removal of the Entire B Train from Service in Support of Maintenance, Rev. 0002

Section 1R19: Post Maintenance Testing

WO 117598162

0-FOR-26-3, 18 Month Inspection of Fire Protection Sprinkler Systems in Accessible Safety-Related Areas, Rev. 10

CR 1249339

CR 1249288

WO 118231283

Component WBN-1-FCV-067-0024-B, Attachment A, WO 118231283

0-MI-0.033, Butterfly Valve Maintenance, Rev. 0004

0-MI-0.29, Enhanced Valve Packing, Rev. 0006

WO 117956889 – WBN-1-FCV-067-0024-B

Drawings 45B1769-8A, Rev. 7; 45W1769-1, Rev. 0

Vendor Manual WBN-VTD-W030-0020, The Walworth Company Maintenance Manual Cast Steel Bolted Bonnet Gate, Globe and Swing Check Valves

PER 940703

Drawing 1-45W751-11, Rev. 64

NPG-SPP-10.1, System Status Control, Rev. 0008

0-MI-57.103, Torque Values for Electrical Terminations, Rev. 0003

Drawing 0-45W760-67-4, R0

0-MI-0.0006, MOVATS Testing of Motor Operated Valves, Rev. 0005

0-MI-0.16.01, Limitorque Motor Operator Repair and Adjustments Guidelines for SMB-000. (10 CFR 50.49), Rev. 0004

WBN-1-MVOP-067-0024-B, Attachment A Work Instructions, WO 117956889, Rev. 1

0-MI-0.03, Limitorque Motor Operator Adjustment Guideline Type SMB and SB (10 CFR 50.49), Rev. 0005

WO 118284229

WO 118506872

CR 1262983

CR 1272965

CR 1263765

VR # 6021-Vendor Manual revision request

WBN-VTD-L170-0270, Vendor Document coversheet and revision log

NPG-SPP-06.14 Troubleshooting Plan

Section 1R20: Refueling and Other Outage Activities

Section 1R22: Surveillance Testing

WO 117903440

0-SI-82-11-A, Monthly Diesel Generator Start and Load Test DG 1A-A, Rev. 0049

WO 117932149

WO 118454212

1-SI-68-32, Reactor Coolant System Water Inventory Balance, Rev. 0017

WO 117932285

1-SI-74-901-A, Residual Heat Removal Pump 1A-A Quarterly Performance Test

WO 117823804

2-SI-81-701, Containment Isolation Valve Local Leak Rate Test Primary Water System, Rev.0001

WO 117761924

1-SI-0-53.1-A, 18 Month Remote Shutdown Transfer Switch Verification Pre-Outage
Performance – Train A, Rev. 0020
WO 118070091
1-SI-3-901-A, Motor Driven Auxiliary Feedwater Pump 1A-A Quarterly Performance Test, Rev.
0027
CR 1262913
WO 118003461
2-SI-3-901-B, Motor Driven Auxiliary Feedwater Pump 2B-B Quarterly Performance Test, Rev.
0006
WO 117761559
0-SI-82-3, 18 Month Loss of Offsite Power with Safety Injection – DG 1A-A, Rev. 0063
0-SI-82-3, 18 Month Loss of Offsite Power with Safety Injection – DG 1A-A, Rev. 0063,
Appendix C
CR 1252620
WO 117823677
NPG Pre-Job Briefing Checklist dated 1/19/17
2-SI-3-22, 18 Month Channel Calibration Auxiliary Feedwater Pump 2B-B Suction Header
Pressure Switches, Rev. 0004
WO 117903579
1-SI-70-914-A, Component Cooling System Pump 1A-A Comprehensive Pump Test, Rev. 4

Section 4OA1: Performance Indicator Verification

Watts Bar 1 – Quarterly Performance Indicators
Watts Bar 2 – Quarterly Performance Indicators
NRC Inspection Procedure 71151, Performance Indicator Verification

Section 4OA3: Followup of Events and Notices of Enforcement Discretion

CR 1178855
CR 1202562
2-SOI-3.02, Auxiliary Feedwater System, Rev. 4
WBN Operations Communicator, Auto Start of U2 TDAFW Pump, August 12, 2016
Performance Analysis Worksheet (PAW) for CR 1202562, August 31, 2016
2-GO-3, Unit Startup From Less Than 4% Reactor Power to 30% Reactor Power, Rev. 0007
CR 1206191
Watts Bar Nuclear Plant Unit 2 Trip Report August 23, 2016 – 2A MFP Trip
0-AOI-30.1, Plant Fires, Rev. 0002
FP-MA-1.1, Watts Bar Nuclear Plant Fire Protection – Mitigating Actions WBN Emergency
Plan X, Rev. 2
CRs 1221797, 1222574, 12258025
NPG-SPP-06.14, Troubleshooting Plan for WBN-2-GE082-0002B-B
Engine Systems, Inc., Document # 8002761-FA, Failure Analysis of NEI AVR, Rev. 0
TS 3.8, Electrical Power Systems
TS B3.8, Electrical Power Systems, Rev. 125

Section 4OA5: Other Activities

WO 117252450
WO 116711879
WO 117734341
POE Documentation for CR 1258568
NPG-SPP-09.26.2, Generator Step-Up and Station Service Transformer Testing and
Maintenance Program, Rev. 0000

1-PI-OPS-1-SY, Switchyard Inspections, Rev. 0004

SOI-200.01, 6.9kV Start Buses, Rev. 0011

SOI-211.01, 6.9KV Shutdown Board 1A-A, Rev. 0016

1-SOI-201.01, 6.9 KV Unit Board 1A, Rev. 0001

Watts Bar Nuclear Plant, Units 1 and 2, Response to NRC Bulletin 2012-01, Design

Vulnerability in Electric Power System_Request for Additional Information

U.S. NRC Safety Evaluation Report, Related to the Operation of Watts Bar Nuclear Plant, Unit

2, NUREG-0847, Supplement 27

DCN 64063A