



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

May 1, 2015

Mr. Michael D. Skaggs  
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**SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED  
INSPECTION REPORT 05000391/2015603**

Dear Mr. Skaggs:

On March 31, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection of construction and testing activities at your Watts Bar Unit 2 reactor facility. The enclosed integrated inspection report documents the inspection results, which were discussed on April 9, 2015, with Mr. Zeringue and other members of your staff.

This inspection examined activities conducted under your Unit 2 construction permit as they relate to safety and compliance with the Commission's rules and regulations, the conditions of your construction permit, and fulfillment of Unit 2 regulatory framework commitments. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the enclosed report documents three NRC-identified findings which were determined to involve violations of NRC requirements. However, because the findings were all Severity Level IV violations and were entered into your corrective action program, the NRC is treating the violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC Enforcement Policy.

If you contest the non-cited violations in the enclosed report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTENTION: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Watts Bar Unit 2 Nuclear Plant. In addition, 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 Watts Bar Unit 2 Nuclear Plant.

In accordance with 10 *Code of Federal Regulations* (CFR) 2.390 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 (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC website at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have questions concerning this letter, please contact us.

Sincerely,

**/RA/**

Robert Haag, Chief  
Construction Projects Branch 3  
Division of Construction Projects

Docket No. 50-391  
Construction Permit No: CPPR-92

Enclosure: Inspection Report 05000391/2015603  
w/ Attachment

cc w/encl: (See next page)

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cc w/encl: (See next page)

\* Previous Concurrence

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  FORM 665 ATTACHED

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Letter to Michael D. Skaggs from Robert C. Haag dated May 1, 2015.

SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED  
INSPECTION REPORT 05000391/2015603

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PUBLIC

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-391

Construction Permit No.: CPPR-92

Report No.: 05000391/2015603

Applicant: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Unit 2

Location: Spring City, TN 37381

Dates: February 15, 2015 – March 31, 2015

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Approved by: Robert C. Haag, Chief  
Construction Projects Branch 3  
Division of Construction Projects

Enclosure

## EXECUTIVE SUMMARY

### Watts Bar Nuclear Plant, Unit 2

This integrated inspection included aspects of engineering and construction activities performed by Tennessee Valley Authority (TVA) associated with the Watts Bar Nuclear (WBN) Plant Unit 2 construction project. This report covered a seven-week period of inspections in the areas of quality assurance (QA), identification and resolution of construction problems, engineering and construction activities, preoperational testing, and follow-up of other activities. The inspection program for Unit 2 construction activities is described in Nuclear Regulatory Commission (NRC) Inspection Manual Chapter (IMC) 2517, "Watts Bar Unit 2 Construction Inspection Program." Information regarding the WBN Unit 2 Construction Project and NRC inspections can be found at <http://www.nrc.gov/info-finder/reactor/wb/watts-bar.html>.

### Inspection Results

- The NRC identified a severity level (SL) IV non-cited violation (NCV) of Title 10 to the Code of Federal Regulations (10 CFR) Part 50, Appendix B, Criterion III, "Design Control," for the applicant's failure to use the most limiting inputs in the essential raw cooling water (ERCW) pressure drop calculation. Specifically, the applicant failed to model the more limiting safety-related flow path of ERCW through the hydraulic gradient to the holding pond. The inspectors determined that this performance deficiency was more than minor because it represented an inadequate quality oversight function that, if left uncorrected, could adversely affect the quality of the testing and analysis of a safety-related structures, systems, and components (SSC). Specifically, the ERCW flow balance testing was performed with safety-related SSCs receiving less than design flow rates. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the Enforcement Policy. Specifically, the finding was a SL IV violation because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance. The applicant issued problem evaluation report (PER) 969021 to address this issue. The finding has a cross cutting aspect in the Design Margin component of the Human Performance area, as defined in NRC IMC 0310, because the applicant failed to ensure that design margins were closely guarded as a result of calculational errors [H.6]. (Section E.1.1)
- The NRC identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the applicant's failure to scope an adequate test to verify that anticipated water hammer forces would not exceed design limitations at high points in the ERCW piping associated with the upper containment coolers (UCCs). The inspectors determined that this was a performance deficiency and was more than minor because it represented an inadequate quality oversight function that, if left uncorrected, could adversely affect the quality of the testing and analysis of a safety-related SSC. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the Enforcement Policy. Specifically, the finding was a SL IV violation because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance. The inspectors determined that no cross-cutting aspect was applicable because the finding was not indicative of current applicant performance. (Section E.1.1)



- The NRC identified a SL IV NCV of 10 CFR 50, Appendix B, Criterion XVI, “Corrective Actions,” for failure to correct a NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants” interaction (location where a single dropped load could damage equipment associated with redundant safe shutdown trains). The inspectors determined that the failure to implement the corrective actions of PER 908065, which were intended to correct a NUREG-0612 interaction required to validate the NUREG-0612 Interaction Analysis, was a performance deficiency. This performance deficiency was determined to be more than minor in accordance with IMC 2517, Appendix C, because the failure to implement the corrective actions of PER 908065 represented an improper work practice that could impact quality or safety, involving safety-related SSCs. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the Enforcement Policy because the failure to correct a condition adverse to quality did not result in multiple examples of recurring significant deficiencies associated with a single construction activity. This finding has a cross-cutting aspect in the Procedural Adherence component of the Human Performance cross-cutting area, as defined in NRC IMC 0310, because the corrective action program procedure was not adhered to [H.8]. Specifically, the NUREG-0612 interaction of conduits 2VC6051A and 2VC9611A were not dispositioned in accordance with the corrective actions procedure. (Section OA.1.2)
- The inspectors concluded that issues pertaining to several open items, including nine inspection procedures (IPs), one temporary instruction (TI), one bulletin (BL), and one supplemental safety evaluation report (SSER) Appendix HH item have been appropriately addressed for WBN Unit 2. These items are closed.
- Other areas inspected were adequate with no findings identified. These areas included QA; piping; operations; mechanical components; emergency preparedness; fire protection; preoperational testing activities; and various NRC inspection procedures.

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## REPORT DETAILS

### Summary of Plant Status

During the inspection period covered by this report, Tennessee Valley Authority (TVA) performed construction completion and preoperational testing activities on safety-related systems and continued engineering design activities of the Watts Bar Nuclear (WBN) Plant, Unit 2 (U2).

#### I. QUALITY ASSURANCE PROGRAM

##### Q.1.1 Identification and Resolution of Construction Problems (Inspection Procedure 35007)

###### a. Inspection Scope

The inspectors continued to review problem evaluation reports (PERs), as part of the applicant's corrective action program, to verify that issues being identified under the corrective action program were being properly identified, addressed, and resolved by the applicant.

The inspectors performed a focused review of PER 236720 which was generated as a result of NRC-identified findings regarding the material condition of the residual heat removal (RHR), safety injection (SI), and reactor coolant system (RCS) piping. NRC-identified damage on these piping systems included arc strikes, paint splatter, weld spatter, and surface defects. The NRC issued a Severity Level (SL) IV, Non-Cited Violation (NCV) of Title 10 to the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion XIII, "Handling, Storage, and Shipping," in integrated inspection report (IIR) 05000391/2010603 (Agencywide Documents Access and Management System [ADAMS] Accession Number [No.] ML102170465).

PER 236720 documented the issues of concern and specifically identified all damaged locations needing repair. Corrective actions identified in the PER included an engineering evaluation of the non-conforming locations. This evaluation concluded that the issues involved arc strikes, weld spatter, paint spatter, and surface defects on the piping. All of these indications were repaired and cleaned in accordance with approved procedures and work orders (WOs).

The inspectors reviewed PER 236720 and associated WOs and determined that the applicant's actions, in response to this issue, were appropriate. The PER was closed to three separate WOs. The inspectors reviewed the WOs for the RCS system to verify corrective actions for those piping indications.

Additionally, the inspectors assessed the applicant's current practices and processes for ensuring that piping is in a proper condition prior to installation of reflective metal insulation (RMI), which is currently in process. The inspectors reviewed the applicant's procedures governing discovery, evaluation, remediation, and removal (as necessary) of indications on piping systems throughout the construction period, with the final piping external cleaning performed just prior to installing insulation on the piping. As part of this

inspection, the inspectors reviewed external cleanliness inspection reports (Procedure N3505, Attachment H), and insulation release forms (Procedure N3510, Attachment B). These forms were used by the applicant to verify that the external cleaning had been performed and the area to be insulated was free from surface defects for all American Society of Mechanical Engineers (ASME) Code Class 1 piping (regardless of location) and ASME Code Class 2 piping in containment. The inspectors reviewed the following procedures, which were coordinated as needed, to ensure piping cleanliness:

- 25402-000-GPP-0000-N3505, "Piping System Cleanliness," Revision (Rev.) 0004
- 25402-000-GPP-0000-N3510, "Insulation," Rev. 0006
- 25402-000-GPP-0000-N1213, "Walkdown Verification for System and Construction Area Completion and Damaged, Loose, or Missing Hardware," Rev. 0002
- 25402-000-GPP-0000-N7204, "ASME Section III Material and Component Surface Assessment," Rev. 0001
- 25402-000-GPP-0000-N3702, "Arc Strike Removal / Base Metal Repair of Piping/Components and Structural/Miscellaneous Steel," Rev. 0002

The inspectors also observed RMI installation on the chemical and volume control system (CVCS) piping inside containment, reviewed the WO package, and interviewed craft workers and field engineers to assess their understanding of the piping cleanliness requirements and verification process. In doing so, the following WOs and packages were reviewed, including external cleanliness inspection reports and insulation release forms, and verified to be consistent with the procedures identified above:

- WO 113595715, Perform Material and Component Surface Assessment, System 63 (SI)
- WO 115807898, RCS Loop 2 Crossover Piping Reflective Metal Insulation installation
- WO 115885469, RCS Loop 2 Crossover Piping Surface Assessment and Surface Deposit Removal
- WO 115338298, Install Reflective Metal Insulation on System 62 (CVCS)
- WO 115186084, Corrective Actions to Repair Arc Strikes on Pressurizer Piping and other Nonconforming Conditions Identified in PER 236720
- WO 111259484, System 74 (RHR) ASME III Clean External Surface of Piping

The inspectors also reviewed and followed up on the corrective actions of several PERs discussed throughout various sections of this report.

b. Observations and Findings

No findings were identified.

c. Conclusions

Overall, the piping inspection and cleanliness verification efforts were adequate. The issues identified in the PERs reviewed were adequately identified, addressed, and resolved.

## II. MANAGEMENT OVERSIGHT AND CONTROLS

### C.1 Construction Activities

#### C.1.1 Unit 1 and Unit 2 Construction Activity Interface Controls

##### a. Inspection Scope

The inspectors independently assessed applicant controls, associated with Unit 2 construction work activities, to prevent adverse impact on Unit 1 operational safety. The inspectors attended routine Unit 1/Unit 2 interface meetings to assess the exchange and sharing of information between the two site organizations. Periodic construction and planning meetings were observed, at least once per week, to assess the adequacy of the applicant's efforts to identify those construction activities that could potentially impact the operating unit. This included the review of select work activities, which the applicant had screened as not affecting Unit 1, to verify the adequacy of that screening effort. Additionally, the inspectors independently assessed select construction activities to verify that potential impacts on the operating unit had been identified and adequately characterized with appropriate management strategies planned for implementation. Furthermore, the inspectors performed independent walkdowns of select construction work locations to verify that controls to protect the operating unit provided an adequate level of protection and had been properly implemented.

Specific work activities observed during the current inspection period included work associated with:

- WO 111735249, CCH SYS 271 0-CRN-271-A1 Track AB Lifts, ABSCE breach
- WO 116633734, SUT SYS 067 WBN-2-MISC-067 2-PTI-067-02-A, Supplemental 1

Specific work activities that the applicant had screened out as not affecting Unit 1 included, but were not limited to, work activities as noted in this inspection report.

##### b. Observations and Findings

No findings were identified

##### c. Conclusions

Overall, management oversight and controls were in place for observed construction activities that could potentially impact the operating unit.

#### C.1.2 Reactor Vessel and Internals Work Observation (Inspection Procedure 50053)

##### a. Inspection Scope

The inspectors continued to monitor in-place storage of the reactor pressure vessel. The reactor pressure vessel, internals, core barrel, and reactor head were assembled during the third quarter of 2014; in addition the missile shield blocks were installed on

top of the reactor cavity; therefore, in-place and installed storage inspections of these components were limited as recommended by Inspection Procedure (IP) 50053 and could not be accomplished in their entirety due to the inaccessibility of the reactor pressure vessel components during this time. However, the inspectors did review access controls to ensure authorized entry of tools, equipment, and personnel; and also verified that cleanliness control requirements were being met. Most of the work around the reactor pressure vessel and inside the upper portions of the reactor building during the inspection period was limited to installation of the manipulator crane.

b. Observations and Findings

No findings were identified.

c. Conclusions

Quarterly inspection of the reactor pressure vessel storage was limited due to inaccessibility as a result of the components having been assembled. For the areas inspected, adequate controls were in place to protect the exterior portions of the reactor vessel.

**C.1.3 Piping – Hydrostatic Testing Activities (Inspection Procedure 49063)**

a. Inspection Scope

The inspectors observed WO 113268970, CCH SYS 003 WBN-2-003-B Pressure Test, a hydrostatic pressure test of the turbine-driven auxiliary feedwater (AFW) pump discharge piping. The inspectors verified that test pressures were held for the required hold times, weld inspections were performed, and nonconformances were documented accordingly.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors concluded that a hydrostatic test was completed in accordance with the approved procedures, and met the test requirements.

**C.1.4 (Closed) Containment Penetrations (Mechanical) Record Review (Inspection Procedure 53055)**

a. Inspection Scope

Background: Section F.1.1 of this report describes the WBN Unit 2 reconstitution effort. IIR 5000391/2009602 (ADAMS Accession No. ML091210420), Attachment 2, documented the reconstitution results for IP 53055 and determined that the requirements of the IP were not met with zero samples obtained. In addition, any sample of new mechanical containment penetration work or activities performed in areas covered by IP 53055 would be inspected. The majority of the mechanical containment

penetration work activities were completed prior to Unit 2 construction reactivation in 2007. The inspection scope of this IP included a review of historical records associated with mechanical containment penetrations installed by Chicago Bridge & Iron (CB&I) and Tube Turns as well as any records associated with rework activities.

Inspection Activities: The purpose of this IP was to confirm documentation met requirements for a sample of two or more records for safety-related containment penetration. This IP includes receipt inspection and material certification, installation and testing inspections, non-conformance/deviation records, training/qualification records, and quality assurance (QA) audits.

Portions of this IP have been previously addressed through inspection samples credited in the following IIRs:

- 05000391/2013603, (ADAMS Accession No. ML13134A239), Section C.1.6
- 05000391/2013605, (ADAMS Accession No. ML13220A640), Section C.1.9

Section 02.01 of this IP required a review of receipt inspection and material certification records. This section was completed in IIR 05000391/2013605, section C.1.9 with 3 samples obtained. Additionally, the inspectors reviewed a sample of historical certified material test reports (CMTR) and non-destructive evaluation (NDE) records, as required by ASME code, for the following penetrations:

- 2X-10A – Lower Compartment Purge Air Supply
- 2X-17 – Residual Heat Removal Return
- 2X-21 – Safety Injection System Pump Discharge
- 2X-48A – Containment Spray

Section 02.02 of this IP required a review of installation and testing inspection records. The attributes in subsections 02.02.a, 02.02.b, 02.02.c were considered complete during a record review associated with IP 53053, Sections 02.02.a and 02.02.b, in IIR 05000391/2013603, Section C.1.6. Additionally, the inspectors reviewed weld and leak testing records associated with the penetrations reviewed under Section 02.01 to verify that welds made were in accordance with ASME Section III code requirements and the required NDE and hydrostatic testing was performed. Section 02.02.d is considered complete with three hydrostatic test record samples reviewed.

Section 02.03 of this IP required a review of nonconformance/deviation records. This section was completed in IIR 05000391/2013605, Section C.1.9, with eight samples obtained.

Section 02.04 of this IP required a review of qualification records of craft, QA, and inspection (QC) personnel. This section was completed in IIR 05000391/2013605, Section C.1.9 with three samples obtained. Additionally, the inspectors reviewed historical welder performance qualifications (WPQ) for penetrations reviewed under Section 02.01 to verify individuals were qualified to perform various weld configurations in accordance with ASME Section III code.

Section 02.05 of this IP required a review of QA audit records. The inspectors reviewed two historical QA audit records associated with the installation of mechanical and



electrical penetrations and NDE procedures on penetrations. The inspectors verified that audits were performed and any identified deficiencies were corrected. Additionally, the inspectors reviewed a more recent Bechtel surveillance associated with grouting of a mechanical penetration. This section is considered complete with three samples obtained. Documents reviewed are listed in the Attachment.

b. Observations and Findings:

Below is a summary of each section of IP 53055:

- Section 02.01 – Complete
- Section 02.02 – Complete
- Section 02.03 – Complete
- Section 02.04 – Complete
- Section 02.05 – Complete

c. Conclusion:

The inspectors determined that records associated with mechanical containment penetrations were prepared, reviewed, and maintained properly and work was accomplished consistent with specifications. Based on the previous NRC inspections and the recent inspection efforts, a sufficient number of samples have been reviewed in order to consider IP 53055 closed; however, if additional mechanical containment penetration activities are performed, inspections may be performed at the NRC's discretion.

**C.1.5 (Discussed) Heat Sink Performance, Subissue: Emergency Raw Cooling Water Testing (Inspection Procedure 71111.07)**

a. Inspection Scope

Background: The ERCW system is a shared system for WBN Unit 1 and Unit 2. The ERCW pumps and associated ERCW piping systems have been in operation in support of WBN Unit 1. As such, the pumps and associated components have been subject to the requirements of 10 CFR 50.55a(f) testing of Class 1, 2, and 3 pumps and valves. The existing ERCW shared pumps have been subjected to the requirements of the ASME Boiler and Pressure Vessel operation and maintenance (O&M) code, as required by 10 CFR 50.55a(f), which, in part, requires the pumps to be subjected to periodic performance testing. Additional background and bases for inspection of this item were previously documented in NRC IIR 05000391/2014604 (ADAMS Accession No. ML14177A214).

Inspection Activities:

The inspectors reviewed a sample of the ERCW pump in-service testing (IST) results and compared those results to the requirements of the ASME O&M Code requirements. Specifically, the O&M Code divides pumps into two categories, Group "A" and Group "B" pumps. The ERCW pumps fall into category "A" type pumps, which is defined by the Code as pumps that are operated continuously, or routinely, during normal operation, cold shutdown, or refueling operations. The Code requirements for vertical line shaft

centrifugal pumps, such as the ERCW pumps, specifies that the pumps are to be tested in accordance with paragraph ISTB-5220 of the Code. Additionally, section ISTB-5221 provides the parameters that are to be monitored in order to meet the intent of the Code in Table ISTB-3000-1, "In-Service Test Parameters." The parameters to be monitored, per the table, include speed for variable speed pumps, differential pressure, discharge pressure, flow rate, and vibration levels.

The inspectors also performed a walkdown of selected components and piping related to the ERCW system for obvious signs of component degradation and system leakage. These areas included field locations such as the ERCW pump house, ERCW buried pipe routing from the pump house to the plant building structures, including the emergency diesel generator (EDG) cooler locations, auxiliary building room cooler locations, AFW pump area, and the component cooling system (CCS) heat exchanger area. These areas were reviewed for visible signs of system leakage, and general condition of the plant equipment located in these areas. Potential discrepancies that were noted and discrepancies identified during various testing scenarios, were entered (or had previously been entered) into the applicant's corrective action program.

The inspectors reviewed a sample of PERs to verify that appropriate corrective actions were being taken, in order to prepare and maintain Unit 2 heat exchanger equipment. The sample reviewed was associated with the resolution of PER/ hardware disposition tracking report 169257, which identified a concern on the Unit 2 Containment Spray (CS) heat exchangers. PER 169257 was identified as a result of a visual examination that reported a dried mud and silt buildup in the return piping, and on the middle support plate of one of the shell sides of the Unit 2 CS heat exchangers. The heat exchanger had been subjected to raw river water in the past, and the visual inspection reported deposits on the interior of the heat exchanger. Eddy current inspections were performed on the tubing of both heat exchangers, and resulted in the recommendation to replace one of the heat exchangers and to plug several tubes in the other heat exchanger. Periodic system flushing was also recommended.

The inspectors also reviewed updates to the licensee's valve IST program in order to verify that the records represented appropriate testing and maintenance on valves required for Unit 2 operation. The review also assured that the valves had been included in the IST program, and that restoration and maintenance activities had been initiated (per valve WO packages) for valves required for Unit 2 operation.

A sample of valve testing results was also reviewed to verify that the licensee demonstrated that they had tested stroke time requirements for valves associated with the ERCW system. Specifically, the inspectors reviewed calculation EPMRM070789, "Valve Stroke Time Determination for System 67, ERCW." This calculation provided the licensee's basis for the required open or closing stroke times, and the position to which the subject valve must move in order to perform its safety-related function. A sample stroke time result was compared to the Updated Final Safety Analysis Report (UFSAR) Chapter 15 timing assumptions, in order to provide reasonable assurance that the valve stroke time, used in the valve performance test, was appropriate when compared to the Chapter 15 accident assumption times.

The inspectors reviewed additional work packages in order to verify that the licensee was in the process of completing required valve testing. Specifically, WOs were

reviewed to verify that valve full-stroke exercising during system operation of the ERCW Train A was completed. The inspectors also sampled completed surveillance task documentation to verify it included the required stroke time for a valve to open to its required safety position. The licensee also provided a sample calculation to demonstrate that the disposition of previously unverified assumptions, in prior calculation revisions, was in progress to support Unit 2 operation. Specifically, the previous revisions had assumed that only Unit 1 was operating, and was being supported by some of the Unit 2 systems. The revised calculations included such items as the restoration of valves that were previously assumed to be locked-out for Unit 1 operation only. The calculation provided references to steps taken to restore the valves to service. A sample motor operated valve (MOV) refurbishment WO was reviewed to verify that the field maintenance procedures were sensitive to MOV stem friction issues.

Documents reviewed are listed in the Attachment.

b. Observations and Findings:

No findings were identified. Review of the sample performance tests provided for the ERCW system pump test results showed that the licensee's test procedure provided an established reference point value for suction pressure, discharge pressure, differential pressure, flow, and pump bearing vibration levels for each pump, along with acceptance criteria for tested parameters. The sample performance tests also included consideration for river elevation variations, in order to account for any river level impacts on the ERCW suction head provided by the river to the ERCW pumps. The tests also provided direction for reporting discrepancies, should the testing results fall outside required acceptance criteria.

The reviewed sample test results showed that the test point parameters were within the established test acceptance criteria ranges provided in the surveillance WO package test results. The monitoring of these parameters, and comparison to the acceptance criteria contained within the performance test procedure, provided reasonable assurance that the ERCW pumps were being tested in accordance with the requirements of the station procedures, and the ASME O&M Code.

A review of the IST program technical instruction showed that the licensee had taken steps to include Unit 2 valves in the IST Program technical instruction scope to satisfy the requirements of 10 CFR Part 50.55a(f). The IST program defined the requirements for valve testing to be performed during the Unit 2 pre-service testing period and identified the O&M Code Year applicable to Unit 2 pumps, valves, and pressure relief devices not currently in the scope of the Unit 1 IST Program.

c. Conclusion:

The activities and reviews completed relative to the ERCW pump and valve performance testing, as described above, provide reasonable assurance that the pump and valve samples reviewed meet the intent of the 10 CFR Part 50.55(a)(f) and ASME O&M code testing requirements.

## E.1 Engineering Activities

### E.1.1 Component Design Basis Inspection (Inspection Procedure 71111.21)

#### a. Inspection Scope

This inspection was a focused review of selected systems whose design margins would be affected by Unit 2 startup. The inspection constituted a partial completion of IP 71111.21, "Component Design Basis Inspection." Specifically, the inspection was performed to gain reasonable assurance that risk significant structures, systems, and components (SSCs) could adequately perform their design basis function. This includes reasonable assurance that the risk significant components could fulfill their design basis function during or after applicant activities (e.g., maintenance, surveillance) which could affect the component's availability, reliability and capability.

#### Components Inspected Under This IP:

- CCS Pumps
- CCS Heat Exchangers
- ERCW Pumps

#### For the 3 components listed above, the inspectors performed the following:

- Reviewed the plant technical specifications, UFSAR, and System Descriptions to establish an overall understanding of the design bases of the selected components.
- Reviewed system pressure drop calculations to verify that design flow rates will be met for safety-related users of ERCW and CCS, and to assure that design and licensing bases had been appropriately translated into these documents.
- Reviewed the heat removal capacity of the CCS heat exchangers to validate their capability to remove the required heat load for various modes of operations.
- Reviewed plant procedures to confirm that proper operator actions are assumed in design calculations and analyses.
- Reviewed design drawings to validate that design calculations and analyses used the proper system configurations.
- Reviewed computer programs used for analysis of safety-related components to validate that their use resulted in conservative output.
- Reviewed test procedures and recent test results against the system descriptions and the safety analyses to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents, and that individual tests and analyses served to validate component operation under the most challenging plant conditions. This included pre-operational fluid transient testing of the ERCW system piping associated with the upper containment coolers.
- Reviewed system modifications, vendor documentation, as well as preventive and corrective maintenance history and corrective action program documents, to verify that the performance capabilities of the affected components were not negatively impacted, and that potential degradations were monitored or prevented.
- Walkdowns were conducted (where plant conditions permitted), to verify that the installed components and their design configurations would support their design

and licensing bases functions under the most challenging plant conditions and had been maintained in a condition at least as adequate as assumed in design documents.

Documents reviewed are listed in the Attachment

b. Observations and Findings

b.1 (Opened) Break In Non-Seismic ERCW Discharge Piping

Introduction: The inspectors identified an unresolved item (URI) related to the applicant's failure to consider the effects of an open break in the non-seismic portion of the ERCW discharge flow path to the cooling tower basin in the calculation used to determine the net positive suction head (NPSH) available to the AFW pumps. This URI is to determine if the performance deficiency is more than minor.

Description: The non-seismic normal discharge flow path of the ERCW system is to the cooling tower basin. The inspectors noted that ERCW system description document WBNSDD-N3-67-4002, "Essential Raw Cooling Water System, System 67," Rev. 0028, stated, in part, that non safety-related ERCW system components shall be designed such that their failures do not jeopardize safety-related components. The inspectors also noted that calculation EPMJKJ011191, "WBN AFW System – Pump Net Positive Suction Head (NPSH) Available Calculation," Rev. 010, was used to determine the available NPSH for the AFW pumps.

Upon review of this calculation, the inspectors determined that the applicant failed to model the ERCW system considering an open break in the non-seismic portion of the discharge flow path to the cooling tower basin. A break of this type could result in a lower backpressure on the ERCW system, which could result in a reduction of available NPSH to the AFW system during accident conditions. Subsequent to the inspectors questioning, the applicant entered the issue into their corrective action program as PER 979323. The applicant is performing an evaluation to determine the magnitude of the loss of available NPSH. This issue will remain open pending the inspector's review of the applicant's evaluation in order to determine if the performance deficiency is more than minor. (URI 05000391/2015603-01, "Break In Non-Seismic ERCW Discharge Piping")

b.2 Failure To Use The Most Limiting Inputs In The ERCW Pressure Drop Calculation

Introduction The NRC identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the applicant's failure to use the most limiting inputs in the ERCW pressure drop calculation. Specifically, the applicant failed to model the more limiting safety-related flow path of ERCW through the hydraulic gradient to the holding pond.

Description: During accident conditions, the ERCW system provides cooling water to safety-related equipment and discharges through one of two flow paths. The discharge path to the cooling tower basin is neither seismically qualified nor safety-related. The seismically qualified and safety-related flow path is through the hydraulic gradients through the overflow structure and to the holding pond via yard standpipes.

Calculation MDQ00006720080341, "ERCW System Pressure Drop Calculation," Rev. 015, calculated the pressure losses in the ERCW system during dual-unit operation and verified that the system was capable of supplying the minimum required cooling water to the ERCW components served during various operating modes dual-unit operation. The inspectors identified that the applicant failed to model the ERCW discharge flow through the hydraulic gradients during various modes of dual-unit operation in the ERCW pressure drop calculation. This flow path resulted in a higher discharge backpressure, and a decrease in ERCW flow through the various safety-related components.

Subsequent to the inspector's questions, the applicant entered this issue into their corrective action program as PER 969021 and determined that it resulted in the 2A containment spray heat exchanger and the 2A component cooling heat exchanger receiving less than design flow.

The applicant's failure to use the most limiting inputs in the ERCW pressure drop calculation was determined to be a performance deficiency. The inspectors determined that this performance deficiency was more than minor because it represented an inadequate quality oversight function that, if left uncorrected, could adversely affect the quality of the testing and analysis of a safety-related SSC. Specifically, the ERCW flow balance testing was performed with safety-related SSCs receiving less than design flow rates. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the Enforcement Policy. Specifically, the finding was a SL IV violation because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance. The finding has a cross cutting aspect in the Design Margin component of the Human Performance area as defined in NRC inspection manual chapter (IMC) 0310, because the applicant failed to ensure that design margins were closely guarded as a result of calculational errors [H.6].

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to the above, since July 30, 2012, the applicant failed to appropriately verify or check the adequacy of design. Specifically, the applicant failed to model the safety-related flow path of ERCW through the hydraulic gradient to the holding pond in the ERCW pressure drop calculation. This finding was determined to be a SL IV violation using Section 6.5 of the NRC Enforcement Policy. Because this was a SL IV violation and the issue was entered into the applicant's corrective action program as PER 969021, this violation is treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. This violation is identified as NCV 05000391/2015603-02, "Failure To Utilize The Most Limiting Inputs In The ERCW Pressure Drop Calculation."

### b.3 Failure To Scope An Adequate Water Hammer Test

Introduction: The NRC identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the applicant's failure to scope an adequate test to verify that anticipated water hammer forces would not exceed design limitations at high points in the ERCW piping associated with the upper containment coolers (UCCs).

Description: Calculation B26880719066, "WBN Fluid Transient Event Identification For Essential Raw Cooling Water System (67)," was completed to identify fluid transients which could cause significant loads on piping, components, and associated supports. One of the transients identified was that during a loss of offsite power (LOOP) the ERCW pumps would trip and column separation was possible at high points in the ERCW piping associated with the UCCs. The water columns may subsequently rejoin when the ERCW pumps are restarted and develop severe water hammer impact forces.

To resolve the issue, the applicant chose to test and measure the pressure in the piping to confirm that it was below the design pressure of 160 pounds per square inch (psi) in accordance with test scoping document, 2-TSD-67, "Essential Raw Cooling Water System," Rev. 10. At the time of this inspection, this test had not been performed. The inspectors noted that the test scoping document directed testing be implemented by manually closing a 4" gate valve to the UCCs and waiting 20 seconds until an individual manually reopened the valve. Additionally, the scoping document directed that pressure transmitters be located approximately 75 feet below the top of the pipe.

The inspectors noted that the calculation recommended a test plan of tripping both ERCW pumps simultaneously and restarting them after 25 seconds. Additionally, it recommended that pressure readings be taken in various locations including the top piping elevation upstream of the check valve. The inspectors determined that the test scoping documents instructions to use a gate valve would not have been adequate to simulate the stopping and starting of the ERCW pumps and that measuring the pressure approximately 75 feet below the top of the pipe could be nonconservative. Additionally the inspectors determined that the test, as scoped, would not have adequately simulated the timing of the system, because the EDG acceptance criteria is  $\leq 10$  seconds, and the ERCW pumps will not sequence on until 20 seconds later. This would allow up to an additional 10 seconds of column separation over what the test would have specified. The inspectors concluded that the test, as defined in the test scoping document, could fail to verify that a water hammer, due to column separation, would not exceed design pressures and result in damage to the system. This issue was entered into the applicant's corrective action program as PER 981278 and corrective actions are being evaluated.

The applicant's failure to scope an adequate test to verify that anticipated water hammer forces would not exceed design limitations at high points in the ERCW piping, associated with the UCCs, was determined to be a performance deficiency. The inspectors determined that this performance deficiency was more than minor because it represented an inadequate quality oversight function that, if left uncorrected, could adversely affect the quality of the testing and analysis of a safety-related SSC. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the Enforcement Policy. Specifically, the finding was a SL IV violation because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance. The inspectors determined that no cross-cutting aspect was applicable because the finding was not indicative of current applicant performance.

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in 50.2 and as specified in the license

application, for those structures, systems, and components to which this appendix applies, are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, since December 20, 2010, the applicant failed to correctly translate the design basis into instructions by not scoping an adequate test to verify that anticipated water hammer forces would not exceed design limitations at high points in the ERCW piping associated with the UCCs. This finding was determined to be a SL IV violation using Section 6.5 of the NRC Enforcement Policy. This violation is being treated as an NCV consistent with section 2.3.2 of the NRC Enforcement Policy. The violation was entered into the applicant's corrective action program as PER 981278 and corrective actions are being evaluated. This violation is identified as NCV 05000391/2015603-03, "Failure To Scope An Adequate Water Hammer Test."

## **P.1 Preoperational Activities**

### **P.1.1 Preoperational Test Program Implementation Verification (Inspection Procedure 71302)**

#### a. Inspection Scope

02.01(Weekly Inspection Activities): The inspectors verified that the applicant's management control system was effectively discharging its responsibilities over the preoperational testing program by facility record review, direct observation of activities, tours of the facility, interviews, and discussions with applicant personnel. Preoperational testing activities during the inspection period included the following systems or portions thereof:

- System 061 - Ice Condenser
- System 072 - Containment Spray
- System 063 - Safety Injection
- System 003 - Auxiliary Feedwater

As systems became available for preoperational testing, inspectors toured the accessible areas of the facility to make an independent assessment of equipment conditions, plant conditions, security, and adherence to regulatory requirements. The inspectors also reviewed the following, as available and on a sampling basis, during the tours:

- general plant/equipment conditions;
- plant areas for fire hazards - examined fire alarms, extinguishing equipment, actuating controls, firefighting equipment, and emergency equipment for operability and also verified that ignition sources and flammable material were being controlled in accordance with the applicant's procedures;
- activities in progress (e.g., maintenance, preoperational testing, etc.) were being conducted in accordance with the applicant's procedures;
- watched for abuse of installed instrumentation such as stepping or climbing on the instrumentation that could affect the calibration or ability to function;
- listened for the public address system announcements to determine that blind spots do not exist; (i.e., cannot be heard clearly enough to be understood);
- construction work force was authorized to perform activities on systems or equipment; and



- looked for uncontrolled openings in previously cleaned or flushed systems or components.

The inspectors observed the component tests of the 2A charging pump and the 2A CS pump to verify that the tests were completed in accordance with the approved WOs (115968618 and 112243775). Also, the inspectors observed the motorized valve component tests for 2-FCV-63-175, 2-FCV-003,001-B, 2-FCV-003-126A-B, 2-FCV-63-0025-B to verify the test was completed in accordance with the approved work instructions.

The inspectors observed WO 112812228, SUT SYS 068 WBN-2-HTR-068-0341D/B1, the component testing of pressurizer heater elements. The inspectors observed the voltage and amperage measurements for 2-BKR-068-341D/B3, 2-BKR-068-341D/B4, and 2-BKR-068-341D/B7 to verify the tests were completed in accordance with the approved work instructions.

The inspectors observed WO 116432245, SUT SYS 003 Perform 2-CP-003B-4, the clean plan for the recirculation line piping associated with the 2B motor-driven auxiliary feedwater (MDAFW) pump. The inspectors observed the testing to verify that pump vibrations were being monitored and the clean plan procedure steps were being followed.

02.02 (Monthly Inspection Activities): During this inspection period, the inspectors reviewed the turnover package for the Unit 2 portion of the SI system (System 63) as part of procedure SMP 4.0, "System Completion and Turnover," Rev.12, to verify jurisdiction controls were appropriate and applicant procedures were followed. Additionally, the inspectors reviewed the turnover package to ensure required preventative maintenance was incorporated into a schedule for accomplishment.

The inspectors reviewed maintenance activities on safety-related equipment (2A CS pump), to verify that qualified personnel performed the activities, the maintenance was scheduled in accordance with developed procedures, and that these procedures were adequate for the maintenance being performed. The inspectors also discussed the methodology of the maintenance program with the refurbishment and preventative maintenance manager to determine how systems with completed preoperational testing would be protected once they transition to Operations.

02.03 (Quarterly Inspection Activities): The inspectors reviewed jurisdictional controls to verify that maintenance activities were performed by the proper group and sampled preventative maintenance activities to ensure satisfactory completion. The inspectors also witnessed testing and interviewed personnel to verify that the method for testing was current, that methods existed to assure personnel involved were knowledgeable of the test, that approved change methodologies were followed, that criteria for test interruptions were discussed, and that test deficiencies were properly documented. Additionally, the inspectors selected four pieces of measurement and test equipment (M&TE) to verify that calibration was current and administrative controls were implemented.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusion

The applicant's implementation of the preoperational test program was in accordance with procedures for those activities observed during the inspection period.

**P.1.2 Preoperational Test Procedure Review (Inspection Procedures 70300 and 70338)**

a. Inspection Scope

Background: The purpose of IMC 2513, "Light Water Reactor Inspection Program - Preoperational Testing and Operational Preparedness Phase," issue date January 1, 1984, is to verify through direct observation, personnel interviews, and review of facility records that:

- Systems and components important to the safety of the plant are fully tested to demonstrate that they satisfy their design requirements.
- Management controls and procedures, including quality assurance programs, necessary for operation of the facility have been documented and implemented.

IMC 2513 defines the minimum inspection program for a finding of readiness for license issuance (IP 94302, Status of Watts Bar Unit 2 Readiness for an Operating License). IMC 2513 requires the review of the mandatory tests defined in IMC 2513 and five of the primal tests defined in IMC 2513. The following inspection was performed in relation to satisfying the required procedural review.

Inspection Activities: The inspectors reviewed test procedure 2-PTI-003B-06, "ATWS Mitigation System Actuation Circuitry (AMSAC) Test," Rev. 0000 to verify that the test procedure adequately addressed NRC requirements and licensing commitments outlined in the FSAR, docketed correspondence, safety evaluation report (SER), technical specifications (TS), and Regulatory Guide 1.68. Additionally, the inspectors reviewed pre-operational test procedure 2-PTI-003B-06 to verify that the procedure contained the following administrative good practice attributes:

- the title described the purpose of the procedure;
- the cover page had appropriate information and approval signatures;
- each page had appropriate identification information;
- the last page was clearly identifiable by markings;
- a clear statement of procedure purpose/objectives;
- planning information such as prerequisites, precautions, required tools, reference documents, and coordination requirements;
- signoff requirements including concurrent and independent verification steps established where appropriate;
- equipment alignment instructions are clear and concise;
- equipment identifiers are accurate;
- actions to be taken within the steps are specifically identified;
- instrumentation units consistent for data collection;

- graphs, charts, tables, data sheets, and work sheets are clearly usable;
- calculation sheets technically accurate;
- clear coordination instructions for test activities involving multiple test personnel;
- clear instructions for system restoration;
- guidance for follow-up actions and points of contact;
- overall, clear concise steps for testing with action critical (acceptance criteria) steps identified;
- clear quantitative acceptance criteria with acceptability and contingencies;
- overall sequence of the procedure consistent with the obtaining the intended result; and
- system boundaries were reviewed to verify adequate overlap exists between tests to ensure the entire system will be tested.

The inspectors also reviewed the procedure to verify that precautions or explanations were placed immediately ahead of the steps to which they applied. The inspectors performed a detailed review with the responsible test engineer to verify that the acceptance criteria met design requirements.

Additionally, the inspectors reviewed the procedure to verify that the following important system performance functions were adequately reflected in this test procedure:

- proper operation of system components at or near normal system parameters, including steam supply to the turbine-driven pump, pump capacity and hydraulic performance,
- proper instrumentation verification,
- proper system control local and remote, and
- system control interlocks and alarms.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant's test procedure was written in a manner consistent with the guidance of procedure SMP-8.0, "Watts Bar Nuclear Plant Unit 2 Administration of Preoperational Test Instructions (PTI)," Rev. 11. This completes the procedure review of pre-operational test procedure 2-PTI-003B-06.

**P.1.3 (Closed) Preoperational Test Procedure Review (Inspection Procedures 70300 and 70333)**

a. Inspection Scope

Background: The background for this preoperational test procedure review is the same as that in the background section of P.1.2.

Inspection Activities: The inspectors reviewed pre-operational test procedure 2-PTI-062-03, "Hot Functional Test – Charging and Letdown," Rev. 0, to verify that the procedure contained the following administrative good practice attributes:

- the title described the purpose of the procedure;
- the cover page had appropriate information and approval signatures;
- each page had appropriate identification information;
- the last page was clearly identifiable by markings;
- a clear statement of procedure purpose/objectives;
- planning information such as prerequisites, precautions, required tools, reference documents, and coordination requirements;
- signoff requirements including concurrent and independent verification steps established where appropriate;
- equipment alignment instructions are clear and concise;
- equipment identifiers are accurate;
- actions to be taken within the steps are specifically identified;
- instrumentation units consistent for data collection;
- graphs, charts, tables, data sheets, and work sheets are clearly usable;
- calculation sheets technically accurate;
- clear coordination instructions for test activities involving multiple test personnel;
- clear instructions for system restoration;
- guidance for follow-up actions and points of contact;
- overall, clear concise steps for testing with action critical (acceptance criteria) steps identified;
- clear quantitative acceptance criteria with acceptability and contingencies;
- overall sequence of the procedure consistent with the obtaining the intended result; and
- system boundaries were reviewed to verify adequate overlap exists between tests to ensure the entire system will be tested.

The inspectors also reviewed the procedure to verify that precautions or explanations were placed immediately ahead of the steps to which they applied. The inspectors performed a detailed review with the responsible test engineer to verify that the acceptance criteria met design requirements. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant's test procedure was written in a manner consistent with the guidance of procedure SMP-8.0, "Watts Bar Nuclear Plant Unit 2 Administration of Preoperational Test Instructions," Rev. 11. The preoperational testing procedure review for System 62 is closed.

**P.1.4 (Closed) Preoperational Test Witnessing (Inspection Procedures 70302 and 70312)**

a. Inspection Scope

Background: The background for this preoperational test witnessing is the same as that in the background section of P.1.2. Additionally, this system was initially witnessed by NRC staff in IIR 05000391/2014602 (ADAMS Accession No. ML14086A063); however, due to the questions identified in Section E.1.1 of this report, the applicant re-performed a portion of this test to assist in the evaluation and disposition.

Inspection Activities: The inspectors witnessed activities associated with the performance of preoperational test instruction 2-PTI-067-02-A, "ERCW System Flow Balance - Train A, Supplement 1," Rev. 0000 to verify that the testing was conducted in accordance with approved procedures and to verify the adequacy of test program records and preliminary evaluation of test results. The purpose of the test was to address potential flow discharge through the hydraulic gradient as identified in PER 969021.

The inspectors assessed the following attributes associated with these test observations:

- all test personnel were on station and had the latest revision of the procedure;
- test prerequisites were performed;
- plant systems were in service to support the test;
- test equipment was installed and within calibration;
- testing was performed in accordance with the approved procedure;
- test interruptions and continuations were handled in accordance with approved procedures and documented in the chronological test log;
- testing events and discrepancies were properly documented in the test deficiency log;
- testing was executed and coordinated properly;
- data was properly collected;
- temporary equipment was installed and tracked appropriately;
- administrative test controls were properly followed; and
- test personnel were using approved drawings and vendor manuals.

The inspectors observed the tests to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the preliminary test evaluations were consistent with the inspector's observations. During the tests, the inspectors observed important data gathering activities to ensure the data was properly gathered and recorded. A post-test cursory review of the test data was performed to verify legibility, traceability, and permanence of the data sheet entries.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant's test procedures were performed in a manner consistent with the guidance of procedure SMP-9, "Watts Bar Nuclear Plant Unit 2, Conduct of Test," Rev. 5. This completes the planned test witnessing inspections of

preoperational test procedure 2-PTI-067-02-A associated with ERCW flow balance testing.

### **P.1.5 Preoperational Test Witnessing (Inspection Procedures 70302 and 70312)**

#### **a. Inspection Scope**

Background: The background for this preoperational test witnessing is the same as that in the background section of P.1.2.

Inspection Activities: The inspectors witnessed activities associated with the performance of preoperational test instructions 2-PTI-063-05A, "Safety Injection System (SIS) Pump/Valve Logic Test - Train A," Rev. 2 and 2-PTI-063-05B, "Safety Injection System (SIS) Pump/Valve Logic Test – Train B," Rev. 2 to verify that the testing was conducted in accordance with approved procedures and to verify the adequacy of test program records and preliminary evaluation of test results. The following component's logic tests were selected for inspection of this item:

- Section 6.1, 2-FCV-63-3 (A)
- Section 6.1, 2-FCV-63-4 (B)
- Section 6.2, 2-FCV-63-26 (A)
- Section 6.2, 2-FCV-63-175 (B)
- Section 6.3, 2-FCV-63-25 (B)
- Section 6.7, 2-FCV-63-48 (B)
- Section 6.10, 2-FCV-63-177 (A)
- Section 6.10, 2-FCV-63-157 (B)
- Section 6.11, 2-FCV-63-72 (A)
- Section 6.11, 2-FCV-63-172 (B)
- Section 6.12, 2-FCV-63-8 (A)
- Section 6.12, 2-FCV-63-73 (B)
- Section 6.13, 2-FCV-63-11 (B)

The inspectors assessed the following attributes associated with these test observations:

- all test personnel were on station and had the latest revision of the procedure;
- test prerequisites were performed;
- plant systems were in service to support the test;
- test equipment was installed and within calibration;
- testing was performed in accordance with the approved procedure;
- test interruptions and continuations were handled in accordance with approved procedures and documented in the chronological test log;
- testing events and discrepancies were properly documented in the test deficiency log;
- testing was executed and coordinated properly;
- data was properly collected;
- temporary equipment was installed and tracked appropriately;
- administrative test controls were properly followed; and
- test personnel were using approved drawings and vendor manuals.

The inspectors observed the tests to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the preliminary test evaluations were consistent with the inspector's observations. During the tests, the inspectors observed important data gathering activities to ensure the data was properly gathered and recorded. A post-test cursory review of the test data was performed to verify legibility, traceability, and permanence of the data sheet entries.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant's test procedures were performed in a manner consistent with the guidance of procedure SMP-9, "Watts Bar Nuclear Plant Unit 2, Conduct of Test," Rev. 5. This completes the planned test witnessing inspections of preoperational test procedures 2-PTI-063-05A and 2-PTI-063-05B associated with the SIS pump/valve logic testing.

**P.1.6 Preoperational Test Witnessing (Inspection Procedures 70302, 70312, and 70433)**

a. Inspection Scope

Background: The background for this preoperational test witnessing is the same as that in the background section of P.1.2.

Inspection Activities: The inspectors witnessed activities associated with the performance of preoperational test instruction 2-PTI-062-01, "Charging and Letdown Logic Test," Rev. 1 to verify that the testing was conducted in accordance with approved procedures and to verify the adequacy of test program records and preliminary evaluation of test results. The following component's logic tests were selected for inspection of this item:

- Section 6.3, 2-FCV-62-56
- Section 6.19, 2-LCV-62-132
- Section 6.21, 2-LCV-62-133
- Section 6.22, 2-FCV-62-1229
- Section 6.23, 2-LCV-62-135
- Section 6.24, 2-LCV-62-136
- Section 6.25, 2-FCV-62-69
- Section 6.25, 2-FCV-62-70
- Section 6.25, 2-FCV-62-72
- Section 6.25, 2-FCV-62-73
- Section 6.25, 2-FCV-62-74
- Section 6.35, Centrifugal Charging Pump 2A-A

The inspectors assessed the following attributes associated with this test observation:

- all test personnel were on station and had the latest revision of the procedure;
- test prerequisites were performed;
- plant systems were in service to support the test;
- test equipment was installed and within calibration;
- testing was performed in accordance with the approved procedure;
- test interruptions and continuations were handled in accordance with approved procedures and documented in the chronological test log;
- testing events and discrepancies were properly documented in the test deficiency log;
- testing was executed and coordinated properly;
- data was properly collected;
- temporary equipment was installed and tracked appropriately;
- administrative test controls were properly followed; and
- test personnel were using approved drawings and vendor manuals.

The inspectors observed the test to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the preliminary test evaluations were consistent with the inspector's observations. During the test, the inspectors observed important data gathering activities to ensure the data was properly gathered and recorded. A post-test cursory review of the test data was performed to verify legibility, traceability, and permanence of the data sheet entries. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant's test procedure was performed in a manner consistent with the guidance of procedure SMP-9, "Watts Bar Nuclear Plant Unit 2, Conduct of Test," Rev. 5. This completes the planned test witnessing inspection of preoperational test procedure 2-PTI-062-01 associated with CVCS logic testing.

**P.1.7 Preoperational Test Witnessing (Inspection Procedures 70302, 70312, and 70436)**

a. Inspection Scope

Background: The background for this preoperational test witnessing is the same as that in the background section of P.1.2.

Inspection Activities: The inspectors witnessed activities associated with the performance of preoperational test instruction 2-PTI-074-02A, "Residual Heat Removal (RHR) Midloop Operation," Rev. 1, to verify that the testing was conducted in accordance with approved procedures and to verify the adequacy of test program records and preliminary evaluation of test results.

The inspectors assessed the following attributes associated with this test observation:



- all test personnel were on station and had the latest revision of the procedure;
- test prerequisites were performed;
- plant systems were in service to support the test;
- test equipment was installed and within calibration;
- testing was performed in accordance with the approved procedure;
- test interruptions and continuations were handled in accordance with approved procedures and documented in the chronological test log;
- testing events and discrepancies were properly documented in the test deficiency log;
- testing was executed and coordinated properly;
- data was properly collected;
- temporary equipment was installed and tracked appropriately;
- administrative test controls were properly followed; and
- test personnel were using approved drawings and vendor manuals.

The inspectors observed the test to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the preliminary test evaluations were consistent with the inspector's observations. During the test, the inspectors observed important data gathering activities to ensure the data was properly gathered and recorded. A post-test cursory review of the test data was performed to verify legibility, traceability, and permanence of the data sheet entries. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant's test procedure was performed in a manner consistent with the guidance of procedure SMP-9, "Watts Bar Nuclear Plant Unit 2, Conduct of Test," Rev. 5. This completes the planned test witnessing inspection of preoperational test procedure 2-PTI-074-02-A associated with RHR midloop testing.

### III. OPERATIONAL READINESS ACTIVITIES

#### O.1 Operations

##### O.1.1 (Closed) Quality Assurance Program - Document Control (Inspection Procedure 35742)

a. Inspection Scope

Background: This IP provided guidance to the inspectors in reviewing QA program documentation to verify that the applicant had document controls that were in conformance with proposed TS, regulatory requirements, commitments in the application, and applicable industry guides and standards. With respect to Unit 1 operations, these controls had been previously established and implemented by the licensee, and are inspected under the NRC reactor oversight process (ROP).

Inspection Activities: This inspection was performed in accordance with IMC 2513, "Light Water Reactor Inspection Program – Preoperational Testing and Operational Preparedness Phase," dated August 5, 2008, and based upon an NRC letter to TVA, dated November 8, 2013, titled "Watts Bar Nuclear Plant Unit 2 Construction – Operational Preparedness Inspection Plan," which described the scope of the operational preparedness inspections listed in Appendix B of IMC 2513. Specifically, this inspection was performed to satisfy the requirements for Section II.2 of NRC IP 35742B, "Document Control," dated October 1, 1976; which required a sampling of drawings, manuals, proposed TS, the FSAR, and procedures, to verify that copies of these documents were handled and processed in accordance with the applicant's procedures and consistent with Unit 1 procedure requirements and/or the transition plan for document control dual-unit operations.

The inspectors reviewed the associated program documents and procedures for TVA Nuclear Power Group (NPG) and for Unit 2 construction group, which included the quality assurance plans and procedures, and the following items:

- "Document Control," 25402-ADM-0001, Rev. 14
- "Watts Bar Nuclear Plant Unit 2 Changes to FSAR, TS, TS Bases, Technical Requirements Manual (TRM) and TRM Bases," NC PP-10, Rev. 5
- "FSAR Management," NPG-SPP-03.15, Rev. 0000
- "Procedures and Document Control," NPG-SPP-31.0, Rev. 0002
- "Document Control," NPG-SPP-31.1, Rev. 0003
- "Records Management," NPG-SPP-31.2, Rev. 0004

The inspectors noted that the applicant used the business support library (BSL) database, which was the same database used by Unit 1, as their master indices for activities; current status for design modifications; and revisions to drawings, procedures, vendor manuals, and calculations. The inspectors performed interviews and reviewed a sampling of Unit 2 modifications, specifically called engineering document construction releases (EDCRs) and their associated document changes in BSL. The inspectors verified that the Unit 2 document control process was being performed in accordance with the applicant's program documents and procedures. The inspectors also verified, for completed modifications, that the transfer of administrative controls for document control was aligned with dual-unit operations. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Based upon the review of the sample and the programmatic process review, the inspectors concluded that TVA had adequately planned to transition from a single unit to a dual-unit document control program. No further inspection is required for adequate implementation of IP 35742. IP 35742 is closed.

### **O.1.2 (Discussed) Quality Assurance Program - Maintenance (Inspection Procedure 35743)**

#### **a. Inspection Scope**

Background: This IP provided guidance to the inspectors to verify the applicant had developed and implemented a QA Program, relating to maintenance activities, that was in conformance with proposed TS, regulatory requirements, commitments in the application, and applicable industry guides and standards. With respect to Unit 1 operations, these controls had been previously established and implemented by the licensee, and are inspected under the NRC ROP.

Inspection Activities: This inspection was performed in accordance with IMC 2513, dated August 5, 2008, and based upon an NRC letter to TVA, dated November 8, 2013. Specifically, this inspection was performed to satisfy the following inspection requirements from the letter: (1) verify Unit 2 equipment had been entered into the preventive maintenance (PM) program and master schedule in a manner that was consistent with Unit 1 and common equipment with additional emphasis placed on unique Unit 2 equipment; and (2) obtain a list of unique Unit 2 safety-related equipment and assess the completeness of this list and verify appropriate PMs had been established.

The inspectors reviewed the associated program documents and procedures for TVA NPG and for Unit 2 construction, which included the quality assurance plans, modifications, preventative maintenance, on-line work control, and the corrective action program. The inspectors performed interviews, reviewed program documents, and reviewed the work management schedules of PMs for systems that had been completed and turned over to the operations department for testing. The inspectors noted that based upon a previously identified internal Quality Assurance corrective action, the applicant was tracking the development of every Unit 2 PM with a unique tracking number in their database titled MAXIMO. The inspectors reviewed a sampling of unique Unit 2 equipment and systems as documented in the master list of Unit 2 changes. The inspectors reviewed the modifications performed and compared them to PM created specifically for those unique features to determine if the PM appropriately addressed the equipment changes that resulted from the modification. Documents reviewed are listed in the Attachment.

#### **b. Observations and Findings**

No findings were identified.

#### **c. Conclusions**

The inspectors concluded that for the two inspection requirements from the NRC letter to TVA, dated November 8, 2013, TVA had adequately entered Unit 2 equipment into a PM program and master schedule in a manner that was consistent with Unit 1; and that TVA had adequately identified unique Unit 2 safety-related equipment and established appropriate PM in accordance with the applicant's program and procedure requirements. As a result, the two inspection items from the letter dated November 8, 2013, are closed.

The inspectors concluded further inspection will be required to verify the adequacy of the completed transition to WBN dual-unit PM program in order to close IP 35743. Specifically, Section II.2.c of IP 35743, "Maintenance," dated January 1, 1982; remains open. The IP required a sampling of Unit 2 equipment on the PM master schedule and verification that the required maintenance activities were performed and documented. At the time of the inspection, the required sampling size was not available for inspection.

### **O.1.3 (Closed) Maintenance Procedure Inspection (Inspection Procedure 42451)**

#### **a. Inspection Scope**

Background: This IP provided guidance to the inspectors to verify that maintenance procedures were prepared to adequately control maintenance of safety-related systems within applicable regulatory requirements. With respect to Unit 1 operations, these controls have been previously established and implemented by the licensee, and are inspected under the NRC ROP.

Inspection Activities: The inspection was performed in accordance with IMC 2513, dated August 5, 2008, and based upon an NRC letter to TVA, dated November 8, 2013. Specifically, the inspection was performed to satisfy the applicable guidance in IP 42451B, "Maintenance," dated February 28, 1975; which required a sampling of procedures in each of the following procedure categories: control of M&TE; performing maintenance; and surveillances. The inspectors were to verify the procedures were included on an index of the plant maintenance procedures and that the index was reviewed for completeness; the procedures were in the appropriate format as specified in the applicant's administrative controls; and they were technically adequate to accomplish the stated purpose. An additional inspection, documented in IIR 05000391/2013607 (ADAMS Accession No. ML12276A028), verified the list of unique Unit 2 equipment, that required maintenance procedures, was kept up-to-date.

The inspectors reviewed the following procedures:

- 2-IMI-62.242, "Calibration of Boric Acid Tank C Level Loop 2-LPL-62-242-G (2L-106)," Rev. 01
- 2-IMI-151, "Back up Ice Condenser Temperature Monitoring," Rev. 0
- 2-FOR-74-1, "18 Month Channel Calibration of RHR Heat Exchanger 2A-A Outlet Temperature Indicator 2-TI-74-15," Rev. 0
- 2-MI-88.003, "Opening Primary Containment Penetrations and Shield Building Penetrations for Maintenance Activities," Rev. 01
- 2-SI-67-915, "Disassembly and Inspection of Upper Containment ERCW Thermal Relief Check Valves Pre-RFO," Rev. 01
- 2-SI-99-201-A, "Response Time Test of Reactor Trip-Train A," Rev. 0
- 2-TI-85.021, "Dynamic Test of ECRW Motor Operated Throttle Valve for CCS Heat Exchanger B," Rev. 4

The inspectors compared the Unit 2 systems and associated unique modifications, if applicable, with Unit 1 procedures. The inspectors performed interviews and reviewed applicable program documents including maintenance rule and in-service testing requirements. The inspectors also reviewed associated drawings, calculations, and vendor manuals to verify that the maintenance procedures were technically adequate to

accomplish the stated purpose. The inspectors verified that the master copies of the procedures and revision tracking were included in the dual-unit BSL database. The inspectors verified that the procedures were formatted in accordance with the procedure requirements of NPG-SPP-01.2, "Administration of Site Technical Procedures," Rev. 0008 and the associated writers' guides. Documents reviewed are listed in the Attachment.

b. Observations and Findings

- b.1 The inspectors performed a programmatic review of maintenance procedure development and the procedure revision tracking process, which included a review of department level procedure development tracking metrics. The inspectors did not identify any findings with respect to the purpose of IP 42451 and the programmatic review for maintenance procedures. The inspectors did identify a URI with respect to the design control of boric acid tank (BAT) C, however this URI was not considered to impact the purpose of this IP.
- b.2. The inspectors identified an URI regarding the design control of BAT C as it translated to maintenance procedure, 2-IMI-62.242, "Calibration of Boric Acid Tank C Level Loop 2-LPL-62-242-G," Rev. 1, and control room alarm response procedure, 2-ARI-109-115, Rev. 5U2 for annunciator 112-A, "BAT C Level Hi/Lo". Specifically, the BAT C was an existing tank that had previously supported Unit 1 operations only. The design bases documents for the tank and the associated level instrumentation and procedures had already existed for Unit 1. With Unit 2 construction, tank C was now categorized as a common unit tank and could be used by either Unit 1 or Unit 2. Modifications were made for Unit 2, which included new level instrumentation with Rosemount level transmitters and a Foxboro digital control system for the control room, which was different than Unit 1 level instrumentation.

Because the tank was common to both units and already existed for Unit 1, the inspectors reviewed associated Unit 1 and Unit 2 design bases documents for BAT C to determine if procedure 2-IMI-62.242 was technically adequate to accomplish the stated purpose. The inspectors reviewed the setpoint and scaling document (SSD), SSD-2-L-62-242, Rev. 3 and the associated calculation CN-SUA-10-7, "Watts Bar Unit 2 Boric Acid Tank Level SSD Supporting Calculation," Rev. 2; and it was not clear to the inspectors that the actual design of the tank was accurately reflected in the Unit 2 SSD and calculation. In addition, the inspectors questioned the high and low level alarm setpoints on Unit 2 for control room alarm 112-A, "BAT C Level Hi/Lo" and whether the alarm setpoints accurately accounted for: actual instrument loop uncertainties; Technical Requirements 3.1.5 for tank level; and the FSAR design bases for minimum level for the BAT. The licensee captured the concern in their corrective action program under PERs 1007729, 1008723, and 1009641. This issue was unresolved pending further analysis to resolve the issue and to determine if a performance deficiency exists (URI 05000391/2015603-4, "Boric Acid Tank C Design Control").

c. Conclusions

Based upon the review of the sample and the programmatic process review, the inspectors concluded that TVA had adequately planned to transition from a single unit to a dual-unit maintenance procedure program. The inspectors did identify an unresolved

item with respect to the BAT C design control; however, this URI was not considered to impact the purpose or conclusion of this IP and will be tracked separately. No further inspection is required for adequate implementation of IP 42451. IP 42451 is closed.

#### **O.1.4 (Discussed) Quality Assurance Program – Surveillance Testing and Calibration Control (Inspection Procedure 35745)**

##### **a. Inspection Scope**

Background: This IP provided guidance to the inspectors to verify the applicant had developed and implemented programs for control and evaluation of: (1) surveillance testing, calibration, and inspection required by proposed TS, in-service inspection of pumps and valves as described in 10 CFR Part 50.55a.(g); and (2) calibration of safety-related instrumentation not specifically controlled by TS. With respect to Unit 1 operations, these controls have been previously established and implemented by the licensee, and are inspected under the NRC ROP.

Inspection Activities: The inspection was performed in accordance with IMC 2513, dated August 5, 2008, and based upon an NRC letter to TVA, dated November 8, 2013. Specifically, this inspection was performed to satisfy Sections II.1.a.1 and II.2.a.1 of 35745B, "Surveillance Testing and Calibration Control," dated April 1, 1979; which required the inspectors to verify that either Unit 2 equipment had been added to the existing master schedule(s) or that a comparable master schedule(s) had been established for Unit 2 equipment. Additional inspection requirements listed on the November 8, 2013 letter were to verify that the existing Unit 1 testing and surveillance programs (including calibrations) had been expanded to include Unit 2 equipment.

For Section II.1.a.1., the inspectors verified that a master schedule for surveillance testing, calibration, and in-service inspections, required by proposed TS or 10CFR50.55a, had been established and included the following: frequency for each test, calibration, or inspection; plant group responsible for performing each test, calibration, or inspection; and surveillance test status. For Section II.2.a.1., the inspectors verified that the calibration requirements had been established for components associated with safety-related systems or functions which were not specified in the proposed TS as requiring calibrations. The inspectors verified that the calibration requirements were specified in a master schedule or equivalent and included: calibration frequency for each component; plant group responsible for performing the calibration; and calibration status.

For both IP sections, the inspectors performed interviews with Unit 2 testing coordinators and planners and reviewed the Unit 2 surveillance testing, calibration, and in-service inspection schedule, its' development, and the work management process. The inspectors verified that the applicant was performing, or had a formal schedule, to perform activities that were required to meet regulatory requirements and/or required to verify a system/component was operable or functional to support Unit 2 construction. The inspectors also interviewed work management and cycle management personnel from Unit 1 to verify that Unit 2 surveillances, calibrations, and inspection activities were incorporated into the dual-unit work management program. The inspectors reviewed the development of the five-year cycle planning process to verify Unit 2 work activities were adequately planned in advance to minimize unavailability time for safety-related equipment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Based upon the programmatic process review, the inspectors concluded that TVA had adequately established programs for surveillance testing, calibration, and inspections, as reviewed under Sections II.1.a.1 and II.2.a.1 of 35745. These two sections are closed.

However the inspectors concluded further inspection will be required to verify the adequacy of the completed transition to WBN dual-unit surveillance testing and calibration control program. Specifically, Sections II.1.b and II.2.b of IP 35745 remain open, which requires a sampling of Unit 2 surveillances and calibrations.

**F. 1 Fire Protection**

**F.1.1 (Closed) Fire Protection and Prevention Procedure (Inspection Procedure 64051)**

a. Inspection Scope:

Background: As described in IMC 2517, TVA addressed WBN Unit 1 construction quality issues as part of the implementation of its Nuclear Performance Plan (NPP). The results of the NRC inspection program were published in NUREG-1528, "Reconstitution of the IMC 2512 Construction Inspection Program for Watts Bar Unit 1." In 1985, construction on Watts Bar Unit 1 and Watts Bar Unit 2 was stopped due to the identification of multiple construction QA issues. TVA completed Unit 1 in 1995 but had conducted very little Unit 2-specific work since 1985. In 2007, TVA decided to finish Unit 2. As part of confirming that all issues and inspection requirements would be completed for Unit 2, a review of all NRC inspection reports was initiated to determine the status of the required IPs, contained in NRC IMC 2512, in effect at the time construction was stopped. This effort was called the reconstitution process. NRC IMC 2512, Appendix I, identifies the current IPs that are applicable to construction and major modification activities, along with condensed scheduling information.

IMC 2517 establishes the policy for the conduct of WBN Unit 2 inspection program covering WBN Unit 2 construction and startup process under IMCs 2512, 2513, and 2514. As described in Section 2517-07, the IP closure process consists of three phases: reconstitution of WBN Unit 2 inspection status; inspection scoping; and inspection planning and completion. Phase I of the closure process, as it pertains to IP 64051, did not identify any creditable attributes that would permit the reduction of the scope of the IP and, as a result, it was determined that none of the inspection requirements were previously satisfied.

Hot work activities continue to decline significantly as construction activities are completed and systems transition to preoperational testing which is inspected under IMC 2513. In addition, temporary fire prevention, protection, and suppression controls for WBN Unit 2 construction are managed and maintained by Unit 1 (operating unit) and coordinated with Unit 2. The fire protection program for Unit 1 is inspected and reviewed periodically by the NRC. As a result, this closure of IP 64051 will describe in sufficient

detail how all attributes and inspection requirements provide adequate assurance that the inspection procedure was completed. Fire protection will continue to have regulatory oversight under IMC 2513.

Inspection Activities: The objective of this procedure is to ascertain whether approved controls exist relative to fire prevention, protection, and suppression at facilities under construction. IP 64051 has eight sections that must be satisfied for the successful completion of the IP. The IP was implemented during the construction phase of Watts Bar Unit 2 and is documented in the following inspection reports:

- 05000391/2008010, Section F.1.a, (ADAMS Accession No. ML090291033)
- 05000391/2010605, Section F.1.a, (ADAMS Accession No. ML110410680)
- 05000391/2011603, Section F.1.a, (ADAMS Accession No. ML111370702)
- 05000391/2011605, Section F.1.a, (ADAMS Accession No. ML112201418)
- 05000391/2011608, Section F.1.1.a, (ADAMS Accession No. ML11311A082)
- 05000391/2011609, Section F.1.1.a, (ADAMS Accession No. ML11350A229)
- 05000391/2012603, Section C.1.4.a, (ADAMS Accession No. ML12123A156)
- 05000391/2012605, Section F.1.1.a, (ADAMS Accession No. ML12220A536)
- 05000391/2012608, Section F.1.1.a, (ADAMS Accession No. ML12319A368)
- 05000391/2012610, Section F.1.1.a, (ADAMS Accession No. ML13035A201)
- 05000391/2013603, Section F.1.1.a, (ADAMS Accession No. ML13134A239)
- 05000391/2013604, Section F.1.1.a, (ADAMS Accession No. ML13179A079)
- 05000391/2013605, Section F.1.1.a, (ADAMS Accession No. ML13220A640)
- 05000391/2013607, Section F.1.1.a, (ADAMS Accession No. ML13273A512)
- 05000391/2013608, Section F.1.1.a, (ADAMS Accession No. ML13316A776)
- 05000391/2013610, Section F.1.1.a, (ADAMS Accession No. ML14049A158)
- 05000391/2014603, Section F.1.1.a, (ADAMS Accession No. ML14129A381)
- 05000391/2014604, Section F.1.1.a, (ADAMS Accession No. ML14177A214)
- 05000391/2014608, Section F.1.1.a, (ADAMS Accession No. ML14322A182)
- 05000391/2014614, Section F.1.1.a, (ADAMS Accession No. ML14363A315)

Section 02.01 of this inspection procedure required that, during construction activities, inspectors ascertain whether adequate and approved fire prevention procedures exist to control the (1) storage, handling, and use of flammable materials; (2) storage, control, and use of combustible materials relative to locations of flammable materials and ignition sources; and (3) use and control of open flames and other ignition sources which may be used in areas containing flammable materials. The inspection reports that specifically reference the sampling of this activity are listed in the table below. The procedures that implement the requirements of this section are listed below. In addition, the inspectors reviewed the most recent revision of the referenced supporting documentation to confirm that subsequent revisions did not invalidate the conclusions reached in previous inspections.

- NPG-SPP-18.4.6, "Control of Fire Protection Impairments," Rev. 6
- NPG-SPP-18.4.7, "Control of Transient Combustibles," Rev. 6
- NPG-SPP-18.4.8, "Control of Ignition Sources (Hot Work)," Rev. 5
- TI-210, "Fire Protection Engineer Periodic Inspection," Rev. 3



Section 02.02 of this inspection procedure required that inspectors ascertain whether adequate and approved procedures exist relative to fire suppression during construction activities which use ignition sources and/or flammable materials, including (1) the use, testing, maintenance, and identification of fire suppression equipment and (2) the use, testing, maintenance, and identification of related auxiliary equipment. The procedures that implement the requirements of this section are listed below. These procedures were reviewed in a number of previous IIRs to support the inspection activities associated with fire protection. In addition, the inspectors reviewed the most recent revision of the referenced supporting documentation to confirm that subsequent revisions did not invalidate the conclusions reached in previous inspections.

- WBN-0-FOR-26-5, "18 Month Inspection of Fire Hose Stations in Accessible Areas," Rev. 6
- WBN-0-FPS-510-0001A, "Preventive Maintenance Instruction: Portable Fire Extinguishers Inspection," Rev. 12
- 0-FOR-228-2B, "Quarterly Inspection of Emergency Light Battery Packs," Rev. 44
- 0-FOR-26-4, "Quarterly Inspection of Fire Hose Stations in Accessible Areas and Hydrant Support Mobile Equipment," Rev. 10
- 0-FOR-26-5, "18 Month Inspection of Fire Hose Stations in Accessible Areas," Rev. 7

Section 02.03 of this inspection procedure required that inspectors ascertain whether approved procedures exist relative to firefighting activities in the areas of (1) supervision/control, (2) action plan, and (3) communications. The procedures that implement the requirements of this section are listed below. These procedures were reviewed in a number of previous IIRs to support the inspection activities associated with fire protection. In addition, the inspectors reviewed the most recent revision of the referenced supporting documentation to confirm that subsequent revisions did not invalidate the conclusions reached in previous inspections.

- TI-64, "Breaching Hazard Barriers," Rev. 9
- TI-211, "Fire Protection," Rev.6
- "Watts Bar Nuclear Plant, Fire Protection Report," Rev. 49

Section 02.04 of this inspection procedure required that inspectors ascertain whether approved procedures exist relative to training in the areas of fire prevention, protection, and suppression; and ascertain whether training was conducted as specified. The inspection reports that specifically reference the sampling of this activity are listed in the table below. The procedure that implements the requirements of this section is listed below. In addition, the inspector reviewed the most recent revision of the referenced supporting documentation to confirm that subsequent revisions did not invalidate the conclusions reached in previous inspections.

- TRN-32, "Ignition Source Fire Watch Training," Rev. 2

Section 02.05 of this inspection procedure required that inspectors ascertain whether adequate and approved procedures exist for the control of the procedures identified in

items 02.01 through 02.04, in the areas of (1) revision, (2) approval, and (3) distribution. The inspectors previously reviewed and verified QA effectiveness, QA independence and that administrative requirements, such as management approvals, were met. The procedures that implement the requirements of this section are listed below. These procedures were reviewed in a number of previous IIRs to support the inspection activities associated with fire protection. In addition, the inspectors reviewed the most recent revision of the referenced supporting documentation to confirm that subsequent revisions did not invalidate the conclusions reached in previous inspections.

- TVA-NQA-PLN89-A, "Nuclear Quality Assurance Plan," Rev. 30
- NGP-SPP-18.4.5, "Fire Protection Quality Assurance," Rev.1
- SMRDP-3, "Self Assessment Program," Rev. 0
- NGP-SPP-22.300, "Corrective Action Program," Rev. 2
- BP-241, "Fire Protection Review of Facility Design and Modifications," Rev. 3

Section 02.06 of this inspection procedure required that, if construction activities are in progress at a multi-unit facility where a unit has received an operating license (OL), the inspector was to ascertain whether additional procedures exist covering:

- Requirements to review, and take subsequent appropriate action, relative to construction activities which could adversely affect the safety of the operating unit.
- Use of an approved work authorization or similar permit arrangement which approves/restricts construction activities which interface with an operating unit.
- Periodic inspections/audits to assure that construction activities adhere to approved requirements and procedures related to the previous two bullets.

The inspection report that specifically references the sampling of this activity is listed in the table below. The procedures that implement the requirements of this section are listed below. In addition, the inspectors reviewed the most recent revision of the referenced supporting documentation to confirm that subsequent revisions did not invalidate the conclusions reached in previous inspections. Furthermore, the inspectors will continue to independently assess applicant controls, associated with Unit 2 construction work activities, to prevent adverse impact on Unit 1 operational safety as it is documented in Section C.1.1, "Unit 1 and Unit 2 Construction Activity Interface Controls," of this report.

- 0-TI-12.08, "Control of Unit Interfaces," Rev. 1
- TI-404, "Unit 2 Separation During Construction/Startup," Rev. 9

Section 02.07 of this inspection procedure required that inspectors examine fire suppression devices at the construction site and determine whether they have been tested within the specified time intervals and whether there is any evidence of deterioration. As part of this quarterly inspection, the inspectors performed walkdowns of construction areas to determine whether construction activities and areas met procedural requirements for fire protection. The inspectors selected a limited set of field-verifiable attributes from fire operating requirement instructions and preventative maintenance guidance for field observation and evaluated 12 fire suppression devices.

The inspectors visually observed the physical condition of portable fire extinguishers in the Unit 2 construction area to ensure they were free of obstructions and easily accessible, that seals were not broken, and that there was no evidence of physical damage, corrosion, or other impairments. The inspectors reviewed preventative maintenance instructions to determine whether records of these 12 fire suppression devices met procedure inspection requirements. The IIRs that sampled this activity are listed in the table below.

The following fire suppression devices were observed;

- CB-11 (Control Building, EL729, Spreading Room)
- CB-12 (Control Building, EL729, Spreading Room)
- CB-16 (Control Building, EL729, Spreading Room)
- CB-21 (Control Building, EL708, Auxiliary Instrument Room)
- CB-27A (Control Building, EL692, Battery Board Room)
- CB-28A (Control Building, EL692, Batter Board Room)
- CB-33 (Control Building, EL729, Stairway)
- AB-1 (Auxiliary Building, EL676, Filter Pit)
- AB-6 (Auxiliary Building, EL692, M&TE Hot Tool Room)
- AB-18 (Auxiliary Building, EL 692, Boric Acid Evaporator Room)
- AB-28A (Auxiliary Room, EL713, North Wall by Tank)
- AB-56 (Auxiliary Room, EL737, Spent Fuel Pit Cool Pump)

Section 02.08 of this inspection procedure required that inspectors observe activities utilizing ignition sources and ascertain whether the provisions of the procedures identified in item 02.01 are being followed. The number of hot work activities continue to decline as systems are completed and transitioned to preoperational testing. As a result, the ability to observe these ongoing activities becomes limited. As part of this quarterly inspection, the inspectors were able to observe a construction activity using ignition sources to determine whether the fire prevention procedure requirements were met. This included the handling and use of flammable materials and the use of combustible materials relative to locations of flammable ignition sources. Specifically the inspectors observed fire watch activities related to:

- Welding under WO 111967552, modification of cable tray supports, U2 Reactor Building, Accumulator Room 3;

The IIRs that sampled this activity are listed in the table below.

Inspection Requirement	Inspection Activity	ADAMS Accession No.
02.01 Ascertain whether adequate and approved fire prevention procedures exist to control the following during construction activities:	05000391/2010605,	ML110410680
	Section F.1.a	
	05000391/2011603,	ML111370702
	Section F.1.a	
	05000391/2011605,	ML112201418
	Section F.1.a	
	05000391/2011609,	ML11350A229

	Section F.1.1.a	
02.04 Ascertain whether approved procedures exist relative to training in the areas of fire prevention, protection, and suppression; ascertain whether training was conducted as specified.	05000391/2011605, Section F.1.a 05000391/2011609, Section F.1.1.a	ML112201418  ML11350A229
02.06 If construction activities are in progress at a multi-unit facility where a unit has received an OL, ascertain whether additional procedures exist	05000391/2011609, Section F.1.1.a	ML11350A229
02.07 Examine fire suppression devices at the construction site and determine whether they have been tested within the specified time intervals and whether there is any evidence of deterioration	05000391/2010605, Section F.1.a 05000391/2011603, Section F.1.a 05000391/2011605, Section F.1.a 05000391/2011608, Section F.1.1.a 05000391/2011609, Section F.1.1.a 05000391/2012603, Section C.1.4.a 05000391/2012605, Section F.1.1.a 05000391/2012608, Section F.1.1.a 05000391/2012610, Section F.1.1.a 05000391/2013603, Section F.1.1.a 05000391/2013605, Section .1.1.a 05000391/2013608, Section F.1.1.a 05000391/2013610, Section F.1.1.a 05000391/2014603, Section F.1.1.a 05000391/2014604, Section F.1.1.a 05000391/2014608, Section F.1.1.a 05000391/2014614,	ML110410680  ML111370702  ML112201418  ML11311A082  ML11350A229  ML12123A156  ML12220A536  ML12319A368  ML13035A201  ML13134A239  ML13220A640  ML13316A776  ML14049A158  ML14129A381  ML14177A214  ML14322A182  ML14363A315

	Section F.1.1.a	
02.08 Observe activities utilizing ignition sources and ascertain whether the provisions of the procedures identified in item 02.01 are being followed.	05000391/2010605, Section F.1.a	ML110410680
	05000391/2011603, Section F.1.a	ML111370702
	05000391/2011605, Section F.1.a	ML112201418
	05000391/2011609, Section F.1.1.a	ML11350A229
	05000391/2012605, Section F.1.1.a	ML12220A536
	05000391/2012608, Section F.1.1.a	ML12319A368
	05000391/2012610, Section F.1.1.a	ML13035A201
	05000391/2013603, Section F.1.1.a	ML13134A239
	05000391/2013604, Section F.1.1.a	ML13179A079
	05000391/2013605, Section F.1.1.a	ML13220A640
	05000391/2013607, Section F.1.1.a	ML13273A512
	05000391/2013610, Section F.1.1.a	ML14049A158
	05000391/2014603, Section F.1.1.a	ML14129A381
	05000391/2014604, Section F.1.1.a	ML14177A214
	05000391/2014608, Section F.1.1.a	ML14322A182
05000391/2014614, Section F.1.1.a	ML14363A315	

IP 71302, "Preoperational Test Program Implementation Verification," is applicable under IMC 2513. This inspection procedure assures that the licensee's management control system is effectively discharging its responsibilities over the preoperational testing program by direct observation of inspection of activities, tours of the facility, interviews and discussions with licensee personnel, and reviewing facility records. A weekly inspection item of IP 71302 requires that inspectors tour the accessible areas of the facility to make an independent assessment of equipment conditions, plant conditions, security, and adherence to regulatory requirements. The inspectors are to observe or verify on a sampling basis the operability of fire alarms, extinguishing equipment, actuating controls, firefighting equipment, and emergency equipment. Furthermore the inspectors are to verify that ignition sources and flammable material are being controlled in accordance with applicant's procedures.

The following samples were inspected:

IP 64051, Section 02.07 – 12 samples

IP 64051, Section 02.08 – one sample

Documents reviewed are listed in the Attachment.

b. Observations and Findings:

No findings were identified.

Below is a summary of each section of IP 64051:

- Section 02.01 – Complete
- Section 02.02 – Complete
- Section 02.03 – Complete
- Section 02.04 – Complete
- Section 02.05 – Complete
- Section 02.06 – Complete
- Section 02.07 – Complete
- Section 02.08 – Complete

c. Conclusions:

The inspectors determined that approved controls relative to fire prevention, protection, and suppression at facilities under construction met the applicable requirements. Based on previous NRC inspections, and the recent inspection efforts, IP 64051 is considered closed; however, inspections related to fire protection and prevention will continue under IP 71302, and the controls associated with temporary fire prevention, protection, and suppression for Watts Bar Unit 2 construction will continue to be maintained by Unit 1 (operating unit).

**EP. 1 Emergency Preparedness**

**EP.1.1 (Closed) Supplemental Safety Evaluation Report, Appendix HH, Open Item 41: Update Plant Displays to include Unit 2 and Update Dose Assessment Models to provide Capabilities for Assessing Releases from Both Watts Bar Units (Inspection Procedure 92701)**

a. Inspection Scope

Background: Appendix HH open item 41 was generated in response to an applicant response to a staff request for additional information regarding the capability of the WBN emergency response facilities (ERFs) to simultaneously handle an emergency event affecting both WBN Unit 1 and Unit 2. The inspectors had previously determined and documented plant data displays as being adequate in IIR05000391/2014604 (ADAMS Accession No. ML 14177A214). Confirmation of dual-unit dose assessment capabilities remained open.

Inspection Activities: The inspectors evaluated the status of the dose assessment models, displays, and procedure updates to include Unit 2. The inspectors reviewed dose assessment procedures and inputs, used onsite and at their central emergency

control center (CECC), and also interviewed appropriate plant and corporate personnel to verify the status of outstanding action items. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified. The licensee completed several outstanding actions including completion of their off-site dose calculation manual including source terms associated with Unit 2. These serve as inputs to some of their dose assessment calculations. The inspectors independently confirmed the incorporation of these actions into site and corporate dose assessment procedures and found them to be adequate.

c. Conclusions

SSER Appendix HH, Open Item 41 is now closed.

**IV. OTHER ACTIVITIES**

**OA.1.1 (Discussed) Construction Deficiency Report 391/89-08: Kapton Insulated Pigtail Insulation Damage (Inspection Procedure 51053)**

a. Inspection Scope

Background: The historical concern that primary containment electrical penetrations containing Kapton insulated pigtails were found with nicks in the insulation, such that their ability to support the safety function of the serviced load or signal, was initially reported to the NRC on August 25, 1989, in accordance with 10 CFR Part 50.55(e) as a condition adverse to quality report (CAQR) WBP 890302 for Unit 1 and CAQR WBP 89436 for Unit 2. The follow-up final report associated with the notification (ADAMS Accession No. ML073551006) was transmitted by letter dated September 25, 1989, and identified the apparent cause, safety implications, and planned or completed corrective actions. By letter dated April 30, 1993 (ADAMS Accession No. ML073241164), the applicant changed the original commitment, which required QC inspection of all penetration pigtail wires for damage, to state that appropriately trained modifications personnel utilizing a two-party inspection process would be used instead.

The background on this issue is discussed in further detail in Section OA.1.4 of IIR 05000931/2014607 (ADAMS Accession No. ML14274A076).

Inspection Activities: The inspectors observed field engineers and Nuclear Engineering performing quality inspections of the individual strands comprising the Kapton insulation system for the inboard and outboard sides of 2-PENT-293-9-B. The NRC inspectors interviewed craft performing inspections and independently verified inspections were identifying damaged Kapton insulated pigtail protection and dispositioning the results accordingly. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors concluded that the inspection performed and the portions of the repairs observed were adequate. Additional samples will be inspected.

**OA.1.2 (Closed) Bulletin 96-02: Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment (Inspection Procedure 35007)**

a. Inspection Scope

Background: In July 1980, the NRC issued NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." NUREG-0612 provided guidelines to (1) ensure the safe handling of heavy loads, (2) reduce the potential for uncontrolled movement of heavy loads or load drops, and (3) limit the consequences of dropping a heavy load. In December 1980 the NRC issued an unnumbered Generic Letter (GL), supplemented in February 1981 by Generic Letter 81-07, requesting that licensees implement the heavy load control guidelines in NUREG-0612. These two Generic Letters requested that licensees implement certain interim actions and provide the NRC with information related to heavy loads at their facilities. The submittals were requested in two parts, a six month Phase I response and a nine month Phase II response. In June 1985, the NRC issued Generic Letter 85-11, which stated that based on the improvements in heavy load handling obtained from implementation of NUREG-0612 Phase I, further action was no longer required to reduce risks associated with the handling of heavy loads. GL 85-11 removed the requirement for, but still recommended the implementation of actions identified in licensees' Phase II submittals. In April 1996 the NRC issued Bulletin (BL) 96-02, Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment. BL 96-02 (1) alerted licensees of the importance of complying with existing regulatory guidance associated with the control and handling of heavy loads [NUREG-0612], (2) requested that licensees review their plans and capabilities for handling heavy loads in accordance with existing regulatory guidance, and (3) required licensees to report to the NRC whether and to what extent they have complied with the requested actions contained in the bulletin.

Phase I of NUREG-0612 covers the following areas:

- definition of safe load paths;
- development of load-handling procedures;
- periodic inspection and testing of cranes;
- qualification, training, and specified conduct of operators;
- special lifting devices that should satisfy the guidelines on ANSI N14.6.6;
- lifting devices not specially designed that should be installed and used in accordance with the guidelines of ANSI B30.9; and
- design of cranes to ANSI B30.2 or Crane Manufacturers Association of America (CMAA) standard CMAA-80.

To address NUREG-0612, the applicant purchased lifting devices and developed programs, procedures, and drawings meeting the requirements of NUREG-0612 Phase I. The NRC found the applicant's actions for meeting the requirements of NUREG-0612 acceptable for



Watts Bar Unit 1 in NUREG-0847, Safety Evaluation Report, Supplement 13, Section 9.1.4 (ADAMS Accession No. ML072060484).

The heavy loads program for Watts Bar Nuclear Plant is in effect and in use at Unit 1. To meet the requirements of NUREG-0612 for dual-unit operation at Watts Bar, the applicant completed NUREG-0612 interaction walkdowns, analyzed the interactions (locations where a single dropped load could damage equipment associated with redundant safe shutdown trains), initiated actions to resolve the interactions, and initiated procedure and drawing revisions to incorporate Unit 2 considerations.

Inspection Activities: To address Unit 2 actions, the inspectors performed the following:

- Reviewed the applicant's open item closure report, NCO930238010, to verify the adequacy of the applicant's approach to addressing BL 96-02.
- Reviewed the applicant's NUREG-0612 Interaction Analysis to verify that interaction walkdown results were properly analyzed.
- Reviewed applicable PERs to verify the adequacy of actions proposed to resolve NUREG-0612 interactions.
- Reviewed applicable drawings and procedures to verify incorporation of NUREG-0612 requirements and considerations associated with Unit 2/dual-unit operation.
- Performed walkdowns of areas with identified NUREG-0612 interactions to verify the adequacy of completed or proposed actions.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

The following finding was identified:

Introduction: The NRC identified a SL IV NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," for failure to correct a NUREG-0612 interaction.

Description: During a review of the applicant's closure documentation for NRC Bulletin 96-02, the inspectors determined that the applicant failed to correct a condition adverse to quality associated with BL 96-02. Specifically, the applicant failed to correct a NUREG-0612 interaction, conduits 2VC6051A and 2VC9611A located in the 0-HST-271-AB9 load drop impact zone on elevation 757' of the auxiliary building, as documented in PER 908065.

The Unit 2 NUREG-0612 Interaction Analysis evaluated and documented interactions discovered during NUREG-0612 walkdowns. Conduits 2VC6051A and 2VC9611A were identified as a NUREG-0612 interaction, and PER 908065 was initiated to disposition this interaction. PER 908065 was closed to Work Order 116004916, which was intended to relocate both conduits and eliminate the NUREG-0612 interaction. WO 116004916 was subsequently closed by PER 958843 which reevaluated the interaction and was dispositioned as "Use-As-Is." PER 958843 did not reference the NUREG-0612 Interaction Analysis Calculation, which was completed with the assumption that these conduits would be moved to eliminate the interaction. Appendix B, Paragraph 2.B, of Corrective Action Program Procedure 25402-MGT-0003 requires, in part, that PERs with a disposition of "Use-As-Is" include a statement referencing any design output requiring

revision due to the “Use-As-Is” disposition. The failure to reference the appropriate design output, the NUREG-0612 Interaction Analysis in this case, led to a failure to implement the corrective actions required to make the NUREG-0612 Interaction Analysis valid.

The inspectors determined that the failure to implement the corrective actions of PER 908065, which were intended to correct a NUREG-0612 interaction required to validate the NUREG-0612 Interaction Analysis, was a performance deficiency. This performance deficiency was determined to be more than minor in accordance with IMC 2517, Appendix C, because the failure to implement the corrective actions of PER 908065 represented an improper work practice that could impact quality or safety, involving safety-related SSCs. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the Enforcement Policy because the failure to correct a condition adverse to quality did not result in multiple examples of recurring significant deficiencies associated with a single construction activity. This finding has a cross-cutting aspect in the Procedural Adherence component of the Human Performance cross-cutting area, as defined in NRC IMC 0310, because the corrective action program procedure was not adhered to [H.8]. Specifically, the NUREG-0612 interaction of conduits 2VC6051A and 2VC9611A were not dispositioned in accordance with the corrective actions procedure.

Enforcement: 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Actions,” requires, in part, that “conditions adverse to quality are promptly identified and corrected.” PER 908065 required that conduits 2VC6051A and 2VC9611A be relocated to eliminate a NUREG-0612 interaction. Contrary to the above, on or before November 26, 2014 the applicant failed to correct the NUREG-0612 interaction captured in PER 908065. Specifically, PER 908065 was closed to WO 116004916, which was subsequently closed by PER 958843, leaving the NUREG-0612 interaction uncorrected. The finding was determined to be a SL IV violation using Section 6.5 of the Enforcement Policy. Because this was a SL IV violation and it was entered into the applicant’s corrective action program as PER 961446, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. This NCV is identified as 05000391/2015603-05, “Failure to correct a NUREG-0612 interaction.”

c. Conclusions

The inspectors identified a SL IV NCV of Criterion XVI associated with failure to correct a NUREG-0612 interaction. This finding has a cross-cutting aspect in the Procedural Adherence component of the Human Performance area. The deficiency was resolved prior to completion of the inspection. Based on the review of the engineering complete package, the aforementioned inspection activities, and resolution of the identified deficiency, the inspectors determined that the applicant has either completed or initiated appropriate actions to address BL 96-02. BL 96-02 is closed.

**OA.1.3 (Closed) Temporary Instruction 2515/171: Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies (Inspection Procedure 92701)**

a. Inspection Scope

Background: The February 25, 2002, Interim Compensatory Measures (ICM) Order (EA-02-026) spanned a wide range of actions required to be taken by power reactor licensees in response to the events of September 11, 2001. Section B.5.b of the Order dealt specifically with postulated events potentially causing loss of large areas of power reactor facilities due to explosions or fires.

These requirements, often referred to as the B.5.b requirements, were formalized in the CFR resulting in 10 CFR Part 50.54 (hh)(2). This section imposes mitigating strategies requirements similar to those imposed by the ICM Order. Section 10 CFR 50.54(hh)(2), states the following:

*"Each licensee shall develop and implement guidance and strategies intended to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire to include strategies in the following areas:*

- (i) Firefighting;*
- (ii) Operations to mitigate fuel damage; and*
- (iii) Actions to minimize radiological release"*

Implementation was accomplished in three phases. During Phase 1, licensees were required to assess their nuclear power plants to identify readily available mitigative strategies to address a range of potential scenarios that may result in the loss of large areas of the plant due to explosions or fires.

For Phases 2 and 3, the NRC determined that differences in plant design and configuration warranted independent assessments. Site specific assessments of spent fuel pools were deemed Phase 2 and site specific assessments of reactor core and containment were deemed Phase 3.

NRC letter to TVA dated August 9, 2007 (ADAMS Accession No. ML072200034) contains the Safety Evaluation (SE) and documents NRC's acceptance of the actions taken by Watts Bar Unit 1 in response to Section B.5.b of the February 25, 2002 ICM order. The actions taken in response to each element of Phase 1 guidance is common to both WBN units.

Prior inspection of WBN Unit 1 under Temporary Instruction (TI) 2515/171, "Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies," was accomplished in inspection report 05000390/2008008 (ADAMS Accession No. ML083120441) dated November 6, 2008.

Minor changes were required to the implementing details to accommodate Watts Bar as a dual-unit site and maintain the requirements of 10 CFR Part 50.54(hh)(2). The description and plans of the mitigating strategies to include WBN Unit 2 are identified in TVA submittals dated February 26, 2007 (ADAMS Accession No. ML070580535), June 29, 2007 (ADAMS Accession No. ML071840366), March 28, 2011 (ADAMS Accession No. ML110890562), May 9, 2011 (ADAMS Accession No. ML11131A124), and September 30, 2014 (ADAMS Accession No. ML14275A218).

Inspection Activities: The inspectors reviewed the applicant's engineering closure package to verify that Unit 2 will implement the strategies already in place for Unit 1, updated to consider that WBN is a dual-unit site and that physical separation between the two unit's response capabilities will be maintained as required. The inspectors verified that revisions were made to accommodate a common spent fuel pool, two operating cooling towers, and individual refueling water storage tanks (RWSTs) for each unit.

The inspectors interviewed plant staff, reviewed documentation, and performed plant walkdowns of selected mitigating strategies to verify the following:

- equipment needed to implement the strategies are appropriately located;
- specified equipment connection devices and fittings are compatible with plant fittings;
- procedures/guidance has been developed for implementing the strategies;
- water sources used to accomplish the strategies is sufficient to operate the system at the required flow rates;
- appropriate training has been provided to implementers, evaluators, and decision makers associated with the strategies; and
- equipment required to implement the strategies is maintained and periodically tested.

Specifically, the inspectors walked down strategies related to RWST makeup and manual depressurization of steam generators and use of portable pumps to verify the feasibility of each strategy.

Additionally, the inspectors reviewed PER 990238 and the 10CFR50.4(hh)(2) and B5b program turnover document, 0-TI-435, to ensure that all remaining open items were identified and had actions initiated to achieve compliance. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Based on the above activities and review of the engineering complete closure package, the inspectors determined that applicant's efforts are consistent with those implemented for Unit 1. The applicant has sufficiently implemented B.5.b phase 2 and 3 strategies to maintain the requirements of 10 CFR Part 50.54(hh)(2) for a dual-unit site. Therefore, TI 2515/171 is considered closed.

**V. MANAGEMENT MEETINGS**

**X1 Exit Meeting Summary**

An exit meeting was conducted on April 9, 2015, to present inspection results to Mr. Zeringue and other members of your staff. The inspectors identified that no proprietary information had been received during the inspection and none would be used in the inspection report. The applicant acknowledged the observations and provided no dissenting comments.

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

#### Applicant personnel

G. Arent, TVA – Licensing Manager  
A. Bangalore, Bechtel - Electrical Engineer  
R. Banks, WBN2 Outage Manager  
R. Bowling, WBN2 SI Project Manager  
E. Brumfield, Bechtel Project QA Manager  
J. Calle, Dual Unit Transition Manager  
D. Charlton, TVA - Regulatory Compliance  
C. Cooke, Senior Program Maintenance OE/Procedures  
C. Deblok, WBN2 Surveillance Program Coordinator  
T. Detchmندی, EP Supervisor  
J. Grant, Start-Up Engineer Manager  
S. Hilmes, TVA - Electrical Engineer  
Z. Keeton, WBN2 PM Coordinator  
J. Kepler, Engineering Group Supervisor  
W. Lee, Corporate EP Manager  
D. Myers, Senior QA Manager  
J. O'Dell, TVA - Regulatory Compliance  
C. Ottenfeld, System Area Turnover Support Operations Manager  
L. Peterson, WBN2 Site Support Manager  
J. Perrel, Program Manager, EP Procedures  
B. Perry, Management Services Supervisor  
R. Phillips, Start-Up Manager  
T. Powell, Dual Unit Master Schedule Coordinator  
G. Scott, TVA – Licensing  
D. Shutt, TVA - Licensing  
M. Skaggs, TVA – Senior Vice President  
T. Wallace, WBN2 Senior Manager Operations Unit 2 Construction  
T. Wilburn, Chemistry Project Supervisor  
N. Welch, TVA - Preoperational Startup Manager  
O. J. Zeringue, TVA - General Manager Engineering and Construction

**INSPECTION PROCEDURES USED**

IP 35007	Quality Assurance Program Implementation During Construction and Pre-Construction Activities
IP 35742	QA Program (Document Control)
IP 35743	QA Program (Maintenance)
IP 35745	QA Program (Surveillance Testing and Calibration Control)
IP 42451	Maintenance Procedures
IP 49063	Piping – Work Observation
IP 50053	Reactor Vessel and Internals Work Observation
IP 51053	Electrical Components and Systems – Work Observation
IP 53055	Containment Penetrations (Mechanical) Record Review
IP 64051	Procedures - Fire Prevention/Protection
IP 70300	Preoperational Test Procedure Review
IP 70302	Preoperational Test Program Implementation
IP 70312	Preoperational Test Witnessing
IP 70333	Chemistry Control System Test – Preoperational Test Procedure Review
IP 70338	Auxilliary Feedwater System Test- Preoperational Test Procedure Review
IP 70433	Chemical Control System Test - Preoperational Test Witnessing
IP 70436	Residual / Decay Heat Removal System Test - Preoperational Test Witnessing
IP 7111.07	Heat Sink Performance
IP 7111.21	Component Design Bases Inspection
IP 71302	Preoperational Test Program Implementation Verification
IP 92701	Followup
TI 2515/171	Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

05000391/2015603-01	URI	Break In Non-Seismic ERCW Discharge Piping (Section E.1.1)
05000391/2015603-04	URI	Boric Acid Tank C Design Control (Section O.1.3)

Opened and Closed

05000391/2015603-02	NCV	Failure To Utilize The Most Limiting Inputs In The ERCW Pressure Drop Calculation (Section E.1.1)
05000391/2015603-03	NCV	Failure To Scope An Adequate Water Hammer Test (Section E.1.1)
05000391/2015603-05	NCV	Failure to correct a NUREG-0612 interaction (Section OA.1.2)

Closed

53055	IP	Containment Penetrations (Mechanical) Record Review (Section C.1.4)
70333	IP	Preoperational Test Procedure Review - Hot Functional Test – Charging and Letdown (Section P.1.3)
70312	IP	Preoperational Test Witnessing – Essential Raw Cooling Water (Section P.1.4)
35742	IP	Quality Assurance Program - Document Control (Section O.1.1)
42451	IP	Maintenance Procedure Inspection (Section O.1.3)
64051	IP	Fire Protection and Prevention Procedure (Section F.1.1)
Item 41	SSER Appendix HH	Update Plant Displays to include Unit 2 and Update Dose Assessment Models to provide Capabilities for Assessing Releases from Both (Section EP.1.1)
96-02	BL	Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment (Section OA.1.2)
2515/171	TI	Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies (Section OA.1.3)

Discussed

71111.07	IP	Heat Sink Performance, Subissue: Emergency Raw Cooling Water Testing (Section C.1.5)
35743	IP	Quality Assurance Program – Maintenance (Section O.1.2)
35745	IP	Quality Assurance Program – Surveillance Testing and Calibration Control (Section O.1.4)
391/89-08	CDR	Kapton Insulated Pigtail Insulation Damage (Section OA.1.1)



## LIST OF DOCUMENTS REVIEWED

### II. MANAGEMENT OVERSIGHT AND CONTROLS

#### C.1 Construction Activities

##### C.1.4 Containment Penetrations (Mechanical) Record Review

###### Audits/Surveillances:

25402-WBN-SR-14-3026, "Grouting of Mechanical Penetration", 02/21/14

WB-W-80-04, "Nondestructive Examination Procedure", 11/12/1980

WB-M-77-10, "Installation of Mechanical and Electrical Penetrations", 11/28/77

###### Hydro Tests:

Hydrostatic Test Package, 2-072-47W812-1-2-1, "Penetrations X48A, X48B, X49A, X49B Test PER NCR 6420 / Supplemental Test"

Hydrostatic Test Package, 2-063-47W811-1-2-32, "Safety Injection Pipe Segment 2-063-RB-P-811-1-32 Supplemental PER NCR 6420"

W.O. 111751832, "WBN-2-PIPE-068-A Primary Hydrotest"

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- CMTRs, RIMS Reel 40139, Frame 1664
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- Repair Weld Operation Sheet for weld, 2-030A-T004-01 (Repair)
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- CMTR, RIMS Reel E07551, Frame 556
- CMTR, RIMS Reel E07551, Frame 583
- CMTR, RIMS Reel E07551, Frame 504
- CMTR, RIMS Reel E07551, Frame 519
- CMTR, RIMS Reel E07551, Frame 349
- Weld Records, RIMS Reel E07552, Frame 1489-1533
- WR-5, Field Weld Operation Sheet, 2-074A-D029-10A, R06
- Welder Test 42-201, RIMS Reel E07551, Frame 162
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- DWG 79432-D21.1
- Weld Records, RIM Reel E07552, Frame 1604-1637
- CMTR, RIMS Reel E07551, Frame 560
- CMTR, RIMS Reel E07551, Frame 583
- CMTR, RIMS Reel E07551, Frame 406
- CMTR, RIMS Reel E07551, Frame 411
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- TVA QC Release, RIMS Reel E07551, Frame 588
- Welder Test 32-1278, RIMS Reel E07551, Frame 150

- Welder Test 42-579, RIMS Reel E07551, Frame 218

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- Weld Records, RIM Reel E07553, Frame 139-153
- CMTR, RIMS Reel E07551, Frame 573
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- Tube Turns, NPP-1 Code Data Report
- Weld Map, WBN-E-2882-IC-39 Rev. 5
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 WBN-SDD-N3-82-4002, Standby Diesel Generator System, Rev. 17  
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 WBN-SDD-N3-3B-4002, Auxiliary Feedwater System, Rev. 17  
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**P.1 Preoperational Activities**

**P.1.1 Preoperational Test Program Implementation Verification**

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 WO111457668, Limit Switch Testing, Steam Generator #4 Isolation Valve, WBN-2-FCV-003-0100-B  
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**P.1.6 Preoperational Test Witnessing**

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**P.1.7 Preoperational Test Witnessing**

TDN 15-0460

**III. OPERATIONAL READINESS ACTIVITIES****O.1 Operations**Procedures

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 2-AOI-7.05, Flood Mode Cold Leg Accumulator Venting and Filling, Rev. 0000B  
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 2-TMI-30.127, Calibration of Annulus Differential Pressure/AB EGTS Air Difference Purge, Rev. 0000A  
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**O.1.2 Quality Assurance Program – Maintenance**

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 EDCR 53417, Rev. A  
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0-MI-271.07, Ice Condenser Crane Periodic Inspection, Rev. 0000

2M1121W, Inspection, Lubrication and Cleaning of Reliance Motors Used in Non-Q Applications, Rev. 0

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620610045, 2-CRN-061-0001, Ice Condenser Crane

620740003, 2-CKV-074-0544-A, RHR Header 2A Check Valve

620810001, 2-MTR-081-0003, Primary Water Makeup Pump Motor 2A

620810002, 2-MTR-081-0007, Primary Water Makeup Pump Motor 2B

620810003, 2-TANK-081-0001, Visual Inspection of Primary Water Storage Tank and Diaphragm, Rev. 0

620810004, 2-PMP-081-0003, Primary Water Makeup Pump

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Procedures

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NC-PI-5, Watts Bar Nuclear Plant Unit 2 Instruction Validation, Rev. 0005

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TI-434, Power Ascension Testing

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**O.1.3 Maintenance Procedure Inspection**EDCRs

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1682C30, Watts Bar Units 1 and 2 Boric Acid Tank, Sheet B7, Rev. 4

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2-ARI-109-115, CVCS & RHR – RPS & ESF, Annunciator 112-A, Rev. 005U2

2-IMI-62.242, Calibration of Boric Acid Tank C Level Loop 2-LPL-62-242-G (2L-106), Rev. 01

2-IMI-151, Back up Ice Condenser Temperature Monitoring, Rev. 0

2-FOR-74-1, 18 Month Channel Calibration of RHR Heat Exchanger 2A-A Outlet Temperature Indicator 2-TI-74-15, Rev. 0

2-MI-88.003, Opening Primary Containment Penetrations and Shield Building Penetrations for Maintenance Activities, Rev. 01

2-SI-67-915, Disassembly and Inspection of Upper Containment ERCW Thermal Relief Check Valves Pre-RFO, Rev. 01

2-SI-99-201-A, Response Time Test of Reactor Trip-Train A, Rev. 0

2-TI-85.021, Dynamic Test of ECRW Motor Operated Throttle Valve for CCS Heat Exchanger B, Rev. 4

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NPG-SPP-07.1, On Line Work Management, Rev. 0015

NPG-SPP-09.11.1, Equipment Out of Service Management, Rev. 0010

NPG-SPP-31.0, Procedures and Document Control, Rev. 0002

TI-436, Dual Unit Operational Readiness, Rev. 0006

**F.1.1 Procedures - Fire Prevention/Protection**

Procedures

NGP-SPP-18.4.8, Control of Ignition Sources (Hot Work), Rev. 0005

Work Orders

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WO#116313612, Fire Extinguisher Inspection, 3/12/2015

WO#116312656, Fire Extinguisher Inspection, 3/7/2015

**EP. 1 Emergency Preparedness**

**EP.1.1 Supplemental Safety Evaluation Report , Appendix HH, Open Item 41: Update Plant Displays to include Unit 2 and Update Dose Assessment Models to provide Capabilities for Assessing Releases from Both**

Procedures

EPIP-1, Emergency Plan Classification Logic, Rev. 42

EPIP-13, Initial Dose Assessment for Radiological Emergencies, Rev. 22

CECC EPIP-8, Dose Assessment Staff Activities During Nuclear Plant Radiological Emergencies, Rev. 41

#### IV. OTHER ACTIVITIES

##### **OA.1.1 Construction Deficiency Report 391/89-08: Kapton Insulated Pigtail Insulation Damage**

W.O. 115536134, CCE EDCR2 59953 PER 766444 SYS 293 2-PENT-293-0009B (outboard)  
W.O. 115788181, CCE EDCR 54918 PER 766444 SYS 293 2-PENT-293-0009B (inboard)

##### **OA.1.2 Bulletin 96-02, Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment**

###### Drawings

44W44-1, NUREG-0612 Overhead Handling System Locations EL. 676.0  
44W44-2, NUREG-0612 Overhead Handling System Locations EL. 692.0  
44W44-3, NUREG-0612 Overhead Handling System Locations EL. 713.0  
44W44-4, NUREG-0612 Overhead Handling System Locations EL. 737.0  
44W44-5, NUREG-0612 Overhead Handling System Locations EL. 757.0  
44W44-6, NUREG-0612 Overhead Handling System Locations EL. 772.0 and Above  
44W44-7, NUREG-0612 Overhead Handling System Locations  
44W44-8, NUREG-0612 Overhead Handling System Locations Sections and Details  
44W44-9, NUREG-0612 Overhead Handling System Locations Sections and Details  
44W44-10, NUREG-0612 Overhead Handling System Locations EL. 728.0, 741.0  
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MI-271.005, Periodic Inspection of Standby Hoists, Rev. 0010  
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DCN 63868  
DCN 63500

##### **OA.1.3 Temporary Instruction 2515/171, Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies**

###### Procedures

0-TI-26.102; 5000 GPM Dominator Portable Diesel Pump (5DPDP) Operating Procedure; Rev. 0  
0-AOI-42.01; Security Events; Rev. 0  
0-EDMG-1; Loss of Main/Auxiliary Control Room Function – Initial Response; Rev. 0  
0-EDMG-2; Serious Event Mitigation; Rev. 0  
0-MA-1; Recovery from Loss of Shutdown Power and Loss of ERCW; Rev. 0

0-MA-2; Alternate Fire Protection Alignments; Rev. 0  
2-SOI-1.01; Main Steam System; Rev. U2

Corrective Action Documents

PER 969431; Unit 2 B.5.b Snapshot Assessment (WBN-LIC-S-002) identified several open items

SR 989305; Unit 2 B.5.b Open Items Tracking PER

Other

Engineering Programs and Components Turnover; 0-TI-435; Program/Component – 10CFR 50.4(hh)(2), B5b

PP-19 Open Items / Commitment Completion Form; Engineering Complete Closure Package for B5b Mitigating Strategies

## LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
AFW	Auxiliary Feedwater
AMSAC	ATWS Mitigation System Actuation Circuitry
ASME	American Society of Mechanical Engineers
BAT	Boric Acid Tank
BSL	Business Support Library
CAQR	Condition Adverse to Quality Report
CB&I	Chicago Bridge and Iron
CCS	Component Cooling System
CECC	Central Emergency Control Center
CMAA	Crane Manufacturers Association of America
CMTR	Certified Material Test Reports
CS	Containment Spray
CVCS	Chemical Volume Control System
EDCR	Engineering Document Construction Releases
EDG	Emergency Diesel Generator
ERCW	Essential Raw Cooling Water
ERF	Emergency Response Facilities
FSAR	Final Safety Analysis Report
GL	Generic Letter
ICM	Interim Compensatory Measures
IIR	Integrated Inspection Report
IMC	Inspection Manual Chapter (NRC)
IP	Inspection Procedure (NRC)
IST	In-Service Testing
LOOP	Loops of Offsite Power
M&TE	Measuring and Test Equipment
MDAFW	Motor Driven Auxiliary Feedwater
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NDE	Non-Destructive Examination
NE	Nuclear Engineering
No.	Number
NPG	Nuclear Power Group
NPP	Nuclear Performance Plan
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
O&M	Operation and Maintenance
OL	Operating License
PER	Problem Evaluation Report
psi	Pounds per Square Inch
PTI	Preoperational Test Instruction
QA	Quality Assurance
QC	Quality Control
RCS	Reactor Coolant System
Rev.	Revision
RHR	Residual Heat Removal
RMI	Reflective Material Insulation
ROP	Reactor Oversight Process
RWST	Refueling Water Storage Tanks

SE	Safety Evaluation
SER	Safety Evaluation Report
SI	Safety Injection
SIS	Safety Injection System
SL	Severity Level
SSC	Structures, Systems, and Components
SSD	Setpoint and Scaling Document
SSER	Supplemental Safety Evaluation Report
TI	Temporary Instruction (NRC)
TRM	Technical Requirements Manual
TS	Technical Specifications
TVA	Tennessee Valley Authority
UCC	Upper Containment Coolers
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
U2	Unit 2
WBN	Watts Bar Nuclear Plant
WO	Work Order
WPQ	Welder Performance Qualifications
10 CFR	Title 10 to the Code of Federal Regulations