



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

March 24, 2015

Mr. Michael D. Skaggs
Senior Vice President
Nuclear Generation Development and Construction
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED
INSPECTION REPORT 05000391/2015602

Dear Mr. Skaggs:

On February 14, 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 March 12, 2015, with you 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.

No findings were identified during this inspection.

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 05000391/2015602
w/ Attachment

cc w/encl: (See next page)

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 05000391/2015602
w/ Attachment

cc w/encl: (See next page)
* Previous Concurrence

■ PUBLICLY AVAILABLE □ NON-PUBLICLY AVAILABLE □ SENSITIVE ■ NON-SENSITIVE
ADAMS: ■ Yes ACCESSION NUMBER: ML15083A276 ■ SUNSI REVIEW COMPLETE ■ FORM 665 ATTACHED

OFFICE	RII:DCP	RII:DCP	RII:DCP	RII:DCP	RII:DCP	RII:DCP
SIGNATURE	EJP1 for TXN1	EJP1 via e-mail	PEC via e-mail	MCM4 via e-mail	JBB5 via e-mail	AAW via e-mail
NAME	T. Nazario	E. Patterson	P. Cooper	M. Magyar	J. Baptist	A. Wilson
DATE	03/18/2015	03/17/2015	03/18/2015	03/17/2015	03/18/2015	03/17/2015
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
OFFICE	RII: DCP	RII:DCI	RII:DCI	RII:DCI	RII:DCI	RII:DRS
SIGNATURE	DJS3 via e-mail	GXC2 via e-mail	ATM1 via e-mail	PXB3 via e-mail	JAC1 via e-mail	JAE1 via e-mail
NAME	J. Seat	G. Crespo	A. Matos-Marin	P. Braxton	J. Christensen	J. Eargle
DATE	03/17/2015	03/17/2015	03/17/2015	03/18/2015	03/18/2015	03/18/2015
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY DOCUMENT NAME: G:\CC\IDCP\CPB3\WATTS BAR 2\CURRENT DRAFT INSPECTION REPORT\2015\IR 2015-602\INTEGRATED IR 2015602 DRAFT FINAL.DOCX

cc w/encl:

Mr. Gordon P. Arent
Director, Licensing
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, Tennessee 37381

Mr. O. J. Zeringue, General Manager
Engineering and Construction
WBN Unit Two
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, Tennessee 37381

Mr. Paul Simmons, Vice President
WBN Unit Two Project
WBN Unit Two
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City Tennessee 37381

Mr. James O'Dell, Manager
Licensing and Industry Affairs
WBN Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, Tennessee 37381

Mr. Joseph P. Grimes
Chief Nuclear Officer
and Executive Vice President
Tennessee Valley Authority
1101 Market Place
3R Lookout Place
Chattanooga, Tennessee 37402-2801

County Executive
375 Church Street
Suite 215
Dayton, Tennessee 37321

Mr. Sean Connors
Plant Manager, WBN Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, Tennessee 37381

Mr. R. R. Baron, Senior Manager
Nuclear Construction Quality Assurance
WBN Unit Two
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, Tennessee 37381

Mr. Joseph Shea, Vice President
Nuclear Licensing
Tennessee Valley Authority
1101 Market Street
3R Lookout Place
Chattanooga, TN 37402-2801

Mr. E. J. Vigluicci
Assistant General Counsel
Tennessee Valley Authority
400 West Summit Hill Drive
6A West Tower
Knoxville, Tennessee 37402

Mr. Lawrence E. Nanney, Director
Tennessee Department of Environmental
Health & Conservation
Division of Radiological Health
3rd Floor, L&C Annex
401 Church Street
Nashville, TN 37243-1532

Mr. Kevin Walsh
Site Vice President
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, Tennessee 37381

County Mayor
P.O. Box 156
Decatur, Tennessee 37322

Ms. Ann P. Harris
Public
341 Swing Loop
Rockwood, TN 37854

cc email distribution w/encl:

Greg Scott
Tennessee Valley Authority
Electronic Mail Distribution

Watts Bar 2 Licensing
Tennessee Valley Authority
Electronic Mail Distribution

Letter to Michael D. Skaggs from Robert C. Haag dated March 24, 2015.

SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED
INSPECTION REPORT 05000391/2015602

Distribution w/encl:

Region II Regional Coordinator, OEDO

J. Quichocho, NRR

J. Poole, NRR

J. Dion, NRR

A. Minarik, NRR

V. McCree, RII

L. Douglas, RII EICS

M. King, RII DRP

J. Nadel, RII WBN Unit 1 SRI

OE Mail

ConE_Resource@nrc.gov

PUBLIC

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-391

Construction Permit No.: CPPR-92

Report No.: 05000391/2015602

Applicant: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Unit 2

Location: Spring City, TN 37381

Dates: January 1, 2015 – February 14, 2015

Inspectors: T. Nazario, Senior Resident Inspector, Construction Projects Branch (CPB) 3, Division of Construction Projects (DCP), Region II (RII)
E. Patterson, Resident Inspector, CPB3, DCP, RII
M. Magyar, Resident Inspector, CPB3, DCP, RII
P. Cooper, Resident Inspector, CPB3, DCP, RII
J. Baptist, Senior Construction Project Inspector, CPB3, DCP, RII, Sections P.1.1, P.1.2, P.1.3, P.1.5, and P.1.7
A. Wilson, Construction Project Inspector, CPB3, DCP, RII, Sections P.1.4 and OA.1.1
J. Seat, Construction Project Inspector, CPB3, DCP, RII, Section OA.1.7
G. Crespo, Senior Construction Inspector, Construction Inspection Branch (CIB) 1, Division of Construction Inspection (DCI), RII, Sections OA.1.3 and OA.1.5
A. Matos-Marin, Construction Inspector, CIB1, DCI, RII, Sections OA.1.5 and OA.1.6
P. Braxton, Construction Inspector, CIB1, DCI, RII, Section OA.1.4
J. Christensen, Construction Inspector, CIB3, DCI, Section OA.1.2
J. Eargle, Senior Reactor Inspector, Engineering Branch 1 (EB) 1, Division of Reactor Safety (DRS), RII, Section OA.1.1

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 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 inspectors concluded that issues pertaining to several open items, including one unresolved item (URI), two inspection procedures (IPs), five temporary instructions (TIs), one generic letter (GL), 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; mechanical components; electrical systems and components; preoperational testing activities; and various NRC inspection procedures.

Table of Contents

I.	QUALITY ASSURANCE PROGRAM	5
Q.1.1	Identification and Resolution of Construction Problems (Inspection Procedure 35007)	5
Q.1.2	Safety Conscious Work Environment (Inspection Procedure 35007 and Temporary Instruction 2512/015)	5
II.	MANAGEMENT OVERSIGHT AND CONTROLS	6
C.1	Construction Activities	6
C.1.1	Unit 1 and Unit 2 Construction Activity Interface Controls	6
C.1.2	Mechanical Components – Work Observation and Construction Refurbishment (Inspection Procedures 50073 and 37002)	7
P.1	Preoperational Activities	9
P.1.1	Preoperational Test Program Implementation Verification (Inspection Procedure 71302)	9
P.1.2	(Closed) Preoperational Test Procedure Review (Inspection Procedures 70300 and 70308)	10
P.1.3	Preoperational Test Procedure Review (Inspection Procedures 70300 and 70311)	12
P.1.4	Preoperational Test Procedure Review (Inspection Procedures 70300 and 70333B)	13
P.1.5	Preoperational Test Witnessing (Inspection Procedures 70302, 70312, and 70433)	14
P.1.6	Preoperational Test Results Evaluation (Inspection Procedure 70400)	15
P.1.7	Preoperational Test Results Evaluation (Inspection Procedure 70400)	16
IV.	OTHER ACTIVITES	17
OA.1.1	(Closed) Quality Assurance Program - Records and Unresolved Item 05000391/2014607-02, Potential Inadequate Storage of QA Records (Inspection Procedure 35748B)	17
OA.1.2	(Closed) Instrument Sensing Lines Corrective Action Program (Temporary Instruction 2512/026 and Inspection Procedures 49061, 49063, 49065, 52051, 52053, and 52055)	19
OA.1.3	(Closed) Inspection of Watts Bar Nuclear Plant Master Fuse List Special Program (Temporary Instruction 2512/037)	21
OA.1.4	(Closed) Generic Letter 96-01, Testing of Safety-Related Logic Circuits (Temporary Instruction 2515/139)	22
OA.1.5	(Closed) Hydrogen Igniter Backup Power Verification (Temporary Instruction 2515/174)	23
OA.1.6	(Closed) Supplemental Safety Evaluation Report, Appendix HH, Open Item 33: Verify Completion of Design Change Notices of 125V DC Vital Battery System Analysis (Inspection Procedures 51053, 51063, and 92702)	24
OA.1.7	(Closed) Bulletin 85-02, Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers (Temporary Instruction 2515/72)	25
V.	MANAGEMENT MEETINGS	25
X1	Exit Meeting Summary	25

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 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 reviewed PER 958010 – System 81 Primary Water Pumps Shunt Trip Wiring Not Landed. The inspectors reviewed PER 958010 to verify that the following corrective actions were completed: immediate actions to tag out the pump breakers, the completion of the extent of condition review, and revising the test procedures. The inspectors reviewed the timeliness and adequacy of the Apparent Cause Analysis Report. Based on the apparent cause, the applicant strengthened the technical instruction process, 0-TI-12.08, "Control of Unit Interfaces," Revision (Rev.) 0001, to ensure special requirements were met prior to releasing the boundary. The inspectors reviewed the Unit 1 impact evaluation to verify that the issue did not significantly affect Unit 1.

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

b. Observations and Findings

No findings were identified.

c. Conclusions

The issues identified in the PERs reviewed were adequately identified, addressed, and resolved.

Q.1.2 Safety Conscious Work Environment (Inspection Procedure 35007 and Temporary Instruction 2512/015)

a. Inspection Scope

On January 23, 2015, the inspectors met with TVA employee concerns program coordinators to discuss the 2014 third and fourth quarterly analysis of concerns and any

trends. The inspectors reviewed existing program requirements and recent concerns identified by the applicant's and contractor's employee concerns programs.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors did not identify any issues or concerns regarding the ability of the applicant to provide a safety conscience work environment.

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 activity observed included work associated with:

- Work Order (WO) 116499660, Drain and Refill Unit 2 GLYCOL System, Maintain Unit 1 Separation, and
- WO 113268970, System 003, Auxiliary Feed Water Pressure Test, Boundary Near Unit 1 equipment.

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 Mechanical Components – Work Observation and Construction Refurbishment (Inspection Procedures 50073 and 37002)

a. Inspection Scope

Background: After resumption of Watts Bar Unit 2 construction activities in 2007, safety injection pumps 2A and 2B were sent to the original equipment manufacturer (OEM) and vendor, Flowserve, to be refurbished as part of TVA's refurbishment program. In October 2010, during the receipt inspection of safety injection pump 2A, a PER was generated to document several hardware non-conformances, to include the lower thrust end bearing housing clearance fit-up with the pump casing and the visual damage to the inboard end auxiliary packing gland. TVA engineering determined that the non-conformances would not invalidate the pump's performance to meet its safety function and accepted the non-conforming parts as "use-as-is." The safety injection pumps were installed and placed in a dry layup condition in the summer of 2011.

In January 2014, the 2A safety injection pump shaft was damaged during construction activities while drilling thermocouple mounting holes through the pump journal bearing housing. TVA determined the pump was delivered, from the vendor, with an incorrect pilot hole angle in the bearing upper housing used for drilling the bearing. TVA initiated corrective actions and replaced the 2A safety injection pump shaft and rotating element. During the disassembly of the 2A safety injection pump, to address the damaged shaft, TVA discovered that the pump had several mechanical assembly errors that did not meet the pump vendor supplied drawings, and foreign material was found in the pump casing and internals. In addition, TVA found water in the bottom half of the 2A pump casing. TVA initiated several PERs to address the pump vendor's negative quality performance trend and included corrective actions for the additional pump vendor assembly errors for the 2B safety injection pump and the two safety-related charging pumps. The vendor submitted an initial 10 CFR Part 21 Notification of Defect in April 2014, a final report to the NRC in June 2014, and a root cause analysis to TVA which stated that the vendor had a lack of quality control during the final refurbishment and reassembly of the pumps prior to shipment due to a lack of knowledge and experience in personnel. The 2A safety injection pump shaft and rotating element was replaced with a spare from TVA's inventory, and the 2B and charging safety-related pumps were repaired and reassembled to support open vessel testing during the summer of 2014.

During open vessel testing the safety injection pumps 2A and 2B operated at a flow rate greater than the rated 800 gallons per minute (gpm), also known as pump run-out, due to a system valve alignment error; this caused the pumps to operate outside of the pump curve specifications for a short period of time. The valve alignment was reconfigured and the test 2-PTI-063-01, "Safety Injection System SIS Integrated Test," Rev. 0, was completed. The pump operating temperature and vibration specifications were monitored during the test and did not exceed alarm limits. TVA disassembled the 2A and 2B safety injection pumps after the open vessel test and discovered the pump shaft and thrust end-bearings were excessively worn. Both pump rotating assembly and shaft

drive lube oil pumps were sent off site to the OEM vendor, Flowserve, for repair and a root cause analysis.

As part of the evaluation of the rotating element for the 2A safety injection pump with the drilled damaged shaft, the vendor noted several defects and water marks on the impellers that appeared to be from microbiological influence corrosion (MIC). During the original construction refurbishment time frame, the 2A safety injection pump was refurbished and returned to site in 2011. The refurbished pump contained the original impeller and diffuser material, but upgraded shaft material. The original impellers were made from ASTM A296, grade CA40, and the diffusers were made from CA6NM. The spacers were made of AISI type 400 series material. The CA40 and American Iron and Steel Institute (AISI) type 400 series material had very little alloying elements and a maximum of 0.5 percent molybdenum. Interviews with TVA's metallurgist noted that contaminated water may cause MIC that attacks stainless steel material that has little to no molybdenum. TVA was unable to conclude the cause, where the water came from, or how long the 2A safety injection pump impeller had been sitting in water. TVA and the vendor verified that the 2B safety injection pump was not sitting in water during its layup condition. They also confirmed that the 2B safety injection pump shaft and impeller material were upgraded to CA6NM material (which was a material with a higher percentage of molybdenum) during the original refurbishment activities in 2011. Also, TVA flushed the safety injection system flow path with demineralized water to verify that no contaminants remained in the pump flow path.

Flowserve implemented the repair plan for both safety injection pumps which included new bearings, removing the shaft scarred areas, and building back up the shaft area with a hard chrome plate. In addition, the 2B safety injection pump repair plans included removing and re-applying material to wear surfaces from significant grooving on several impeller stages. Several other minor impeller groove wear and casting defects were accepted as-is and all critical dimensions were noted as within OEM tolerances. The 2A safety injection pump repair plan is in progress.

Inspection Activities: The inspectors reviewed the corrective actions and observed the corrective action management reviews associated with the safety injection pump refurbishment. Also, the inspectors interviewed TVA staff and the pump vendor representative on site to verify that specially trained personnel were utilized and were available to meet the manufacturer's instructions. The inspectors reviewed the vendor's root cause evaluation, TVA's engineering consultant root cause evaluation, and the pump vendor's as-found condition report and repair plans to verify that the causes and corrective actions were properly identified, documented, and were implemented into TVA's corrective action plans.

The inspectors observed the installation of the 2B safety injection pump and reviewed WO 116306257, Assembly of the 2B Safety Injection Pump, to verify the vendor and TVA assembly instructions were followed, to include pre-lubrication of the pump, cleanliness, alignment, tolerances, and that clearances were met. In addition, the inspectors reviewed the pump assembly documents to verify the hold points were observed and the inspection records were adequate, to include hold points for the refurbishment cleanliness inspections.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified. The refurbishment program is a unique process specific to the Watts Bar Unit 2 reactivation construction project. TVA is in the process of documenting the corrective actions and has provided additional quality oversight to the pump vendor refurbishment remaining scope of work. The safety-related charging pumps have been repaired and reinstalled and have performed adequately during initial component testing. The safety injection pump repair plans are in process in accordance with the approved corrective action plans.

c. Conclusions

The inspectors determined that TVA had identified several safety-related pump manufacturing and field construction non-conformances and created several corrective action plans to ensure the pumps are assembled correctly and will perform their safety function. The remaining repair plans and corrective actions include assembly of the 2A safety injection pump, component testing, and updating site specific procedures and vendor manuals.

P.1 Preoperational Activities

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

a. Inspection Scope

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

- System 061 - Ice Condenser
- System 063 - Safety Injection System
- System 074 - Residual Heat Removal
- System 003B - 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. Inspectors also verified 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 applicant's procedures;
- activities in progress (e.g., maintenance, preoperational testing, etc.) were being conducted in accordance with 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 is authorized to perform activities on systems or equipment; and
- looked for uncontrolled openings in previously cleaned or flushed systems or components.

In addition, the inspectors observed the component tests of motor-operated valve 2-FCV-074-40 and observed portions of the implementation of test procedure GTM-02, "Pump Functional Test," Rev. 2, for the 2A auxiliary feedwater pump and the 2B safety injection pump.

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 (Closed) Preoperational Test Procedure Review (Inspection Procedures 70300 and 70308)

a. Inspection Scope

Background: The purpose of Inspection Manual Chapter (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 procedural 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 preoperational test procedure (PTI) 2-PTI-068-01, Hot Functional Test (HFT) – Heatup and Cooldown, Rev.0, to verify that the test procedure adequately addressed NRC requirements and licensing commitments outlined in the Final Safety Analysis Report (FSAR), docketed correspondence, Safety Evaluation Report (SER), Technical Specifications, and Regulatory Guide 1.68. Additionally, the inspectors reviewed preoperational test procedure 2-PTI-068-01 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; and
- overall sequence of the procedure was consistent with obtaining the intended result.

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 preoperational test procedure 2-PTI-068-01 to verify the following:

- all related procedures (operating, administrative, etc.) were approved;
- variations made to conduct the cold functional testing have been reset or returned to normal as required to perform HFT;
- the integrated HFT procedure was the controlling document for testing to be performed;
- the procedure had provisions to document satisfactory completion of the various steps and sequence that must be accomplished;
- initial conditions were listed;
- water quality was stated;
- test criteria was clearly defined for each test;
- the heatup, systems to be operated, indicated modes of operation, and checks to be performed are listed;
- a specified inspection of piping hangers, piping leakage, and hanger settings while the systems are hot;

- the residual heat removal system will be tested to demonstrate the performance and capability for cooldown and for low temperature overpressure control while solid;
- the temperature/pressure plateaus at which testing will be performed are defined;
- provisions exist to correct operating procedures if errors are found;
- provisions exist for system inspections to ensure that electrical cables, paper boards, flammable material, etc., will not contact hot pipes;
- all applicable steam turbines are protected against inadvertent rotation during testing;
- necessary actions exist to control the plant in the event relief valves lift and do not reset;
- guidance exists regarding vibration of reactor internals outlined in Regulatory Guide 1.20;
- guidance exists regarding demonstration of component and system operability in various modes and throughout full design operating range, regarding expansion and restraint testing, "water hammer," and other areas as outlined in applicable sections of Regulatory Guide 1.68, Appendix A;
- guidance exists on testing of emergency core cooling systems (ECCS) as outlined in applicable sections of Regulatory Guide 1.79; and
- there is evidence of incorporation of appropriate documents from applicable vendor manuals and applicable precaution, limitation, and setpoint documents.

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. This completes the hot functional test procedure review of preoperational test procedure 2-PTI-068-01. IP 70308 is closed.

P.1.3 Preoperational Test Procedure Review (Inspection Procedures 70300 and 70311)

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 preoperational test procedure 2-PTI-063-06, Safety Injection System Check Valve Test, 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 were 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; and
- the overall sequence of the procedure was consistent with obtaining the intended result.

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. This concludes all the planned procedure reviews for System 63 (safety injection system) preoperational testing.

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 NRC requirements and the guidance of applicant procedure SMP-8.0, "Watts Bar Nuclear Plant Unit 2 Administration of Preoperational Test Instructions," Rev. 11.

P.1.4 Preoperational Test Procedure Review (Inspection Procedures 70300 and 70333B)

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 preoperational test procedure 2-PTI-062-02, Boric Acid Subsystem Logic Test, 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 obtaining the intended result.

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.

P.1.5 Preoperational Test Witnessing (Inspection Procedures 70302, 70312, and 70433)

a. Inspection Scope

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 6.12, 2-FCV-62-84
- Section 6.27, 2-FCV-62-77.

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 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.

P.1.6 Preoperational Test Results Evaluation (Inspection Procedure 70400)

a. Inspection Scope

The inspectors performed a detailed review of the results for portions of the preoperational test procedure 2-PTI-030E-01, containment air return fans associated with the implementation of GTM-05, "HVAC Air Balance," Rev. 2. The containment air return fan system moves air from upper containment, from several dead-ended spaces where there is potential for accumulation of hydrogen, to lower containment up through the ice condenser during a large break loss of coolant accident. The inspectors reviewed the test procedure to verify that the applicant's evaluation of the procedure performance and results was conducted in accordance with approved procedures. This review was performed to provide assurance that the test data was within the established

acceptance criteria and the applicant's methods for identifying and correcting deficiencies were adequate. The inspectors performed the following activities associated with this test results review:

- reviewed all documented test deficiencies to verify they had been properly resolved, reviewed, and accepted;
- reviewed the test summary and evaluation to verify that the system was evaluated to meet design requirements and acceptance criteria;
- reviewed the original "as-run" copy of the test to verify completion of data sheets, calculations and signatures/initials; and
- the approval of the test results was reviewed for completeness with respect to the acceptance of the test results.

The inspectors reviewed the test results to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to ensure that the test evaluation was performed in accordance with established procedures.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified. The applicant initiated PER 971781 to address several test deficiency notices for not meeting the required air flow rates for the containment air return system. The as-built air flows were consistent with Watts Bar Unit 1 air flows. The air flows were reviewed and accepted as-is and the applicant committed to update the design documents to reflect the as-built airflows as part of the corrective actions associated with PER 971781.

c. Conclusions

The inspectors determined that the applicant's test results were documented, reviewed, and approved in a manner consistent with the guidance of procedure SMP-10.0, "Watts Bar Nuclear Plant Unit 2 Packaging and Processing Test Results," Rev. 2. This completes the test results evaluation of preoperational test procedure 2-PTI-030E-01 associated with GTM-05, "HVAC Air Balance," Rev. 2.

P.1.7 Preoperational Test Results Evaluation (Inspection Procedure 70400)

a. Inspection Scope

The inspectors performed a detailed review of the results for preoperational test procedure 2-PTI-063-02, Safety Injection System (SIS) Accumulators, Rev. 1, to verify that the applicant's evaluation of the procedure performance and results was conducted in accordance with approved procedures. This review was performed to provide assurance that the test data was within the established acceptance criteria and the applicant's methods for identifying and correcting deficiencies were adequate. The inspectors performed the following activities associated with this test results review:

- reviewed all changes made to the test procedure to verify they were properly annotated, did not affect the objective of the test, and were performed in accordance with administrative procedures;

- reviewed all documented test deficiencies to verify they had been properly resolved, reviewed, and accepted;
- reviewed the test summary and evaluation to verify that the system was evaluated to meet design requirements and acceptance criteria;
- reviewed the original “as-run” copy of the test to verify completion of data sheets, calculations, and signatures/initials;
- quality assurance (QA) inspection records were reviewed to verify they were completed as required by the test procedure; and
- the approval of the test results was reviewed for completeness to ensure that personnel charged with the responsibility for review and acceptance had documented their evaluation and corrected any identified discrepancies.

The inspectors reviewed the test results to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the test evaluation was performed in accordance with established procedures.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the applicant’s properly evaluated the test in accordance with the guidance of procedure SMP-10.0, “Watts Bar Nuclear Plant Unit 2 Packaging and Processing Test Results,” Rev. 2. This completes the test results evaluation of preoperational test procedure 2-PTI-063-02.

IV. OTHER ACTIVITIES

OA.1.1 (Closed) Quality Assurance Program - Records and Unresolved Item 05000391/2014607-02, Potential Inadequate Storage of QA Records (Inspection Procedure 35748B)

a. Inspection Scope

Background: For Watts Bar Unit 1, IP 35748B, “Records”, dated October 1, 1976, was used to verify that the applicant had developed a QA program relating to the control of records that is in conformance with regulatory requirements, commitments in the application, and industry guides and standards. Based on the record storage program being well-established under the Unit 1 organization, the inspectors performed Section II.2.b of the IP 35748B and verified that Unit 2 will be incorporated into the established record storage program at Watts Bar when dual-unit operation begins. This Unit 2 inspection was performed and documented in NRC IIR 05000391/2014607 (ADAMS Accession No. ML14274A076). IIR 05000391/2014607 documented an unresolved item (URI), URI 05000391/2014607-02, “Potential Inadequate Storage of QA Records.”

Inspection Activities: In response to the inspectors’ observations in IIR 05000391/2014607, the applicant issued PER 927528 to review the URI. The

inspectors reviewed PER 927528 to verify that the applicant had made corrective actions to restore compliance.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

On January 18, 1990, the NRC approved TVA's Nuclear Quality Assurance Plan (NQAP) as acceptable to meet 10 CFR Part 50, Appendix B. The applicant's NQAP states, in part that, TVA will provide two-hour minimum fire-rated protection for QA records and utilize one of the following alternatives as single storage facilities:

1. A fire-resistive vault or file room that meets the applicable requirements of American National Standards Institute (ANSI) 45.2.9-1974 with the following exceptions:
 - a. records will be afforded the protection of a two-hour rated facility;
 - b. records will be stored in fully enclosed cabinets;
 - c. structure, doors, frames, and hardware shall be designed to fully comply with a minimum two-hour rating;
 - d. pipes or penetrations will be allowed for fire protection, lighting, temperature, humidity control, or communications;
 - e. work not directly associated with records storage or retrieval will be prohibited in the facility; and
 - f. smoking and eating/drinking will be prohibited throughout the records facility.
2. One-hour fire-rated cabinets if the following conditions are met:
 - a. the records are re-creatable; OR
 - b. are contained within a facility of fire-resistive construction with adequate smoke detection or fire-suppression systems; OR
 - c. are within a facility with a fuel loading less than 25 pounds/square foot as defined by National Fire Protection Act (NFPA) 232-1980.

TVA utilized Trailer 71 and room EQB1D as facilities to process QA records. Trailer 71 and room EQB1D met the second part of the statement by following alternatives 2.c. and 2.b., respectively, of the NQAP as a single storage facility. However, TVA had not demonstrated that the configuration of Trailer 71 met the first part of the statement, that the single storage facility was equivalent to two-hour fire-rated protection. The inspectors determined that the applicant's failure to comply with the NQAP was a performance deficiency.

Criterion V of Appendix B of 10 CFR Part 50 requires, in part, that "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings." Section 5.6 of the NQAP states that TVA will provide two-hour minimum fire-rated protection for QA records.

Contrary to the above, since identified on August 25, 2014, the applicant failed to provide two-hour minimum fire-rated protection for QA records in accordance with the

requirements of the NQAP. The records were contained in a one-hour fire-rated cabinet and were within a facility with fuel loading less than 25 pounds/square foot. The inspectors' review of ASTM E119-80 time temperature curves indicate that a one hour barrier within the typical trailer structure would not reach a temperature of 2000 degrees until approximately four hours; therefore, the inspectors determined that the applicant's storage of QA records in a one-hour fire-rated cabinet in this trailer would not have resulted in damage if a fire would have occurred. For this reason, the inspectors determined this violation to be of minor significance in accordance with IMC 2517, "Watts Bar Unit 2 Construction Inspection Program." The applicant issued PER 927528 to review the deficiency and make corrective actions to restore compliance. Corrective action was taken to electronically scan all QA records in Trailer 71 and store them on a designated QA server. The applicant modified the receipt process to store all incoming QA records in a two-hour fire rated, impact-resistant cabinet until scanning of the records is complete. This failure to comply with 10 CFR 50 Appendix B, Criterion V constitutes a violation of minor significance that is not subject to enforcement action in accordance with the NRC's Enforcement Policy. URI 05000391/2014607-02 is closed.

c. Conclusions

The inspectors determined that corrective actions were taken to restore compliance for the issue identified in URI 05000391/2014607-02. URI 05000391/2014607-02 is closed. In addition, the inspectors concluded no further inspection will be required to verify the adequacy of IP 35748B as long as the implementation of current procedures and the planned transition plan to two unit operation remains intact. Inspection Procedure 35748B is closed.

OA.1.2 (Closed) Instrument Sensing Lines Corrective Action Program (Temporary Instruction 2512/026 and Inspection Procedures 49061, 49063, 49065, 52051, 52053, and 52055)

a. Inspection Scope

Background: The objective of Temporary Instruction (TI) 2512/026, Inspection of Watts Bar Nuclear Plant Instrument Lines Corrective Action Program Plan, is to gather sufficient information to make a determination as to whether TVA's Instrument Sensing Lines Corrective Action Program (CAP) plan has been satisfactorily implemented to assure that the issues it addressed are being adequately resolved.

The Watts Bar Program Team was formed in 1987 and performed an integrated systematic evaluation of Watts Bar after the applicant withdrew the certification that Watts Bar Unit 1 was ready for licensing due to over 5000 employee concerns. This team recommended 18 CAP plans (including the Instrument Sensing Lines CAP) and submitted them to the NRC for review. The issues identified with the instrument sensing lines fell into two categories:

1. Functional issues related to minimum slope requirements: A number of sensing lines were found that did not conform to the minimum slope requirements on design output drawings.

2. Structural issues related to:

- a. Thermal effects: Instrument lines and supports were not designed considering the effects of thermal expansion. Operating modes associated with many of these lines indicated that portions of systems will be subjected to thermal expansion effects.
- b. Pipe and tube bending devices: Implementing procedures used to qualify pipe and tube bending devices were not being executed and qualification records for the bending devices and specific bends were not being maintained for all work.
- c. Compression fittings: Numerous discrepancies with compression fittings were discovered that did not satisfy manufacturer's installation instructions. These discrepancies were not specific to one aspect of installation. Tubing cuts were not properly deburred, fittings were not properly tightened or installed, and ferrules were missing, reversed, or unidentifiable.
- d. Installation discrepancies: Support documentation for some instrumentation lines was determined to be lost or incorrect. The scope of the structural issues included Seismic Category I and I(L) instrument lines and their associated supports.

TVA committed to implement the Unit 1 approach to instrument line systems for Unit 2. To date, NRC inspectors have performed numerous inspections that have focused on these issues. Inspectors have previously reviewed much of the progress of the Watts Bar 2 corrective actions. Information on previous inspections of the CAP can be found in the following Watts Bar Unit 2 Inspection Reports:

- 05000391/2010603 (ADAMS Accession No. ML102170465)
- 05000391/2010604 (ADAMS Accession No. ML103060240)
- 05000391/2011602 (ADAMS Accession No. ML110800483)
- 05000391/2011604 (ADAMS Accession No. ML111810890)
- 05000391/2011607 (ADAMS Accession No. ML112730197)

These inspections covered the design and calculation aspects of the Instrument Sensing Lines CAP. The inspectors performed field observations of work on the sensing lines including slope and installation verifications. Inspections also covered the review of previous modifications, the review of engineering change notices and field change requests, and the inspection of previous testing performed on instrument sensing lines. These previous inspections also reviewed nonconformance and deviation reports and audit reports relating to instrument sensing line work orders.

Inspection Activities: The inspectors reviewed applicant and contractor procedures for the qualification and use of pipe and tube bending machines. The inspectors also reviewed the process for determining the instrument systems affected by thermal expansion. This included a review of the drawings and calculations associated with thermal expansion, to verify that the process was implemented correctly and that proper engineering practices were used in the determination. Additional inspection of thermal effects on instrument line systems will be conducted as part of a future inspection of Construction Deficiency Report (CDR) 86-11.

The inspectors reviewed and walked down the accessible portions of six safety-related instrument lines on five different safety-related systems to determine if they were properly sloped and supported, the pipe was correctly sized, and if the actual field configuration matched the isometric drawings. The inspectors reviewed drawings for two supports to determine if the supports and tubing clips were installed according to the drawings and specifications. The inspectors also reviewed field change requests associated with the instrument lines to verify that changes were incorporated into the work orders.

The inspectors reviewed a sample of six receipt inspection reports for material on the selected work orders to determine if adequate measurements were in place to verify physical condition and delivery of correct materials along with proper documentation to ensure that procurement specifications have been met. The inspectors reviewed 30 examples of work orders to verify that the correct bender usage lists and bender inspection documents were maintained as required by TVA procedure. The inspectors also reviewed training records for seven craft personnel conducting work on instrument line work orders.

The inspectors witnessed one in-process field hydrostatic test to verify that the work performed on instrument systems met the design requirements. The NRC inspectors also witnessed the testing of numerous instrument sensing lines during the reactor coolant system cold hydrostatic test, which was conducted in September 2014 and is documented under IIR 05000391/2014608 (ADAMS Accession No. ML14322A182).

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The inspectors determined that issues associated with the Instrument Sensing Lines CAP (TI 2512/026) were properly addressed and tracked in the applicant's corrective action program and appropriate measures were taken to prevent recurrence. Based on a review of the applicant's engineering complete closure package and results of this and previous inspections, the Instrument Sensing Lines CAP (TI 2512/026) is closed.

OA.1.3 (Closed) Inspection of Watts Bar Nuclear Plant Master Fuse List Special Program (Temporary Instruction 2512/037)

a. Inspection Scope

Background: In 1989, the Watts Bar Nuclear Plant Performance Plan identified a special program (SP) to establish a controlled master fuse list. The SP provided corrective actions to address three primary issues: (1) Class 1E safety-related fuses had not been adequately identified and controlled; (2) Bussmann KAZ actuators had been improperly used to provide circuit protection; and (3) requirements for redundant overcurrent protection of electrical penetration assemblies had not been adequately addressed by design.

The previous inspections of this SP on Unit 2 were documented in IIRs 05000391/2010603 (ADAMS Accession No. ML102170465), Section OA.1.8; 05000391/2010605 (ADAMS Accession No. ML110410680), Section OA.1.16; 05000391/2013604 (ADAMS Accession No. ML13179A079), Section OA.1.23; and 05000391/2013610 (ADAMS Accession No. ML14049A158), Section OA.1.5. These reports documented acceptable results for a sample of 39 fuse sets in six safety-related plant systems.

Inspection Activities: The inspectors reviewed the engineering complete closure package regarding the Master Fuse List Special Program. The inspectors selected a sample of fuses that had been installed and verified by the applicant from four safety-related systems that had been turned over to startup, including systems 30A (auxiliary building ventilation), 62 (chemical and volume control system), 70 (component cooling system), and 30J (reactor building ventilation). The list of fuses inspected is provided in the Attachment. Included in the listing of fuses reviewed was fuse KAZ – WBN-2-BD-212-B002-B/9C (applied as an indicator device in parallel with actual power fuses). The inspectors interviewed applicant staff members responsible for the design and selection of the fuses listed on the master equipment list (MEL). The inspectors performed a direct visual inspection on a sample of fuses to verify that they agreed with the fuses listed in the MEL. The inspectors conducted walkdowns of motor control centers (MCCs) to verify fuses installed in the individual compartments matched those listed in the design documents.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusion

The inspectors concluded that the fuses in the systems reviewed were adequately sized, installed, and properly documented for the samples selected for inspection. Based on the significant number of fuses and systems reviewed, inspectors determined that sufficient inspections have been performed. Therefore, Temporary Instruction 2512/037 is closed.

OA.1.4 (Closed) Generic Letter 96-01, Testing of Safety-Related Logic Circuits (Temporary Instruction 2515/139)

a. Inspection Scope

Background: A TVA letter dated April 18, 1996, (ADAMS Accession No. ML082401216), Subject: Response to Generic Letter (GL) 96-01, Testing of Safety-Related Logic Circuits, committed to completing the actions requested by the NRC in GL 96-01 for Unit 1 and prior to the initial fuel load for Unit 2. During an inspection of Watts Bar Unit 2 on August 25-29, 2014, IIR 391/2014608 (ADAMS Accession No. ML14322A182) the inspectors concluded that objective evidence was not provided to confirm that applicable Unit 2 surveillance instructions were reviewed in accordance with the GL 96-01 requirements during the development process. This inspection continued the inspection

efforts of gathering sufficient information to determine if TVA performed adequate technical reviews in connection with their commitment and the requirements of GL 96-01.

Inspection Activities: The inspectors continued the inspection efforts initiated in NRC IIR 391/2014608 (ADAMS Accession No. ML14322A182) regarding the commitments and requirements of GL 96-01, Testing of Safety-Related Logic Circuits. The inspectors reviewed the corrective actions related to PER 931429 and the resolutions for any differences between WBN Unit 1 and Unit 2. Additionally the inspectors conducted interviews with responsible personnel developing the surveillance instructions to better understand the process and methodology used to address GL 96-01 for Unit 2. Inspectors performed a review of applicable procedures, surveillance requirements and instructions, PERs, electrical schematics, and logic diagrams. Based on the objective evidence reviewed, the inspectors concluded that the applicant performed the needed reviews and verified the referenced electrical schematic and logic diagrams against the surveillance requirements in accordance with their commitment to GL 96-01.

Documents reviewed are listed in the Attachment.

b. Observation and Findings

No findings were identified

c. Conclusion

Based on a review of the applicant's documents and the aforementioned inspection activities, the inspectors determined that the applicant had implemented actions that are sufficient to address the commitment and requirements of GL 96-01 for Watts Bar Unit 2. Therefore, Generic Letter 96-01 and Temporary Instruction 2515/139 are closed.

OA.1.5 (Closed) Hydrogen Igniter Backup Power Verification (Temporary Instruction 2515/174)

a. Inspection Scope:

Background: The objective of TI 2515/174, "Hydrogen Igniter Backup Power Verification," is to verify that licensees have adequately implemented commitments related to providing backup power to containment hydrogen igniters. The inspection activities under this TI were closed for Unit 1 and documented in NRC IIR 05000390/2008003 (ADAMS Accession No. ML082210342). Previous inspections of this item for Unit 2 were documented in IIR 05000391/2011608 Section OA.1.7 (ADAMS Accession No. ML11311A082), IIR 05000391/2012609 Section OA.1.2 (ADAMS Accession No. ML12356A073), and IIR 05000391/2014608 OA.1.7 (ADAMS Accession No. ML14322A182).

Inspection Activities: The inspectors conducted walkdowns and held discussions with responsible personnel to verify that the generator and associated components were pre-positioned in suitable locations according to the commitments. The inspectors reviewed training documents to verify that a suitable training program was established to train selected staff in the actions necessary to provide backup power to the igniters. In

addition, the inspectors reviewed implementing documents to verify that procedures were in place to govern those actions. The inspectors reviewed emergency operating instructions related to power recovery following a station blackout to verify that starting of the air-return fans and assessment of the concentration of hydrogen are accomplished prior to energizing the hydrogen igniters. This would address the concern of hydrogen concentration at or above the ice beds following a loss of power as expressed in NUREG 1150, Part II, Section 5.3.2, "Important Plant Characteristics."

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusion

The inspectors concluded that TVA had established adequate measures to implement the remaining commitments related to providing backup power to containment hydrogen igniters. Temporary Instruction 2515/174 is closed.

OA.1.6 (Closed) Supplemental Safety Evaluation Report, Appendix HH, Open Item 33: Verify Completion of Design Change Notices of 125V DC Vital Battery System Analysis (Inspection Procedures 51053, 51063, and 92702)

a. Inspection Scope:

Background: While responding to a preliminary request for information regarding the Unit 2 FSAR, TVA stated in Attachment #9 of its letter dated July 31, 2010 (ADAMS Accession No. ML102290332), that certain design change notices (DCNs) were required or anticipated for completion of WBN Unit 2. These DCNs, later identified as DCN 53421 and DCN 54636, were assumed design configurations deemed equivalent to Unit 1. These assumptions used by TVA in their 125V DC Vital Battery System Analysis were the basis of an open item subsequently established by the NRC. The open item was documented as Item #33 in Appendix HH of Supplement 22 to the WB2 Safety Evaluation Report (SSER), NUREG-0847 (ADAMS Accession No. ML110390197). The NRC determined that verification of completion of these DCNs would need to be provided to the NRC staff before issuance of the operating license. SSER 24 (ADAMS Accession No. ML11277A148) established that the item will remain open until NRC staff has verified implementation of these DCNs by inspection. These DCNs later became EDCRs and subsequently experienced further changes based on field change requests.

Inspection Activities: The inspectors conducted interviews, document reviews, and walkdowns to verify adequate implementation of cable modifications associated with DCN 54636 in the turbine driven auxiliary feedwater pump and throttle valve control circuits. The inspectors interviewed responsible engineers and reviewed calculations to evaluate a decision to utilize cables sized smaller than those proposed in the original modification design. The inspectors reviewed calculations to verify that voltage drop will remain adequate based on the as-installed cable sizes. In addition, the inspectors reviewed closed work orders, Integrated Cable & Raceway Design Software (ICRDS) reports, and other records to verify that necessary actions were taken to abandon reciprocating charging pump 2C in order to implement DCN 53421.

Documents reviewed are listed in the Attachment.

b. Observations and findings

No findings were identified.

c. Conclusion

The inspectors determined that TVA had addressed the assumptions used in its analysis of the 125V DC vital battery system which prompted the SSER 22 Open Item #33. Furthermore, TVA had subsequently incorporated changes associated with DCNs 53421 and 54636 into the WB2 design. This item is closed.

OA.1.7 (Closed) Bulletin 85-02, Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers (Temporary Instruction 2515/72)

a. Inspection Scope:

Section OA.1.23 of IIR 05000391/2011602 (ADAMS Accession No. ML110800483) documents the closure of NRC Bulletin (BL) 85-02. NRC inspectors utilized TI 2515/72 to ensure that the applicant had met the applicable requirements of BL 85-02. Although it was never specifically stated in Section OA.1.23 of IIR 05000391/2011602, the intent of TI 2515/72 was met at the time of the inspection, and no further inspections were to be performed.

No BL 85-02 or TI 2515/72 inspection activities were performed during this inspection period. This report entry is intended only to clarify both BL 85-02 and TI 2515/72 were considered closed in Section OA.1.23 of IIR 05000391/2011602.

b. Observations and findings

No findings were identified.

c. Conclusion

Based on inspection activities documented in Section OA.1.23 of IIR 05000391/2011602, BL 85-02 and Temporary Instruction 2515/72 are closed.

V. MANAGEMENT MEETINGS

X1 Exit Meeting Summary

An exit meeting was conducted on March 12, 2015, to present inspection results to you 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
D. Charlton, TVA - Regulatory Compliance
D. Cox, Bechtel - Field Engineering
W. Crouch, TVA - Engineering
G. Gomez, Bechtel - Field Engineering
S. Hilmes, TVA - Electrical Engineer
M. McGrath, TVA - Licensing
J. McLemore, Bechtel - Field Engineering
J. Noriega, Bechtel - Field Engineering
J. O'Dell, TVA - Regulatory Compliance
G. Peterson, Bechtel - Electrical Engineer
L.J. Peterson, TVA - Engineering
G. Scott, TVA – Licensing
D. Shutt, TVA - Licensing
M. Skaggs, TVA – Senior Vice President
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 35748B	QA Program - Records
IP 37002	Construction Refurbishment Program – Watts Bar Unit 2
IP 49061	Safety-Related Piping – QA Review
IP 49063	Piping – Work Observation
IP 49065	Safety-Related Piping – Records Review
IP 50073	Mechanical Components - Work Observation
IP 51053	Electrical Components and Systems – Work Observation
IP 51063	Electric Cable - Work Observation
IP 52051	Instrument Components and Systems – Procedure Review
IP 52053	Instrument Components and Systems - Work Observation
IP 52055	Instrument Components and Systems - Record Review
IP 70300	Preoperational Test Procedure Review
IP 70302	Preoperational Test Program Implementation
IP 70308	Preoperational Hot Functional Testing – PWR Procedure Review
IP 70311	Preoperational Testing Procedure Verification
IP 70312	Preoperational Test Witnessing
IP 70333B	Chemistry Control System Test – Preoperational Test Procedure Review
IP 70400	Preoperational Test Results Evaluation
IP 70433	Chemical Control System Test - Preoperational Test Witnessing
IP 71302	Preoperational Test Program Implementation Verification
IP 92702	Followup on Corrective Actions for Violations and Deviations
TI 2512/015	Inspection of Watts Bar Nuclear Plant Employee Concerns Program
TI 2512/026	Inspection of Watts Bar Nuclear Plant Instruments Line Corrective Action Program Plan
TI 2512/037	Inspection of Watts Bar Nuclear Plant – Master Fuse List Special Program
TI 2515/72	Inspection of Response to IE Bulletin 85-02
TI 2515/139	Inspection of Licensee's Implementation of Generic Letter 96-01 Testing of Safety Related Logic Circuits.
TI 2515/174	Hydrogen Igniter Backup Power Verification

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

05000391/2014607-02	URI	Potential Inadequate Storage of QA Records (Section OA.1.1)
35748B	IP	Quality Assurance Program – Records (Section OA.1.1)
70308	IP	Preoperational Hot Functional Testing – PWR Procedure Review (Section P.1.2)
2512/026	TI	Inspection of Watts Bar Nuclear Plant Instrument Lines Corrective Action Program Plan (Section OA.1.2)
2512/037	TI	Inspection of Watts Bar Nuclear Plant Master Fuse List Special Program (Section OA.1.3)
2515/139	TI	Inspection of Licensee's Implementation of Generic Letter 96-01-Testing of Safety Related Logic Circuits (Section OA.1.4)
2515/174	TI	Hydrogen Igniter Backup Power Verification (Section OA.1.5)
96-01	GL	Testing of Safety-Related Logic Circuits (Section OA.1.4)
Item 33	SSER Appendix HH	Verify Completion of Design Change Notices of 125V DC Vital Battery System Analysis (Section OA.1.6)
2515/72	TI	Inspection of Response to IE Bulletin 85-04 (Section OA.1.7)

Discussed

None

LIST OF DOCUMENTS REVIEWED

II. MANAGEMENT OVERSIGHT AND CONTROLS

C.1 Construction Activities

C.1.2 Mechanical Components – Work Observation and Construction Refurbishment (Inspection Procedures 50073 and 37002)

PERS

945339, 2A Safety Injection pump was found in a degraded condition when inspected by the vendor, 12/08/14

939339, Safety Injection Pump 2A and 2B shaft and thrust-end bearing found with excessive wear

937185, Safety Injection Pump 2B shaft and thrust-end bearing found with excessive wear after open vessel testing, 12/2/2014

822083, 2A and 2B charging pumps, vendor refurbished pumps found multiple assembly errors, 9/17/2014

857667, ASME Section III Components, Trend PER, assembly qualify issues with OEM Flowserve for safety related pumps, 9/10/2014

907088, Hardware non-conformance, During performance of open vessel testing, Safety Injection pumps, 2A and 2B achieved greater than design flow rates, 8/18/2014

857667, ASME Section III Components, Trend PER, assembly qualify issues with OEM Flowserve for safety related pumps, 9/10/2014

851810, 2A Safety Injection Pump multiple deficiencies were identified during disassembly, 7/18/2014

839037, 2A Safety Injection pump Hardware non-conformance, pump shaft damaged during drilling thermocouple mounting holes, 3/28/2014

417239, 2A and 2B charging Pumps, vendor supplied couplings would not fit shaft, 12/31/2012

307092, 2A Safety Injection pump hardware non-conformance from vendor, (lower thrust end bearing housing to case clearances, and packing gland damage), 1/31/2011

Miscellaneous

NC PP-13 10CFR50.55(e) screening form, Potential Reportability Determination, 2A Safety Injection pump multiple deficiencies identified, Trend PER, assembly qualify issues with OEM Flowserve, 4/2/2014

Flowserve Final Report of the Evaluation of Deviation Pursuant to 10CFR21.21, 6/2/2014

Flowserve, As Found Condition Report and Repair Plan for SI Pump 2B, 10/21/2014

Flowserve, As Found Condition Report and Repair Plan for SI Pump 2A, 10/22/2014

MPR-4152, Root Cause Evaluation of Watts Bar Unit 2 Safety Injection Pump Bearing Damage, 1/29/2015

Flowserve, Root Cause Evaluation for 2.5" RLIJ CCPs, 3 & 5 HMTA Pumps, and 3.0" JHF SIPs for TVA Watts Bar II Nuclear Plant, revision 1

Flowserve, Rotor clearance as-built inspection procedure, 1/16/2015

PL-1500, Flowserve, Electrodeposited Chromium Plating Procedure IAW Aerospace Material Specification (AMS) 2460, Rev. B

AXS-49351, JHF Pump Assembly drawing, Rev. 7

WBN-VTD-D245-0350, Operating & Maintenance Instruction for Dresser Pump Division Model JHF Safety Injection Pumps, Rev. 21

0-MI-63.001, Safety Injection Pump, Disassembly, Inspection, and Reassembly, Rev. 3

Kingsbury, Inc, Letter to TVA, thrust bearing component dimensions within design tolerance, 10/24/2014

Westinghouse Letter, Refurbished Safety Injection Pump Test Engineering Support, 2/20/2015

P.1 Preoperational Activities

P.1.2 Preoperational Test Procedure Review (Inspection Procedures 70300 and 70308)

2-TSD-68-1, Reactor Coolant System Hot Functional Testing – Heatup, Rev.3
 2-TSD-68-6, Reactor Coolant System Cooldown from Hot Functional Testing, Rev.2
 2-TSD-HFT-1, Test Scoping Documents for Hot Functional Testing, Rev. 3
 SOI-74.01, System Operating Instruction, Residual Heat Removal System
 2-TOP-074-03, Residual Heat Removal System, Rev. 0002
 2-PTI-074-02B, RHR HFT Heatup/Cooldown, Rev. 0000
 2-PTI-999-02, Thermal Expansion, Rev. 0000
 FSAR Table 14.2-1 Sheets 77, 78, and 79, Rev. 112

P.1.3 Preoperational Test Procedure Review (Inspection Procedures 70300 and 70311)

2-TSD-63-6, SIS-Integrated Check Valve Flow and Integrity Test, Rev.10
 WBN2-63-4001, Safety Injection System, System 63
 Drawing 2-47W811-1, Flow Diagram Safety Injection System, Rev.40

P.1.4 Preoperational Test Procedure Review (Inspection Procedures 70300 and 70333B)

Drawing:

2-47W809-1; Flow Diagram Chemical and Volume Control System; Rev. 32

Other:

USAR Section 9.3.4; Chemical and Volume Control System

Procedure:

2-PTI-062-02; Boric Acid Subsystem Logic Test; Rev. 0

Test Scoping Documents:

2-TSD-62-2; Chemical and Volume Control System: Boric Acid Subsystem Logic Test; Rev. 2
 2-TSD-88-5; Containment Isolation System; Rev. 3

System Descriptions:

WBN2-62-4001; Chemical and Volume Control System; Rev. 3
 WBN2-63-4001; Safety Injection System; Rev. 3

P.1.6 Preoperational Test Results Evaluation (Inspection Procedure 70400)

Work Orders

WO 112609871, Air Return Fan 2A-A and 2B-B GTM-05 Test

Calculations

EPMSM060192, Containment Air Return Fans Pressure Loss and Fan Evaluation, Rev. 7
 TIECS68, Hydrogen Distribution with Air Return Fan System, Rev. 5
 NEB 840522200, WBN Hydrogen Volume Percent In Containment Following a LOCA, Rev. 13

Miscellaneous

2-PTI-030E-01, Containment Air Return Fan Preoperational Test, Rev. 0
 2-TSD-30E-1, Test Scoping Document Containment Return Air Fans, Rev. 3
 2-030-01231-M05-000, Air Return Fan 2A-A and 2B-B HVAC Air Balance Test Results,
 1/9/2015

NPG-WBN2-30RB-4002, Reactor Building Ventilation System, Section 3.1.3, Containment Air Return System, Rev. 2

P.1.7 Preoperational Test Results Evaluation (Inspection Procedure 70400)

SMP-8.0, Watts Bar Nuclear Plant Unit 2 Administration of Preoperational Test Instructions, Rev. 0011

SMP-3.0, Watts Bar Nuclear Plant Unit 2 Joint Test Group Charter, Rev. 0005

WO 115778373

WO 116032262 2-PTI-063-02, Rev. 1, Safety Injection System (SIS) Accumulators Test Results Package

Joint Task Group Meeting Minutes dated September 25, 2014

QA Review and Comment Form for Instruction 2-PTI-063-02 Rev.1

IV. OTHER ACTIVITIES

OA.1.1 Quality Assurance Program - Records and Unresolved Item 05000391/2014607-02, Potential Inadequate Storage of QA Records (Inspection Procedure 35748B)

PER 927528

NC PP-22, "ASME Section III Division 1 Document Control and Records Management," Rev. 5

OA.1.2 Instrument Sensing Lines Corrective Action Program (Temporary Instruction 2512/026 and Inspection Procedures 49061, 49063, 49065, 52051, 52053, and 52055)

Procedures:

TVA Procedure MAI 4.4A, Instrument Line Installation, Rev. 0015, dated 09/04/2014

TVA Procedure MAI 4.4B, Instrument and Instrument Panel Installation, Rev. 0007, dated 06/24/2014

TVA Procedure MAI 4.5, Pipe and Tube Bending, Rev. 0006, dated 10/16/2013

Bechtel Procedure 25402-000-GPP-0000-N3504, Pipe and Instrument Tubing Supports, Rev. 0004, dated 12/11/2013

Bechtel Procedure 25402-000-GPP-0000-N3401, Instrument and Instrument Line Installation, Rev. 0012, dated 09/11/2014

Bechtel Procedure 25402-000-GPP-0000-N305, Piping System Cleanliness, Rev. 0004, dated 11/03/2014

TVA Procedure NPG-SPP-04.3, Material Storage and Handling, Rev. 0002, dated 10/31/2014

TVA Procedure NPG-SPP-04.4, Material Issue, Control, and Return, Rev. 0003, dated 02/03/2014

Work Orders:

WO 115211958, EDCR 53638, PER 733507 SYS 068 2-SENL-068-0434A SG Loop 4

WO 111567801, EDCR2 53618, SYS 074 2-FI-074-0024

WO 110815492, EDCR2 53620, SYS 063 2-RTV-063-0305A ASME Sect III

WO 110880155, EDCR2 52446 SYS 072 2-RTV-072-0208A ASME Sect III

WO 114390990, PER 466210, EDCR2 53616, EDCR 53998 SYS 070 WBN-2-RTV-070-0373A

WO 09-954157-050, EDCR 53390 SYS 068 WBN-2-PI-068-0042

WO 09-952052-004, EDCR2 53419 Complete Install, Inspect Panel 2-L-914

WO 09-952052-010, EDCR2 53419 Install Sense Line WBN-2-SENL-3-329A

WO 09-952061-008, CCI EDCR 53174 SYS 001 & SYS 032 Loop 1&4 Install Flex hoses at MSIV 2-FCV-001-0004 and 2-FCV-001-0029

WO 09-952504-003, CCI EDCR2 53615/54252 PER 143705 PER 680826 SYS 003 WBN-2-RTV-003-0322A-S

WO 09-952506-002, CCI EDCR2 53606 PER 143705 SYS 003 276 WBN-2-RTV-003-0343A-B ASME III
 WO 09-952660-002, EDCR2 53317 PER 680626 & 143705 Install/Verify Sense Line 2-SENL-003-031 Valve 2-RTV-003-0316A
 WO 09-953656-040, CCI EDCR 53391 54252 PER 143705 SYS 003 Install Inspect Sense Line 2-SENL-003-0303A from RTV to ISIV
 WO 09-953656-050, CCI EDCR 53391 PER 680826 143705 148196 SYS 001 2-RTV-001-0305A Install/Test Sense Line
 WO 09-953851-001, CCI SYS 026 EDCR2 53677 2-ISIV-026-0635B
 WO 09-954098-009, CCI EDCR 53684 PER 143705 148196, 886911 WBN 2-RTV-001-0290A
 WO 09-954155-001, CCI EDCR 53401 SYS 003 032 PER 144175 2-PREG-003-0156
 WO 09-954157-026, EDCR 53390 54252 PER 680826 143705 Complete Installation/Inspection of 2-SENL-003-0292A
 WO 09-954157-027, EDCR 53390 PER 680826 143705 SYS 003 WBN-2-RTV-003-0391A
 WO 09-954157-032, EDCR 53390 PER 680826 143705 148196 SYS 003 WBN-2-RTV-003-0299A
 WO 110775702, EDCR2 53419 SYS 3 WBN-2-FT-3-147A
 WO 110887862, PER 144175 WBN-0-ISIV-032-1486-A
 WO 110950623, EDCR 55172 PER 143705 SYS 030 2-ISIV-030-0042A ASME Sect III
 WO 110997863, EDCR 53276 PER 144175 SYS 032, 003 WBN-2-ISV-032-3724-B
 WO 114001445, EDCR2 53606 SYS 003 WBN-2-FT-003-0170B-B
 WO 115709992, EDCR 53876 WBN-2-ISV-032-3580
 WO 115883774, EDCR 53389 54252 2-RTV-003-0325A-B Install new sense line and supports
 WO 115908332, EDCR2 58210 0-ISV-032-0383-A Reroute Air Line ASME III-3
 WO115977447, EDCR2 53401 PER 144175 Install Control Air from 2-ISV-3688-B to 2-LCV-3-148A
 WO 115042689, EDCR 53401 PER 144175 Install Control Air from 2-ISV-032-3754 to 2-LCV-003-0164A-A

Engineering Specification:

N3E-934, Instrument and Instrument Line Installation and Inspection, Rev. 8

Field Change Requests:

FCR 61224-A
 FCR 61065
 FCR 56167
 FCR 59809

Training Records:

Sandy Farr
 Terry Shourd
 George Graham
 Fred Jarvis
 Nathan Picklesimer
 Adrian Smith
 Aaron Walker

Bend Procedure Qualifications:

WB2-CF-005, Tool no. 2070057
 WB2-CF-002, Tool no. 2092144

Drawing Revision Authorization

53998-104
 53998-105

Material Receiving Instructions:

25402-011-MRI-PB03-00015, Rev. 0

Material Records:

CAT ID CNX339F, Pipe, 3/4"

CAT ID CNX286A, Coupling, Reducing, 3/4" x 1/2"

CAT ID CNX337K, Pipe, 1/2"

CAT ID CNX325T, Tubing, 1/4"

CAT ID CBM188P, Sleeve, 1/4"

CAT ID CQD819B, Pressure Indicator

Problem Evaluation Report:

977671

653113

680826

Drawings:

47W600-0-9, Electrical Instrument Sensing Line Slope Configuration-Interface

**OA.1.3 Inspection of Watts Bar Nuclear Plant Master Fuse List Special Program
(Temporary Instruction 2512/037)**Equipment Reviewed:

WBN-2-FU-213-B213/31-B / TRM1 / WBN-2-MCC-213-B002-B/13D

WBN-2-FU-214-B012/21-B / TRM1 / WBN-2-MCC-214-B001-B/2C

WBN-2-FU-232-A016/31 / TRM1-6/10 / 480V REACTOR VENT BD, 2A-A/ 16D

WBN-2-FU-213-B215/41A-B / TRM1 / 480V RX MOV BD 2B2-B /15E

WBN-2-FU-214-A013/21-A / TRM1 / C&A VENT BD 2A1-A, /3C

WBN-2-FU-213-A012/21N-A / TRM2.5 / WBN-2-MCC -213-A001 -A/2C

WBN-2-FU-213-A012/21A-A / TRM2.5 / WBN-2-MCC -213-A001 -A/2C

WBN-2-FU-213-A017/1A-A / TRM1 / WBN-2-MCC -213-A001 -A/7A

WBN-2-FU-213-A017/1N-A / TRM1 / WBN-2-MCC -213-A001 -A/7A

WBN-2-FU-213-A017/11N-A / TRM1 / WBN-2-MCC -213-A001 -A/7B

WBN-2-FU-213-A018/11A-A / TRM1 / WBN-2-MCC -213-A001 -A/8B

WBN-2-FU-213-A018/11N-A / TRM1 / WBN-2-MCC -213-A001 -A/8B

WBN-2-FU-213-A019/1A-A / TRM1 / WBN-2-MCC -213-A001 -A/9A

WBN-2-FU-213-A019/1N-A / TRM1 / WBN-2-MCC -213-A001 -A/9A

WBN-2-FU-213-A019/31-A / TRM1 / WBN-2-MCC -213-A001 -A/9D

WBN-2-FU-213-A216/1A-A / TRM1 / WBN-2-MCC -213-A002 -A/16A

WBN-2-FU-213-A216/1N-A / TRM1 / WBN-2-MCC -213-A002 -A/16A

WBN-2-FU-213-B012/21A-B / TRM2-1/2 / WBN-2-MCC -213-B001 -B/2C

WBN-2-FU-213-B012/21N-B / TRM2-1/2 / WBN-2-MCC -213-B001 -B/2C

WBN-2-FU-213-B016/31N-B / TRM1 / WBN-2-MCC -213-B001 -B/6D

WBN-2-FU-213-B016/31A-B / TRM1 / WBN-2-MCC -213-B001 -B/6D

WBN-2-FU-213-B016/32-B / TRS30R / WBN-2-MCC -213-B001 -B/6D

WBN-2-FU-213-B017/1A-B / TRM1 / WBN-2-MCC -213-B001 -B/7A

WBN-2-FU-213-B017/1N-B / TRM1 / WBN-2-MCC -213-B001 -B/7A

WBN-2-FU-213-B018/1A-B / TRM1 / WBN-2-MCC -213-B001 -B/8A

WBN-2-FU-213-B018/1N-B / TRM1 / WBN-2-MCC -213-B001 -B/8A

WBN-2-FU-213-B018/11A-B / TRM1 / WBN-2-MCC -213-B001 -B/8B

WBN-2-FU-213-B018/11N-B / TRM1 / WBN-2-MCC -213-B001 -B/8B

WBN-2-FU-213-B212/31A-B / TRM1 / WBN-2-MCC -213-B002 -B/12D

WBN-2-FU-213-B212/31N-B / TRM1 / WBN-2-MCC -213-B002 -B/12D

WBN-2-FU-213-B212/32-B / TRS30R / WBN-2-MCC -213-B002 -B/12D

WBN-2-FU-213-B216/11A-B / TRM1 / WBN-2-MCC -213-B002 -B/16B
 WBN-2-FU-213-B216/11N-B / TRM1 / WBN-2-MCC -213-B002 -B/16B
 WBN-2-FU-214-A018/1-A / TRM1 / WBN-2-MCC -214-A001 -A/8A
 WBN-2-FU-214-A019/1-A / TRM1 / WBN-2-MCC -214-A001 -A/9A
 WBN-2-FU-214-B110/1-B / TRM1 / WBN-2-MCC -214-B001 -B/10A
 WBN-2-FU-214-B013/11-B / TRM1 / WBN-2-MCC -214-B001 -B/3B
 WBN-2-FU-214-B013/21-B / TRM1 / WBN-2-MCC -214-B001 -B/3C
 WBN-2-FU-214-B018/11-B / TRM1 / WBN-2-MCC -214-B001 -B/8B
 WBN-2-FU-213-A212/31-A / TRM1 / WBN-2-MCC-213-A002-A/ 12D
 WBN-2-FU-213-A216/31A-A / TRM1 / WBN-2-MCC-213-A002-A/16D
 WBN-2-FU-213-A216/31N-A / TRM1 / WBN-2-MCC-213-A002-A/16D
 WBN-2-FU-213-B213/32-B / TRS30R / WBN-2-MCC-213-B002-B/13D
 WBN-0-FU-236-0003/A17-A / LI05/LITTELFUSE INC / 125V VITAL BATT BD III, CKT A17
 WBN-0-FU-236-0003/B30-A / LI05/LITTELFUSE INC / 125V VITAL BATT BD III, CKT B30

Miscellaneous:

EDCR 54797 – dated: 4/20/2010 – Work Scope: Install fuses for the Control Rod Drive System; Auxiliary Building Common Motor Control; 6.9KV Shutdown Power; 480V Shutdown Power; Reactor Motor Operated Valve Power; Control and Auxiliary Vent Power; Heat Trace; and Permanent Hydrogen Mitigation System.
 EDCR 54798 – dated: 3/18/2010 – Work Scope: Install fuses for the Fuel and Waste Handling Power; Chemical and Volume Control Power; CCW Pump Station Power; Reactor Vent Power; Yard Lighting; 120-V AC Vital Power; 125-V DC Vital Power; 120-V AC Instrument Power; 120V AC Computer Power.
 EDCR 54799 – dated: 4/15/2010 – Work Scope: Install fuses for the Main Relay Boards; Code Call, Paging, Intercom, & Evacuation Alarm; Communications Room; Balance of Plant Instrument (All “R” panels); Local Instrument Control Panel; (All “L” panels except those in system 13); Main & Auxiliary Control (All “M” panels); Control Building Conduit & Cable Trays; Diesel Generator Building Conduit & Cable Trays.
 Fuse Verification Form CTN/Test#: 2-070-04861-E11-000 / WO# 111480789 dated: 8/16/2013
 Service Request# 982342 – NRC Identified Incorrect Fuse Installations dated: 01/28/2015

Work Orders:

111480789 Minor Maintenance Sut Sys 070 WBN-2-FCV-070-0089-B CTN 2-070-04861-E11-000-PER 391272 PER 592716 Dated: 12/12/2012

Procedures:

NPG Standard Department Procedure OPDP-7 Rev. 0005 – Fuse Control dated: 04/15/2013

Drawings:

Unit 2 Wiring Diagrams Ventilating System Schematic Diagrams 2-45W760-30-13, R9, dated: 1/15/15

OA.1.4 Generic Letter 96-01, Testing of Safety-Related Logic Circuits (Temporary Instruction 2515/139)

Drawings:

2-54114-1-1082H70-13B, Unit 2 Electrical Schematic UV Output Solid State Protection System, Rev. 1
 2-45W600-99-1, Unit 2 Wiring Diagram Reactor Protection System Schematic Diagrams, Rev. 4
 2-47W611-99-1, Unit 2 Electrical Logic Diagram Reactor Protection System, Rev. 7
 2-47W611-99-2, Unit 2 Electrical Logic Diagram Reactor Protection System, Rev. 5
 2-45N2624-1, Unit 2 Wiring Diagram Reactor Trip Switchgear Connection Diagram- Sheet 1, Rev. 0

1-47W611-99-1, Unit 1 Electrical Logic Diagram Reactor Protection System, Rev. 7
 2-47W611-99-4, Unit 2 Electrical Logic Diagram, Reactor Protection System, Rev. 2
 2-45N2676-4, Unit 2 Wiring Diagram Solid State Protection System Train A Connection Diagram Sheet 4, Rev. 5
 2-45N2676-3, Unit 2 Wiring Diagram Solid State Protection System Train A Connection Diagram Sheet 3, Rev. 1
 2-45N2677-3, Unit 2 Wiring Diagram Solid State Protection System Train B Connection Diagram Sheet 3, Rev. 1
 2-45N2677-4, Unit 2 Wiring Diagrams Solid State Protection System Train B Connection Diagram Sheet 4, Rev. 18
 2-45N2677-5, Unit 2 Wiring Diagrams Solid State Protection System Train B Connection Diagram Sheet 5, Rev. 9
 2-45N2676-5, Wiring Diagrams Solid State Protection System Train A Connection Diagram Sheet 5, Rev. 3
 2-47W611-88-1, Unit 2 Electrical Logic Diagram Containment Isolation, Rev. 4
 1-47W611-88-1, Unit 2 Electrical Logic Diagram Containment Isolation, Rev. 25

Procedures:

2-SI-92-31, 18 Month Channel Calibration of Source Range, Intermediate Range and Remote Shutdown Neutron Flux, Channel 1, Rev. 0
 2-SI-211-3-A, 18 Month System Functional Test on 6900V SD BD 2A-A Degraded Voltage and Undervoltage Relays, Rev. 11
 1-SI-211-3-A, 18 Month System Functional Test on 6900 V SD BD 1A-A Degraded Voltage and Undervoltage Relays, Rev. 12
 2-SI-90-130A, 18 Month Channel Calibration Containment Purge Air Exhaust Rad Monitor Loop 2-LPR-90-130A, Rev. 1
 Letter dated April 6, 2011 TVA to NRC (T02 110406 005), Watts Bar Nuclear Plant Unit 2- List of Design Differences, Rev. 1
 2-SI-92-32A, Unit 2 18 Month Channel Calibration of Source Range Discriminator Channel II, Rev. 0
 1-SI-99-4-A, Unit 1 Trip Actuating Device Operational Test of Reactor Trip P-4 ESFAS Interlock Train A, Rev. 13
 2-SI-99-4-A, Unit 2 Trip Actuating Device Operational Test Reactor Trip P-4 ESFAS Interlock Train A, Rev. 0
 2-SI-92-31A, Unit 2 18 Month Channel Calibration of Source Range Discriminator Channel I, Rev. 0
 1-SI-99-1, 18 Month Trip Actuating Device Operational Test of Manual Reactor Trip, Rev. 7
 2-SI-99-1, 18 Month Trip Actuating Device Operational Test of Manual Reactor Trip, Rev. 1
 2-SI-99-1, 18 Month Trip Actuating Device operational Test of Manual Reactor Trip, Rev. 0
 1-SI-99-202A, 18 Month Trip Actuation Device Operational Test of Reactor Trip Bypass Breaker A from Automatic SI Input from ESFAS Train B, Rev. 8
 2-SI-99-202-A, 18 Month Trip Actuating Device Operational Test of Reactor Trip Bypass Breaker A from Automatic SI Input from ESFAS Train B, Rev. 1
 WG-1.3, Procedure Formatting Requirements, Rev. 1
 NC-PP-32, Development and Issue of Operating and Technical Instruments, Rev. 5
 NPG-SPP-01.2, Administration of Site Technical Procedures, Rev. 8
 1-SI-90-6, 18 Month Channel Calibration (Source Cal) of the General Atomic Containment Purge Air Exhaust Radiation Monitor Loop 1-LPR-90-130, Rev. 14
 2-SI-90-6, 18 Month Channel Calibration (Source Cal) of the General Atomic Containment Purge Air Exhaust Radiation Monitor Loop 2-LPR-90-13, Rev. 1

Miscellaneous:

PER 931429
 Watts Bar Unit 2 Technical Specifications (developmental)

EDCR 52328-A, Westinghouse Refurbishment of WBN Unit 2 Solid State Protection System Cabinets

OA.1.5 Hydrogen Igniter Backup Power Verification (Temporary Instruction 2515/174)

Miscellaneous:

MA-1 Procedure and applicable training plans

NUREG 0933 Section 3. New Generic Issues- Issue 189: Susceptibility of Ice Condenser And Mark III Containments to Early Failure From Hydrogen Combustion During a Severe Accident (Rev. 1)

NUREG 1150 Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants; Dated: March 29, 2012

Sequoyah Nuclear Plant (SQN) Units 1 and 2, and Watts Bar Nuclear plant (WBN) unit 1- enhancement of the capability of the containment hydrogen igniters; Dated: March 6, 2007

Sequoyah Nuclear Plant, unit 1 and 2, and Watts Bar Nuclear Plant, unit1- commitment for hydrogen igniter backup power supply and closure process for generic issue 189, "susceptibility of ice condenser and mark III containments to early failure from hydrogen combustion during a severe accident"; Dated: June 15, 2007

Watts Bar Cycle 13-03 License Operator (LOR) Curriculum; Dated: January 11, 2013
2-ECA-0.2 "Recovery from Loss of Shutdown Power with SI Required" Rev 0

OA.1.6 Supplemental Safety Evaluation Report, Appendix HH, Open Item 33: Verify Completion of Design Change Notices of 125V DC Vital Battery System Analysis (Inspection Procedure 51053, 51063, and 92702)

Calculations:

EDQ00023620070003 "125V DC Vital Battery System Analysis" Rev 30; Dated: Dec 9, 2014.

EDQ00223620080011 "125 DC Vital Power Control Voltage Analysis - Unit" Rev 16; Dated: Nov 10, 2014

Miscellaneous:

EDCR-54636-A; Dated: January 29, 2010

FCR 55754; Dated: May 26, 2010

FCR 64437-A; Dated: November 6, 2014

NGDC PP-19-2 Pending items/ commitment completion form - Engineering Complete, Tracking number 112145148; Dated: December 4, 2013

NRC IIR 05000391/2012604; Dated: June 14, 2012

NRC IIR 05000391/2014601; Dated: February 28, 2014

NUREG 0847, Safety Evaluation Report Supplement 22. Related to the Operation of Watts Bar Nuclear Plant, Unit 2; Dated: February, 2011

NUREG 0847, Safety Evaluation Report Supplement 24. Related to the Operation of Watts Bar Nuclear Plant, Unit 2; Dated: September 2011

TVA Letter "Watts Bar Nuclear Plant Unit 2 - Final Safety Analysis Report - Response to preliminary Request for additional Information" and Requests for additional information; Dated: July 31, 2010

TVA Letter, "Watts Bar Nuclear Plant Unit 2 - Safety Evaluation Report Supplement 22 (SSER22) - Response to NRC Required Action Items"; Dated: April 6, 2011

WO 114404657 "CCE EDCR 53421 Sys 062 212 278 292 BC Cable Terminations"; Dated: July 12, 2013

ICRDS Reports for Cables 2PL5025, 2PL5026, 2PL5028, 2PL5031, 2PL5470, 2PL5471; All Dated: January 29, 2015 (DCN 53421)

ICRDS Reports for Cables 2SG221B, 2SG222S, 2SG233S, 2SG232S; All Dated: January 22, 2015 (DCN 54636)

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
CAP	Corrective Action Program
CDR	Construction Deficiency Report
CFR	Code of Federal Regulations
DCN	Design Change Notice
ECCS	Emergency Core Cooling Systems
FSAR	Final Safety Analysis Report
GL	Generic Letter
GPM	Gallons Per Minute
HFT	Hot Functional Testing
ICRDS	Integrated Cable & Raceway Design Software
IIR	Integrated Inspection Report
IMC	Inspection Manual Chapter (NRC)
IP	Inspection Procedure (NRC)
MCC	Motor Control Center
MEL	Master equipment list
MIC	Microbiological Influence Corrosion
NFPA	National Fire Protection Act
No.	Number
NPP	Nuclear Performance Plan
NQAP	Nuclear Quality Assurance Plan
NRC	Nuclear Regulatory Commission
OEM	Original Equipment Manufacturer
PER	Problem Evaluation Report
PTI	Preoperational Test Instruction
QA	Quality Assurance
Rev.	Revision
SER	Safety Evaluation Report
SIS	Safety Injection System
SP	Special Programs
SSER	Supplemental Safety Evaluation Report
TI	Temporary Instruction (NRC)
TVA	Tennessee Valley Authority
URI	Unresolved Item
U2	Unit 2
WBN	Watts Bar Nuclear Plant
WO	Work Order
10 CFR	Title 10 to the Code of Federal Regulations