



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

November 6, 2013

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

SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 1 - NRC TRIENNIAL FIRE PROTECTION INSPECTION (REPORT NO. 05000390/2013008) AND UNIT 2 – FIRE CONSTRUCTION DEFICIENCY REPORTS INSPECTION (REPORT NO. 05000391/2013615)

Dear Mr. Shea:

On September 27, 2013, The U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Nuclear Plant, Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed with Mr. Cleary and other members of your staff on September 27, 2013.

The inspection examined activities conducted under your Unit 1 license as they related to safety and compliance with the Commission's rules and regulations alongside the conditions of your license. This inspection also 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 for Units 1 and 2.

The enclosed report documents two NRC-identified findings of very low safety significance (Green) that were determined to involve violations of NRC requirements. Further, inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating these violations as noncited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Watts Bar Nuclear Plant.

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

In accordance with 10 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).

Sincerely,

RA

Scott M. Shaeffer, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos.: 50-390; 50-391
License No.: NPF-90
Construction Permit No: CPPR-92

Enclosures:
Inspection Report 05000390/2013008,
05000391/2013615
w/Attachment: Supplemental Information

cc: Distribution via Listserv

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Letter to Joe Shea from Scott M. Shaeffer dated November 6, 2013.

SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 1 - NRC TRIENNIAL FIRE PROTECTION INSPECTION (REPORT NO. 05000390/2013008) AND UNIT 2 – FIRE CONSTRUCTION DEFICIENCY REPORTS INSPECTION (REPORT NO. 05000391/2013615)

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: 50-390, 50-391

License No.: NPF-90

Construction Permit No: CPPR-92

Report Nos.: 05000390/2013008 and 05000391/2013615

Licensee: Tennessee Valley Authority

Facility: Watts Bar Nuclear Plant

Location: Spring City, TN 37381

Dates: September 9 – 13, 2013 (Week 1)
September 23 – 27, 2013 (Week 2)

Inspectors: O. López, Senior Reactor Inspector (Lead Inspector)
D. Jones, Senior Reactor Inspector
P. Braxton, Reactor Inspector
J. Dymek, Reactor Inspector
J. Montgomery, Reactor Inspector
E. Patterson, Resident Inspector, Watts Bar Unit 2

Accompanying Personnel: G. Wiseman, Senior Reactor Inspector (Mentor)
M. Cummings (NRC Contractor)
J. Grant (NRC Contractor)

Approved by: Scott M. Shaeffer, Chief
Engineering Branch 2
Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000390/2013008, 09/09-13/2013 and 09/23-27/2013; Watts Bar Nuclear Plant, Unit 1, Fire Protection (Triennial).

IR 05000391/2013615; 09/09-13/2013 and 09/23-27/2013; Watts Bar Nuclear Plant Unit 2; Watts Bar Nuclear Plant Unit 2 – Quality Assurance Program Implementation during Construction and Pre-Construction Activities, Criterion XVI - Corrective Action.

This report covers an announced two-week triennial fire protection inspection by a team of six regional inspectors, one resident inspector from Watts Bar Unit 2 and two contractors. One Severity Level (SL) IV non-cited violation (NCV), and two Green NCVs were identified. The significance of inspection findings is indicated by their color (Green, White, Yellow, or Red) and determined using Inspection Manual Chapter (IMC) 0609, Significance Determination Process, dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Components Within the Cross-Cutting Areas," dated October 28, 2011. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Rev. 4, dated December 2006.

This report also included aspects of engineering and construction activities performed by TVA associated with the Watts Bar Nuclear Plant Unit 2 construction project. The inspection program for Unit 2 construction activities is described in NRC Inspection Manual Chapter 2517, "Watts Bar Unit 2 Construction Inspection Program, dated June 6, 2013." 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>.

Cornerstone: Mitigating Systems

- Green: An NRC identified Green NCV of Technical Specification 5.7.1, Procedures, was identified for the licensee's failure to validate Appendix R abnormal operating instructions (AOI) in accordance with station procedures. The issue was entered into the licensee's corrective action program as problem evaluation report (PER) 787990.

The licensee's failure to validate time critical operator actions for Appendix R AOIs as required by site procedures was a performance deficiency. The performance deficiency was considered more than minor because if left uncorrected, the issue had the potential to result in the failure to meet design bases operator action times during fire events. The significance of this finding was determined to be of very low safety significance (Green) because the identified deficiencies did not adversely affect the ability to reach and maintain safe shutdown. The cause of the finding involved the cross-cutting aspect of whether the licensee takes appropriate corrective actions to address safety issues within the Corrective Action Program component of the Problem Identification and Resolution area. Specifically, the licensee implemented inadequate corrective actions for PER 637443 which identified that Appendix R time critical actions were not performed as required by procedure TI-12.19. [P.1(d)] (Section 1R05.01)

- Green: An NRC identified Green NCV of Operating License Condition (OLC) 2.F was identified for the licensee's failure to ensure that established operating requirements (ORs) for the high pressure fire protection (HPFP) system accounted

for affected and credited equipment as determined in the fire hazard analysis (FHA) and safe shutdown (SSD) analysis. The issue was entered into the licensee's corrective action program as PER 786848, and implemented Shift Orders FPU-13-018 and 13-071 which required the establishment of fire watches for the affected areas.

The licensee's failure to ensure that established ORs for the HPFP water supply system were supported by the FHA and SSD analysis was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems Cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The significance of this finding was determined to be of very low safety significance (Green) because the affected fixed fire suppression systems would be able to suppress a fire such that no additional equipment important to safety would be affected by a fire. The inspectors determined that no cross cutting aspect was applicable to this performance deficiency because this finding was not indicative of current licensee performance. (Section 1R05.10)

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

REPORT DETAILS

1. REACTOR SAFETY (Inspection Report (IR) 05000390/2013008)

Cornerstones: Initiating Events, Mitigating Systems

1R05 Fire Protection

Inspection Report 05000390/2013-008 documents the results of a triennial fire protection inspection of the Watts Bar Nuclear Plant (WBN) Unit 1. The inspection was conducted in accordance with the guidance provided in NRC Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)," dated January 31, 2013. The objective of the inspection was to review a sample of three risk-significant fire areas (FAs) to evaluate implementation of the fire protection program (FPP) as described in the Watts Bar Nuclear Plant Fire Protection Report, Revision 45, and to review site specific implementation of one mitigating strategy from Section B.5.b of NRC Order EA-02-026, "Order for Interim Safeguards and Security Compensatory Measures" (commonly referred to as B.5.b), as well as the storage, maintenance, and testing of B.5.b mitigating equipment. The sample FAs were chosen based on a review of available risk information as analyzed by a senior reactor analyst from Region II, a review of previous inspection results, plant walkdowns of FAs, consideration of relational characteristics of combustible material to targets, and location of equipment needed to achieve and maintain SSD of the reactor. In selecting a B.5.b mitigating strategy sample, the inspectors reviewed licensee submittal letters, safety evaluation reports (SERs), licensee commitments, B.5.b implementing procedures, and previous NRC inspection reports (IRs). Section 71111.05-05 of the IP specifies a minimum sample size of three FAs and one B.5.b mitigating strategy for addressing large fires and explosions. This inspection fulfilled the requirements of the procedure by selecting a sample of three FAs and one B.5.b mitigating strategy. The FAs chosen were identified as follows:

1. Fire Area 17: 6.9 kV and 480 V Shutdown Board Room A (Room 757.0-A2) and Personnel and Equipment Access – HVAC (Room 757.0-A9)
2. Fire Area 25: Control Rod Drive Equipment (Rooms: 782.0-A1) and Pressurizer Heater Transformer (Room 782.0-A2)
3. Fire Area 48: Cable Spreading Room (Room: 729.0-C1)

For each of the selected FAs, the inspectors evaluated the licensee's FPP against applicable NRC requirements and licensee design basis documents. Applicable licensing and design basis documents reviewed by the inspectors are listed in the Attachment to this report.

.01 Protection of Safe Shutdown Capabilities

a. Inspection Scope

For the selected FAs, the inspectors performed physical walkdowns to observe: (1) the material condition of fire protection systems and equipment; (2) the storage of permanent and transient combustibles; (3) the proximity of fire hazards to cables relied upon for SSD; (4) the potential environmental impacts, if any, on credited operator manual actions (OMAs) to the areas adjacent to the FA, and (5) the licensee's implementation of procedures and processes for limiting fire hazards, housekeeping practices, and compensatory measures for inoperable or degraded fire protection systems and credited fire barriers.

Methodology

For the selected FAs, the inspectors evaluated the potential for the effect from the fire event on credited actions specified by licensee procedures. The inspectors reviewed calculation WBNOSG4031, "Equipment Required for Safe Shutdown per 10CFR50 Appendix R," Rev. 48, and conduit and cable tray routing information by FA, and conducted field walkdowns of the cable routing to confirm that at least one train of redundant cables routed in the FA were adequately protected from fire damage or the licensee's analysis determined that the fire damage would not prohibit safe plant shutdown. The inspectors reviewed the WBN safe shutdown analysis (SSA) for the selected FAs and compared it to the abnormal operating instructions (AOIs) to verify that cables and equipment credited to provide reactivity control, reactor coolant makeup, reactor heat removal, process monitoring and support functions for post-fire SSD in the SSA and applicable procedures were adequately protected from fire damage in accordance with the requirements of 10 CFR 50, Appendix R, Section III.G, "Fire Protection of Safe Shutdown Capability."

Operational Implementation

The inspectors reviewed the WBN Fire Protection Report and the SSA, and applicable references to other AOIs to verify that the shutdown methodology properly identified the systems and components necessary to achieve and maintain post-fire SSD. The inspectors performed walkdowns of the procedural actions based upon the FAs selected to assess the implementation of the SSD strategy and human factors attributes associated with them. The inspectors reviewed licensee records, which specified the shift staffing from randomly selected dates, to ensure the proper staffing levels existed to implement actions specified by licensee procedures. The inspectors reviewed licensee-training material to ensure licensed and non-licensed operators were being trained based upon the current plant configuration.

b. Findings

Introduction: An NRC identified Green NCV of Technical Specification 5.7.1, Procedures, was identified for the licensee's failure to validate time critical operator actions for Appendix R AOIs as required by site procedures.

Description: The licensee used AOIs for combating fires that affect equipment necessary to achieve and maintain safe shutdown. These procedures were referred to as the 1-AOI-30.2, Fire Safe Shutdown "C-Series" procedures. At the time of inspection, the licensee maintained 69 "C-Series" procedures. These procedures contained specific instructions for each fire area, detailing the manual actions required to address the potential effects of an Appendix R fire. Operator actions that must be completed within a designated amount of time were listed in design documents. The inspectors noted that the time critical operator actions listed in the design bases documents included both main control room (MCR) and local operator actions. The licensee utilized procedure TI-12.19, Control of Time Critical Operator Actions, Rev. 6, to ensure that credited action times in the site's licensing bases could be accomplished by station personnel using approved AOIs. Procedure TI-12.19 was originally issued on February 8, 2010, and was applicable to "emergency operating instructions (EOIs) and AOIs, including those which implement Appendix R."

The inspectors identified the following deficiencies during the review of procedures AOI-30.2 C.1, C.20, and C.69 that were associated with fire areas 17, 25 and 48:

- Procedure TI-12.19, Section 2.2.3, Validation Aspects, Paragraph E, stated, in part, that a combination of simulator and in-plant walkthrough validation is most effective for timelines which include actions both in the MCR and in the plant. The inspectors determined through interviews and the review of records that the licensee had only validated local manual actions; none of the main control actions in any of the Appendix R “C-Series” procedures had been validated.
- Procedure TI-12.19, Section 2.2.5, Evaluation of Time Critical Action Validation, Section A, stated, in part, that a completion time within 80% of the required time is considered adequate assurance that the time critical action can be reliably performed. The inspectors noted the following discrepancies:
 - the action to de-energize the 6.9kv bus in procedure C.20 exceeded the 80% criteria – this action was observed by the inspectors during a simulator scenario
 - the verification and validation of local manual actions that was performed for procedure C.69 in 2009 had 12 actions that exceeded the 80% criteria
 - a 2012 revision to procedure C.69 failed to identify that 9 of the local actions exceeded the 80% criteria
- Due to the lack of information available for the inspectors to confirm that MCR time critical actions could be met; the inspectors requested the development and performance of a simulator scenario for procedure C.20. The inspectors noted the following discrepancies during the observation of the simulator scenario and associated walkdowns:
 - the action to isolate normal charging, within 2 minutes, as required by Drawing 45A897-1 was not met - the inspectors determined that the additional time taken to isolate normal charging was inconsequential to plant operation
 - the action to de-energize the 6.9kv bus exceeded the 80% criteria
 - the action to de-energize the 6.9kv bus in procedure C20 was inadequate because it relied upon the remote operation of components located in the fire area - the inspectors determined that the additional time taken by the operators to open an upstream breaker was inconsequential to plant operation
- Procedure TI-12.06, Writer’s Guide for Abnormal and Emergency Operating Instructions, Rev. 6, Step 6.10.A, stated, in part, “if an action is required at a specific time, state the time in the step.” The inspectors noted that procedures C.1 and C.20 did not state the times as required.
- Procedure TI-2018 Section 5.9, Time Validation, stated, “validate the capability of operators to perform the manual actions in the time required as specified by drawing 45A897-1.” Drawing 45A897-1, Manual Actions Required for Safe Shutdown Following a Fire, Rev. 1, was the licensee’s calculation that determined the maximum performance time for manual actions. Drawing 45A897-1 included both MCR and local operator actions. The inspectors noted that procedure TI-2018 provided guidance for validating local operator actions, but did not provide guidance for validating MCR actions.
- Procedure TI-2018 (1995 version) required that the walkdowns completed in the 1995 timeframe be retained in the licensee’s record management system. The licensee determined that the records could not be located.
- Fire Protection Audit Report (SSA1214, dated 11/29/2012) identified that validation time studies of Appendix R time critical actions were not being performed by the training department as required by procedure TI-12.19. This issue was entered into the licensee’s corrective action program as PER 637443. The inspectors determined that the corrective actions were inadequate because no actions were taken to validate the Appendix R procedures as required by TI-12.19. The only action taken was to re-assign the responsibilities of performing validations from the training department to the operations department.

The inspectors determined that the licensee's failure to adequately implement station procedures associated with the validation of time critical operator actions was a deficiency that impacted all 69 of the "C-Series" procedures. The failure to adequately implement the administrative procedures could result in AOs that fail to meet design bases time critical operator actions. The licensee issued PER 787990 to address these deficiencies.

Analysis: The licensee's failure to validate time critical operator actions for Appendix R AOs as required by site procedures was a performance deficiency. This issue was considered more than minor because if left uncorrected, the performance deficiency has the potential to lead to a more significant safety concern. Specifically, the licensee's failure to validate the Appendix R "C-Series" procedures could result in design bases times for MCR and local operator actions not being met during fire events.

The finding was screened in accordance with NRC IMC 0609, "Significance Determination Process," dated June 2, 2011, Attachment 4; "Initial Characterization of Findings," dated June 19, 2012, which determined that, an IMC 0609, Appendix F, "Fire Protection Significance Determination Process," dated September 20, 2013, review was required because it affected the ability to achieve safe shutdown for a fire event. Using question A of IMC 0609, Appendix F, Attachment 1, Step 1.3.B, Ability to Achieve Safe Shutdown, the issue was assigned a "Low" degradation rating because the identified deficiencies did not adversely affect the ability to reach and maintain SSD. Therefore, this finding was determined to be of very low safety significance (Green).

The cause of the finding involved the cross-cutting aspect of whether the licensee takes appropriate corrective actions to address safety issues within the Corrective Action Program component of the Problem Identification and Resolution area. Specifically, the licensee implemented inadequate corrective actions for PER 637443 which identified that Appendix R time critical actions were not performed as required by procedure TI-12.19. [P.1(d)]

Enforcement: Technical Specification 5.7.1, Procedures, requires, in part, that written procedures shall be established, implemented, and maintained covering activities described in Regulatory Guide (RG) 1.33, Revision 2, Appendix A, February 1978; Appendix A, Section 6.v, requires procedures for Combating Emergencies and other Significant Events such as Plant Fires.

Procedure TI-12.19, Control of Time Critical Operator Actions, Rev. 6, Section 1.2, Applicability, states, in part, that the procedure applies to EOs and AOs, including those which implement Appendix R; and Section 1.3.2, states, in part, that the role and responsibility of Operations is to perform periodic validation of time critical actions.

Contrary to the above, since February 8, 2010, the licensee failed to perform periodic validation of time critical actions in AOs as required by procedure TI-12.19 which resulted in the licensee's failure to adequately maintain procedures for combating plant fires as required by RG 1.33. Specifically, the licensee failed to validate MCR operator actions in the "C-Series" AOs that were used to mitigate plant fires. This violation is being treated as an NCV, consistent with section 2.3.2 of the NRC Enforcement Policy. The violation was entered into the licensee's corrective action program as PER 787990. NCV 05000390/2013008-01, Failure to Validate Appendix R Abnormal Operating Instructions in accordance with Station Procedures.

.02 Passive Fire Protection

a. Inspection Scope

The inspectors walked down the selected FAs to evaluate the adequacy of the fire resistance of barrier enclosure walls, ceilings, floors, and structural steel support fire proofing protection. This evaluation also included fire barrier reinforced concrete, penetration seals, fire doors, fire dampers, and the Thermo-Lag electrical raceway fire barrier systems to ensure that at least one train of SSD equipment would be maintained free of fire damage. Construction detail drawings were reviewed as necessary. Where applicable, the inspectors observed the installed barrier assemblies and compared the as-built configurations to the approved construction details; supporting fire endurance test data; licensing basis commitments; and standard industry practices.

b. Findings

No findings were identified.

.03 Active Fire Protection

a. Inspection Scope

The inspectors reviewed the redundancy of fire protection water sources and fire pumps to confirm that they were installed in accordance with the National Fire Protection Association (NFPA) codes of record to satisfy the applicable separation, design requirements, and licensing basis requirements of the WBN Fire Protection Report. Current fire protection system health reports were reviewed and discussed with personnel knowledgeable in the operation and maintenance of these systems. The inspectors performed in-plant observations of the material condition and operational lineup for the operation of the fire water pumps and fire protection water supply distribution piping which included manual fire hose and standpipe systems for the selected FAs. Using operating and valve cycle/alignment procedures as well as engineering drawings, the inspectors examined the electric motor-driven and the diesel-driven fire pumps and accessible portions of the fire main piping system to verify the operational status and the alignment of system valves; and to verify the consistency of as-built configurations with engineering drawings. The inspectors also examined portions of the licensee's SSA and select electrical circuit routing drawings outlining the fire water pumps' power and pressure start capability to verify that the fire water system would be available to support fire brigade response activities during power block fire events.

The inspectors compared the fire detection and fire suppression systems for the selected FAs to the applicable NFPA Standard(s) by reviewing design documents and observing their as-installed configurations during in-plant walkdowns. The inspectors reviewed selected fire protection vendor equipment specifications, drawings, and engineering calculations to determine whether the fire detection and suppression methods were appropriate for the types of fire hazards that existed in the selected FAs. During plant walkdowns, the inspectors observed the placement of the fire hose stations, fire extinguishers, fire hose nozzle types, and fire hose lengths, as designated in the firefighting pre-plan strategies, to verify that they were accessible and that adequate reach and coverage was provided. The inspectors reviewed completed periodic surveillance testing and maintenance program procedures for the fire detection and suppression systems and compared them to the operability, testing, and compensatory

measures. This review was to assess whether the test program was sufficient to validate proper operation of the fire detection and suppression systems in accordance with their design requirements.

Aspects of fire brigade readiness were reviewed, including but not limited to, the fire brigade's personal protective equipment, self-contained breathing apparatuses, portable communications equipment, and other fire brigade equipment to determine accessibility, material condition, and operational readiness of equipment. During plant walkdowns, the inspectors compared firefighting pre-plan strategies to existing plant layout and equipment configurations and to fire response AOIs for the selected FAs. This was done to verify that firefighting pre-fire plan strategies and drawings were consistent with the fire protection features and potential fire conditions within the area. The inspectors also verify that appropriate information was provided to fire brigade members to facilitate suppression of an exposure fire that could impact the SSD strategy. An operating shift of the fire brigade was randomly selected to confirm that all members were currently qualified with regard to their medical and fire brigade training records. Current mutual aid agreements with local outside fire departments were also reviewed.

b. Findings

No findings were identified.

.04 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The inspectors evaluated whether water-based manual firefighting activities could adversely affect equipment credited for SSD, inhibit access to alternate shutdown equipment, or adversely affect local OMAs required for SSD in the selected FAs. The inspectors reviewed available documentation related to flooding analysis for the rupture and inadvertent operation of fire suppression systems, fire protection activities, and potential flooding through unsealed concrete floor cracks for this assessment. The inspectors also performed independent calculations of inter-area migration of water under fire doors to validate feasibility of selected OMAs in adjacent plant areas.

Firefighting pre-plan strategies; fire brigade training procedures; fire damper locations; heating, ventilation and air conditioning drawings; and fire response procedures were reviewed to verify that inter-area migration of heat and smoke via the ventilation system was addressed such that OMAs would not be inhibited by smoke migration from one area to adjacent plant areas used to accomplish SSD.

b. Findings

No findings were identified.

.05 Alternative Shutdown Capability

a. Inspection Scope

The inspectors reviewed the licensee's FPP described in Fire Protection Report (FPR), FHA, the licensee's plant procedures, system flow diagrams, electrical drawings, and other supporting

documents for postulated fires in Fire Area 48 (Analysis Volume (AV)-076). The reviews focused on ensuring that the required functions for post-fire SSD and the corresponding equipment necessary to perform those functions were included in the procedures. The review included assessing whether hot and cold shutdown from outside the MCR could be implemented, and that transfer of control from the MCR to the auxiliary control room could be accomplished. The inspectors reviewed surveillance tests records for some of the transfer switches that were required to transfer plant controls from the MCR room to the auxiliary control room to verify that the transfer switches were functional. By reviewing the records, the inspectors confirmed that testing was performed to demonstrate functionality of the transfer switches, and that test deficiencies were documented and addressed in the corrective action program.

b. Findings

No findings were identified.

.06 Circuit Analyses

a. Inspection Scope

The inspectors reviewed WBN Fire Protection Report, system flow diagrams, and the WBN post-fire SSA to verify that the licensee had identified required and associated circuits that may impact post-fire SSD for the selected FAs. On a sample basis, the inspectors verified that the cables of equipment specified in the SSA essential equipment list required for achieving and maintaining shutdown conditions, in the event of a fire in the selected fire areas, had been properly identified. In addition, the inspectors reviewed cable routing information for credited equipment/components and verified that these cables had either been adequately protected from the potentially adverse effects of fire damage or analyzed to show that fire induced faults (e.g. hot shorts, open circuits, and shorts to ground) would not prevent post-fire safe shutdown. The inspectors reviewed the licensee's electrical coordination study to determine if power supplies were susceptible to fire damage, which would potentially affect the credited components for the FAs chosen for review. The specific components reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.07 Communications

a. Inspection Scope

The inspectors reviewed the communication capabilities required to support plant personnel in the performance of OMAs to achieve and maintain SSD, as credited in the WBN FPR. The inspectors performed plant walkdowns with the licensee's operations staff to assess the credited method of communications used to complete safe shutdown actions as specified in post-fire SSD procedures for the selected FAs. The inspectors also verified that portable radio communications and fixed emergency communication systems were available, operable, and adequate for the performance of designated activities to support fire event notification and fire brigade firefighting activities. Additionally, the inspectors verified that the design and location of

communications equipment, such as repeaters and transmitters, would not cause a loss of communications during a fire. The inspectors reviewed preventive maintenance and surveillance test records and vendor manuals to verify that the communication equipment was being properly maintained and tested.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The inspectors reviewed maintenance and design aspects of the fixed 8-hour battery pack emergency lighting units (ELUs) required by 10 CFR 50 Appendix R, Section III.J and the WBN approved FPP. The inspectors performed plant walkdowns of the post-fire SSD procedures for the selected FAs to observe the placement and coverage area of the ELUs required to illuminate operator access and egress pathways, and any equipment requiring local operation and/or instrumentation monitoring for post-fire SSD. The inspectors also reviewed completed surveillance and maintenance tests to verify that adequate surveillance testing was in place. The manufacturer's information and vendor manuals for the fixed and portable 8-hour battery pack ELUs were reviewed to verify that the battery power supplies were rated with at least an 8-hour capacity.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The inspectors reviewed the licensee procedures, equipment, and materials credited for repairing components required for cold shutdown. The inspectors reviewed and verified that repair equipment, components, tools, and materials (e.g., pre-cut cable connectors with prepared attachment lugs) were available and accessible on site to plant personnel.

b. Findings

No findings were identified.

.10 Compensatory Measures

a. Inspection Scope

Compensatory Measures for Degraded Fire Protection Components

The inspectors reviewed the administrative controls for out-of-service, degraded and/or inoperable fire protection features (e.g. detection and suppression systems, and passive fire barriers) to verify that short-term compensatory measures were adequate for the degraded function or feature until appropriate corrective actions could be taken. The inspectors reviewed

impairment and compensatory measures forms for fire watches tours to confirm they were being performed within the allowable time frames. Hourly and roving fire watch personnel were interviewed to ascertain that their duties and responsibilities were properly understood.

Operator Manual Actions as Compensatory Measures for Safe Shutdown

The inspectors reviewed licensee operator manual actions feasibility calculation WBN-OSG4-165, Manual Actions Required for Safe Shutdown Following a Fire – 10CFR50 Appendix R, dated 06/29/1993, which documented OMAs for Watts Bar Unit 1. In cases where local OMAs were credited in lieu of cable protection of SSD equipment for the selected fire areas, the inspectors reviewed and performed walkdowns of those applicable OMAs to verify that the OMAs were feasible utilizing the guidance of NRC IP 71111.05T, paragraph 02.02.j.2. Additionally, the inspectors reviewed PER 748052, “Leak in 1C-A CRDM Cooler to verify the adequacy of the proceduralized compensatory measures.”

b. Findings

Introduction: An NRC identified Green NCV of Operating License Condition (OLC) 2.F was identified for the licensee’s failure to ensure that established operating requirements (ORs) for the high pressure fire protection (HPFP) system accounted for affected and credited equipment as determined in the fire hazard and safe shutdown analyses.

Description: The FPR stated that the HPFP water supply consisted of four vertical turbine motor-driven pumps and one horizontal centrifugal diesel fire pump. The FPR also stated that each of the four motor-driven pumps could provide 50% capacity and the diesel pump could provide 100% capacity of the required pressure and flow to the largest demanding fire protection water system serving safety-related areas. The FPR defined the operability requirements as three fire suppression pumps consisting of the diesel driven pump (2500 gpm at 125 psig) and two electric driven pumps (1590 gpm at 130 psig) with their discharge aligned to the fire suppression system header. In addition, the HPFP system is normally pressurized by the raw cooling water (RCW) system via an intertie in the Turbine Building. The intertie is automatically isolated on any fire pump start by two, in series, check valves. Thus when the HPFP system pressure was lower than the RCW system pressure these check valves automatically reopen to maintain the HPFP system pressure.

Part II of the FPR stated that in the event a fire protection system or feature became inoperable, compensatory actions (operating requirements) were developed to minimize the effects of the impaired equipment on safe plant operations and safe shutdown. The inspectors noted that the HPFP water supply system ORs were in place to ensure that redundant water supplies were available to meet suppression system demands.

The inspectors noted that OR 14.2.1.a allowed for the diesel fire pump to be out of service for 7 days without taking any compensatory actions as long as two motor-driven pumps remained operable. The FPR stated that the completion time of 7 days was reasonable considering that 100% of the required pumping capacity to safety related areas was still provided. The inspectors also noted that Part VI, Fire Hazard Analysis, of the FPR, stated that a fire in FA 17 (AV-042) could potentially affect three of the motor-driven fire pumps. Therefore, for FA 17 (AV-042) the licensee only credited the diesel fire pump (0-PMP-26-3150) and one motor-driven pump (2-MTR-26-11-B) for the postulated fire event. As a result, every time that the diesel fire pump was taken out of service, the licensee only had 50% of the calculated water supply capacity for the HPFP water system. The inspectors determined that the established ORs for

the HPFP water system were not supported by the FHA/SSD analyses and were not adequate to ensure adequate protection of equipment important for safe shutdown in FA 17.

The licensee performed an extent of condition to determine if there were additional fire areas that could be impacted by this condition. The licensee determined the following FAs/AVs did not have two motor-driven pumps available while the diesel fire pump was out of service:

- Fire Area 8 (AV-026)
- Fire Area 14 (AV-036, 037, 037C, and 038)
- Fire Area 17 (AV-042)
- Fire Area 41 (AV-068)
- Fire Area 60 (AV-089)

For AV-036, AV-037, AV-037C, AV-042, and AV-068 the licensee only credited the diesel fire pump and one motor-driven pump for the postulated fire events. The licensee hydraulically modeled these areas using only the credited motor-driven pump as the source of water to the HPFP system. In all cases the required flow and pressure were obtained using only the credited motor-driven pump. The inspectors independently reviewed the hydraulic model results and agreed with the licensee's conclusion.

For AV-089, the licensee only credited the diesel fire pump for the postulated fire events. Part VI, Fire Hazard Analysis, of the FPR, stated that all four of the motor-driven pumps were affected by a fire in this area. Further research by the licensee into the cables affected and circuit analysis showed that at least one of the motor-driven pumps would be available to operate for a fire in this area.

For AV-026 and AV-038, the diesel fire pump is the only credited pump. The licensee determined that the power cables associated with the four motor-driven fire pumps would be affected by the postulated fire. However, the licensee stated that the RCW system could provide the design water flow to the affected AVs, albeit at a lower water pressure. The licensee also confirmed that the cables associated with the RCW pumps would not be affected by the postulated fire. Although the RCW system would not provide the full design sprinkler system pressure, the inspectors determined that it would provide adequate water supply for normal sprinkler operation for the expected fire. Based on the fuel loading for the affected areas (mostly cable), the inspectors expected a slow developing fire that would not grow to the sprinkler design basis area size.

The licensee entered the deficiency into their corrective action program as PER 786848, and implemented Shift Orders: FPU-13-018 and 13-071 which required the establishment of fire watches for the affected areas.

Analysis: The licensee's failure to ensure that established ORs for the HPFP system accounted for affected and credited equipment as determined in the fire hazard and safe shutdown analyses was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems Cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the established ORs did not consider that the fire areas described above would have less than credited suppression capability, when the diesel fire pump was taken out of service.

The finding was screened in accordance with NRC IMC 0609, "Significance Determination Process," dated June 2, 2011, Attachment 4, "Initial Characterization of Findings," dated June 19, 2012, which determined that, an IMC 0609, Appendix F, "Fire Protection Significance Determination Process," dated September 20, 2013, review was required because it affected fixed fire protection systems. The finding was assigned a Moderate degradation rating since the inspectors determined that the performance deficiency could adversely impact the system reliability and render the system less effective in fighting one or more fire ignition sources in the fire area. Question G of IMC 0609, Appendix F, Attachment 1, Step 1.4.2, Fixed Fire Protection Systems, screened the finding to very low safety significance (Green) since the inspectors determined that the affected fixed fire suppression systems would be able to suppress a fire such that no additional equipment important to safety would be affected by a fire.

For AV-036, AV-037, AV-037C, AV-042, and AV-068, the licensee demonstrated, through cable routing / circuit analysis and hydraulic calculations, that one motor-driven fire pump would be available and capable of meeting design flow and pressure. For AV-089, the licensee demonstrated that the 2A or 2B motor-driven fire pump would be available due to normal standby ready configuration, and either pump would be capable of providing design pressure and flow to suppress a fire in AV-089. For AV-026 and AV-038, the licensee demonstrated that RCW was aligned to the HPFP system, and it would provide the full design flow at a reduced pressure. The licensee also demonstrated that cables related to the RCW pumps would not be damaged due to fires in AV-026 and AV-038. Based on the fuel loading for the affected areas (mostly cable), the inspectors expected a slow developing fire that would not grow to the sprinkler design basis area size. Therefore, the inspectors determined that the RCW should provide adequate water supply for normal sprinkler operation for the expected fire. Additionally, the licensee stated that if the water pressure needed to be increased the Fire Brigade Leader and the Incident Commander would work with the Main Control Room to start additional RCW pumps as needed.

The inspectors determined that no cross cutting aspect was applicable to this performance deficiency because this finding occurred in the past and was not indicative of current licensee performance.

Enforcement: Watts Bar Operating License Condition 2.F requires that the licensee shall implement and maintain in effect all provisions of the approved fire protection program, as described in the Fire Protection Report for Watts Bar Unit 1, as approved in Supplements 18 and 19 of the SER (NUREG-0847). Fire Protection Report, Section 13.0, Fire Protection System Impairments and Compensatory Actions states, in part, WBN "Regulatory Required" (REG) fire protection systems and features, provide fire protection capabilities in those areas where protection of safety-related or FSSD equipment is deemed necessary. In the event a REG fire protection system or feature becomes inoperable, compensatory actions have been developed to minimize the effects of the impaired equipment on safe plant operations and safe shutdown.

Contrary to the above, before September 27, 2013, the licensee failed to develop adequate compensatory actions to minimize the effects of impaired fire protection equipment on safe plant operations and safe shutdown. Specifically, the licensee did not consider that FA 8 (AV-026), FA14 (AV-036, 037, 037C, and 038), FA 17 (AV-042), FA 41 (AV-068), and FA 60 (AV-089) would have less than credited suppression capability, when the diesel fire pump was taken out of service. This violation is being treated as an NCV, consistent with section 2.3.2 of the NRC Enforcement Policy.

The licensee entered the deficiency into their corrective action program as PER 786848. NCV 05000390/2013008-02, Inadequate Compensatory Actions to Minimize the Effects of Impaired Fire Protection Equipment on Fire Safe Shutdown.

.11 Review and Documentation of Fire Protection Program Changes

a. Inspection scope

The inspectors reviewed a sample of FPP changes made between January 2010 and September 2013 to determine if the changes to the FPP were in accordance with the fire protection license condition and had no adverse effect on the ability to achieve SSD.

b. Findings

No findings were identified.

.12 Control of Combustibles and Ignition Sources

a. Inspection Scope

The inspectors conducted tours of numerous plant areas that were important to reactor safety, including the selected FAs, to verify the licensee's implementation of FPP requirements as described in the WBN FPP and administrative procedure NPG-SPP-18.4.7, "Control of Transient Combustibles." For the selected FAs, the inspectors evaluated generic fire protection training; fire event history; the potential for fires or explosions; the combustible fire load characteristics; and the potential exposure fire severity to determine if adequate controls were in place to maintain general housekeeping consistent with the Fire Protection Report, administrative procedures, and other FPP procedures. There were no hot work activities ongoing within the selected fire areas during the inspection and observation of this activity could not be performed.

b. Findings

No findings were identified.

.13 B.5.b Inspection Activities

a. Inspection Scope

The inspectors reviewed, on a sample basis, the licensee's use of the HPFP system to feed the steam generators and restore heat sink for reactor coolant system temperature control. The inspectors verified that the guidelines were feasible, personnel were trained to implement the strategy, and equipment was properly staged and maintained to ensure the licensee staff provided an adequate response to large fires and explosions specified by the guidelines. The inspectors requested and reviewed the inventory of equipment; maintenance records of required equipment; job performance measures and requests to view the physical location of the equipment to ensure all attributes would be available based upon the chosen strategy. The inspectors performed walk downs of the storage and staging areas for the B.5.b equipment to verify that equipment identified for use in the current procedures were available, calibrated, maintained, and tested in accordance with the licensee's B.5.b program procedures.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Problem Identification and Resolution

a. Inspection Scope

The inspectors reviewed a sample of licensee independent audits, self- assessments, and system/program health report for thoroughness, completeness and conformance to FPP requirements. The inspectors also reviewed corrective action program documents, including completed corrective actions documented in selected problem evaluation reports and operating experience program documents, to ascertain whether industry identified fire protection issues affecting WBN were appropriately entered into the corrective action program for resolution. The documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA5 Other Activities

A. Review of Open Items for IR 05000390/2013-008

.01 (Closed) Unresolved Item (URI) 05000390/2010007-01, Use of OMAs Potentially Not Consistent with the Fire Protection Licensing Basis

a. Inspection Scope

During an NRC Triennial Fire Protection Inspection (TFPI), as documented in NRC Inspection Report 05000390/2010007, the inspectors identified that the licensee's post-fire safe shutdown procedures potentially credited OMAs that had not been reviewed and approved by the NRC. Specifically, inspectors identified certain OMAs, which were described in procedures that were not included in licensee calculation WBN-OSG-165, Rev. 5, "Manual Actions Required for Safe Shutdown Following a Fire," which was referenced in SSER 18, Section 3.5.

Inspectors performed an in-office review of WBN fire protection program licensing documents, design basis documents, and plant procedures to determine if a performance deficiency existed. Inspectors also performed a site visit to conduct a walkthrough of the OMAs in question, to evaluate the implementation and human factors adequacy of the procedures and shutdown strategy.

b. Findings

The inspectors determined that Watts Bar did not violate any of their fire protection licensing or design basis documents relative to use and implementation of OMAs for post-fire SSD. Additionally, the inspectors determined that the reviewed OMAs were feasible and reliable, and did not adversely impact SSD. No findings were identified.

.02 (Closed) Unresolved Item (URI) 05000390/2010007-03, Questions Related to OMA to Establish RCP Seal Cooling in the Event of a Fire in AV-076, Computer Room

a. Inspection Scope

During an NRC TFPI, as documented in NRC Inspection Report 05000390/2010007, inspectors identified a missing hand wheel on a valve that was required by procedure to be locally closed for a fire in the control building, FA 48 (AV-076). The procedure directed the operator to close valve 1-ISV-32-2934 to isolate air to valve 1-FCV-62-93, and open the petcock on the regulator for valve 1-FCV-62-93 to bleed off the air, which forced valve 1-FCV-62-93 to fail open. This would allow charging flow to the reactor coolant pump (RCP) seals to be controlled by the seal water injection filter via a series of manually-operated valves. As a result, the inspectors requested additional information regarding the effect of the missing hand wheel on RCP seal injection flow rates.

Inspectors performed an in-office review of WBN fire protection program licensing documents, as well as supporting information provided by the licensee to determine if a performance deficiency existed. Inspectors also reviewed the licensee's corrective actions in response to this issue.

b. Findings

The inspectors determined that the OMA in question was not needed to ensure SSD. Specifically, valve 1-FCV-62-93 was equipped with a pneumatic relay to prevent the valve from closing following a spurious input signal during an Appendix R fire event. The pneumatic relay ensured that minimum flow rate was maintained. No findings were identified.

B. Reviewed of Open Items for IR 05000391/2013-615

.01 (Discussed) Generic Letter 2006-03: Potentially nonconforming HEMYC and MT fire barrier configurations (Inspection Procedure 35007)

a. Inspection Scope

Background: Generic Letter (GL) 2006-03 requested licensees to address whether or not Hemyc or MT electrical raceway fire barrier system (ERFBS) material was installed and relied upon for separation and/or safe shutdown purposes to satisfy applicable regulatory requirements. In addition, licensees were asked to describe controls that were used to ensure the adequacy of other fire barrier types, consistent with the assessment requested in GL 92-08.

The GL concerned the use of Hemyc and MT fire barriers in nuclear power plants that may be relied on to protect electrical and instrumentation cables and equipment that provide safe shutdown capability during a fire. In 2005, NRC testing revealed that both materials failed to provide the protective function intended for compliance with existing regulations.

For Unit 1, the applicant submitted a letter from G. W. Morris to the NRC on June 7, 2006 (ADAMS Accession Number (No.) ML061600208) in response to GL 06-03, stating TVA does not rely on Hemyc or MT materials to protect electrical and instrumentation cables or equipment that provide safe shutdown capability during a postulated fire. In addition, TVA stated, TVA relies upon Thermo-Lag fire barrier material to protect fire safe shutdown circuits for WBN Unit 1 as approved by the NRC staff. The NRC acknowledged TVA's response to GL 06-03 and in a

letter from B. T. Moroney to K. W. Singer on January 31, 2007 (ADAMS Accession No. ML070250345). In addition, the NRC's staff review of TVA's TSI Thermo-Lag testing program and response to GL 92-08 was documented in Supplemental Safety Evaluation Report (SSER) 18. The issue was closed by the NRC for Unit 1 in a letter dated January 6, 1998. In addition, the NRC acknowledged the resolution of the ampacity derating issues in a letter from R.M. Martin to O.J. Zeringue, "Completion of Licensing Action for Generic Letter 92-08, THERMO-LAG 330-1 Fire Barriers, And Supplemental Safety Evaluation Report on Ampacity Issues Related to THERMO-LAG Fire Barriers for Watts Bar Nuclear Plant, Unit 1 (TAC No. M85622), January 6, 1998.

For Unit 2, the applicant submitted a letter to the NRC from B. Masoud, "Watts Bar Nuclear Plant (WBN) – Unit 2 – Initial Responses to Bulletins and Generic Letters," dated September 7, 2007, (ADAMS Accession No. ML072570676). In the applicant's letter, TVA committed that the Fire Protection Corrective Action Program will ensure that Watts Bar Unit 2 conforms to NRC requirements and applicable guidelines prior to fuel load and that the fire barrier configurations are documented in facility design basis documents that are controlled and maintained in accordance with TVA's Design Control and Quality Assurance Programs. The letter also referenced the letter from TVA to the NRC dated June 7, 2006 (ADAMS Accession No. ML061600208), which stated TVA does not rely on Hemyc or MT materials to protect electrical and instrumentation cables or equipment that provide safe shutdown capability during a postulated fire. In a letter from L. Raghavan to A. Bhatnagar, dated February 25, 2010 (ADAMS Accession No. ML100470398), the NRC safety evaluation determined that TVA's response for WBN Unit 2 regarding GL 06-03 was acceptable for the issue regarding Hemyc and MT fire barriers and TVA's response for other fire barrier materials was acceptable, subject to TVA completing its commitments stated in TVA's letter dated September 7, 2007.

Remaining Unit 2 Actions:

- Complete work orders (WOs) associated with EDCR 55523; and
- Complete the as-built combustible loading, seismic, ampacity degradation, and safe shutdown calculations for the fire barrier installations.

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

- Reviewed NCO0080008020 package to verify the engineering methodology to support the corrective actions were in place;
- Reviewed EDCR-2 55523, Rev. A, to verify that the required design, materials, and installation instructions were properly scoped to address the planned correction actions;
- Reviewed G-98, "Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems," Rev. 9, to verify that Hemyc and MT fire barrier material was not specified for use for WBN Unit 2 and to verify that the approved specifications were in place to control the future installation of the approved fire barrier material;
- Reviewed calculation EPMD0M012990, "Combustible Loading Data," Rev. 70, to verify that the design estimated quantities of the proposed fire barrier material were added to the combustible loading calculation; and
- Reviewed three seismic support calculations to verify that the calculations included the as designed loads from the addition of the fire barrier material and were completed in accordance with WB-DC-40-31.10, "Seismically Qualifying Conduit Supports," Rev. 11

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Hemyc and MT fire barrier materials were not installed or planned to be installed at WBN Unit 2. The engineering methodology and description of the controls to be used to ensure the adequacy of other fire barrier types appear to be consistent with the assessment requested in GL 06-03 and GL 92-08. Additional inspection activities are required prior to closure of GL 06-03. The inspectors will inspect a sample of the approved Thermo-Lag fire barrier material installations to include a review of the controls to manage the as-built design configuration.

.02 (Discussed) Bulletin 1992-01: Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Small Conduits Free from Fire Damage; Bulletin 1992-01 (Supplement 1): Failure of Thermo-Lag 330 Fire Barrier System to Perform Its Specified Fire Endurance Function; Generic Letter 1992-08: Thermo-Lag 330-1 Fire Barriers (Inspection Procedure 35007)

a. Inspection Scope

Background: NRC Information Notice (IN) 92-46, "Thermo-Lag Fire Barrier Material Special Review Team Findings, Current Fire Endurance Tests, and Ampacity Calculation Errors," dated June 23, 1992, informed licensees of failures in fire barrier system endurance and ampacity derating tests, installation procedures, and as-built configuration discrepancies. The failures were associated with the Thermal Science, Incorporated (TSI), St. Louis, Missouri, Thermo-Lag 330-1 ERFBS that was installed to protect safe shutdown capability. Texas Utility Electric Company (TU Electric) conducted a series of full-scale fire endurance tests to qualify the Thermo-Lag 330-1 ERFBS configuration installed at its Comanche Peak Steam Electric Station.

The NRC also initiated a series of small scale fire tests of 1-hour and 3-hour Thermo-Lag prefabricated panels at the National Institute of Standards and Technology to assess the fire performance of the panels. The staff issued the results of the TU Electric and NRC fire tests in Bulletins 92-01, "Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Small Conduits Free from Fire Damage," June 24, 1992, and Bulletin 92-01 Supplement 1, "Failure of Thermo-Lag 330-1 Fire Barrier system to Perform its Specified Fire Endurance Function," August 28, 1992. In the bulletin and its supplement, the NRC notified the licensees of apparent failures of Thermo-Lag 330-1 fire barriers and materials during fire endurance testing. The bulletin and its supplement requested that each licensee determine which plant areas use 1-hour or 3-hour prefabricated Thermo-Lag 330-1 panels or conduit shapes for raceway, wall, ceiling, or equipment enclosure fire barriers; determine the plant areas that use these materials to protect or separate safe shutdown capability; and implement compensatory measures in accordance with plant procedures until fire barriers can be declared operable.

In addition, GL 92-08 requested the licensees to state whether Thermo-Lag 330-1 barriers were relied upon to protect safe shutdown capabilities; whether the licensee had qualified the Thermo-Lag-330-1 fire barriers, whether or not the as-built configurations installed were in accordance with the qualification test assembly configurations; and whether or not the as-built Thermo-Lag 330-1 barrier configurations were consistent with the barrier configurations used during the ampacity derating tests. The licensees were also asked to describe controls that

were used to ensure the adequacy of other fire barrier types, consistent with the assessment requested in GL 92-08.

The GL concerned three principal areas: (1) the fire endurance capability of Thermo-Lag-330-1 barriers; (2) the ampacity derating of cables enclosed in Thermo-Lag 330-1 barriers; and (3) the evaluation and application of the results of tests conducted to determine the fire endurance ratings and the ampacity derating factors of Thermo-Lag 330-1 barriers. The NRC was concerned that the Thermo-Lag 330-1 fire barrier systems may not provide the level of fire endurance intended by licensees and that the licensees that use Thermo-Lag 330-1 fire barriers may not be meeting the requirements of 10 CFR 50.48, "Fire Protection," and General Design Criterion (GDC) 3, "Fire Protection," of 10 CFR Part 50, Appendix A, "General Design Criterion for Nuclear Power Plants."

For Unit 1 the applicant submitted an initial response to GL 92-08 in a letter from W. J. Museler to the NRC on April 16, 1993, and a revised response from R.R. Baron to the NRC on March 22, 1995. The response stated TVA would perform the following actions:

- Develop and conduct testing programs to evaluate and qualify Thermo-Lag fire barrier material for use at WBN;
- Develop TVA design requirements for Thermo-Lag installations to ensure conformance to NRC guidance and test requirements for fire endurance and ampacity ratings;
- Evaluate the existing Thermo-Lag installations at WBN to ensure compliance with all Appendix R requirements;
- Identify and correct deficiencies; and
- Develop recurrence controls

In addition, TVA, along with the NRC and other nuclear utilities, developed and conducted extensive testing of Thermo-Lag installations on varied cable tray and conduit configurations. The TVA specific testing and all of the other industry testing of TSI Thermo-LAG and other manufacturer's fire barrier material and systems were documented in NRC technical report designation (NUREG)/CR-6681 and NUREG-1024.

After completion of the test program, TVA issued several design standards to control the fire barrier design parameters and prevent recurrence. The fire barrier material was installed in accordance with the General Engineering Specification G-98, "Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems," and drawing series 47W243 of Typical Thermo-Lag 330-1 ERFBS enclosures. Calculation WBEVAR8909010, "Cable Ampacity -V4 and V5," evaluated and documented Unit 1 cable ampacity margins in accordance with design standard DS-E12.6.3 and the as-constructed Thermo-Lag calculations concluded that all power cables had adequate ampacity margin.

In TVA's response to GL 92-08, dated March 22, 1995, TVA stated, based on the testing results, that TVA had evaluated the previously installed Thermo-Lag 330-1 material and determined that there was insufficient evidence to justify its use. Accordingly, TVA removed the "old" Thermo-Lag 330-1 at WBN Unit 1. All existing TSI barriers, credited and required by the safe shutdown analysis in the WBN Unit 1 "as constructed" fire protection report, were removed and or replaced by either qualified new TSI Thermo-Lag 330-1 or 3M fire barrier systems per DCN M11727. The NRC's staff review of TVA's TSI Thermo-Lag testing program and response to GL 92-08 was documented in Supplemental Safety Evaluation Report (SSER) 18. The issue was closed by the NRC for Unit 1 in a letter dated January 6, 1998 (ADAMS Accession No. ML 073240226). In addition, the NRC acknowledged the resolution of the ampacity derating issues

in a letter from R.M. Martin to O.J. Zeringue, "Completion of Licensing Action for Generic Letter 92-08, THERMO-LAG 330-1 Fire Barriers, And Supplemental Safety Evaluation report on Ampacity Issues Related to THERMO-LAG Fire Barriers for Watts Bar Nuclear Plant, Unit 1 (TAC No. M85622), January 6, 1998 (ADAMS Accession No. ML073240205).

For Unit 2 the applicant initiated EDCR 55523 and Design Change Notice (DCN) 54413/PIC 57215 to install fire rated ERFBS and addresses the fire barrier conduits to be wrapped for dual unit operations in accordance with the applicable design standards for ampacity derating, combustible loading, structural loading, and installation requirements controlled by procedure G-98 and drawing series 47W243. Walkdowns were completed by Unit 2 to verify the absence of "old" Thermo-Lag material.

Remaining Unit 2 Actions:

- Complete WOs associated with EDCR 55523 and DCB 53413/PIC 57215; and
- Complete the as-built combustible loading, seismic, ampacity degradation, and safe shutdown calculations for the fire barrier installations.

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

- Reviewed NCO0080008057 package to verify the engineering methodology to support the corrective actions were in place;
- Reviewed EDCR-2 55523, Rev. A, to verify that the required design, materials, and installation instructions were properly scoped to address the planned correction actions;
- Reviewed G-98, "Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems," Rev. 9, to verify that the approved specifications were in place to control the future installation of the approved fire barrier material;
- Reviewed calculation EPMD0M012990, "Combustible Loading Data," Rev. 70, to verify that the design estimated quantities of the proposed fire barrier material have been added to the combustible loading calculation;
- Reviewed three seismic support calculations to verify that the calculations included the as designed loads from the addition of the fire barrier material and were completed in accordance with WB-DC-40-31.10, "Seismically Qualifying Conduit Supports," Rev. 11;
- Reviewed the applicant's design standard requirements applicable to fire-wrap derating factors and the underlying methodologies to verify that those requirements were then translated to the applicable ampacity calculations;
- Reviewed recent alterations to derating values for two cables which were impacted by construction activities to verify that the methodologies were properly implemented and resulted in conservative deratings;
- Performed a walkdown of one installation for which the licensee determined derating was not required due to short impacted length to verify that those exceptions were properly applied in accordance with procedures; and
- Reviewed two field change requests (FCRs) associated EDCRs and interviewed three design engineers to verify that adequate design control measures were established, design changes, including field changes, related to Appendix R cables relied on for safe shutdown, were subject to design control measures commensurate with those applied to the original design and completed in accordance with 25402-000-GPP-0000-N3105, "Field Change Requests," Rev. 16, and 25402-3DP-G04G-00081, "Engineering Document Construction Release," Rev. 16.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The engineering methodology and the description of the design controls to be used to control the design implementation and installation of the approved ERFBS materials for WBN Unit 2 appear to be consistent with the assessment requested in GL 92-08, Bulletin 92-01 and Bulletin 92-01 Supplement 1. Additional inspection activities are required prior to closure of GL 92-08 and the associated bulletins. The inspectors will inspect a sample of the approved Thermo-Lag fire barrier material installations to include a review of the controls to manage the as-built design configuration.

.03 (Discussed) Construction Deficiency Report 391/81-88 Fire Prevention Spray Protection for Oil Lift Assembly and Upper Bearing Cooler (IP 35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on October 30, 1981, as nonconformance report (NCR) WBN MEB 8133 in accordance with 10 CFR 50.55(e). The issue was documented as Construction Deficiency Report (CDR) WBRD-50-390/81-94 for Unit 1 and WBRD-50-391/81-88 for Unit 2.

The CDR concerned the deficiency to provide spray shields for the upper bearing coolers of the reactor coolant pumps. Should a rupture of one of these components occur, the potential exists for pressurized lube oil to come in contact with hot reactor coolant system piping; resulting in a fire. TVA concluded the cause of the deficiency was the incorrect assumption that oil spray from an upper bearing cooler rupture would be contained within the drain pans located below the reactor coolant pump motors. Additionally, the lift pumps were only partially enclosed so they could be sprayed by the reactor coolant pump fixed water spray systems.

For Unit 1, TVA issued Engineering Change Notice (ECN) 3271 to address the modifications to the spray shields around the oil lift assembly and upper bearing cooler for the reactor coolant pumps. On July 9, 1982, TVA issued a letter that provided information regarding how compliance with 10 CFR Part 50 Appendix R, was to be achieved for Units 1 and 2, including the requirements of Section III.O that outlined the need for reactor coolant pumps to be provided with an oil collection system to include spray shields for the oil lift pumps.

On May 11, 1984, the NRC issued Inspection Report 50-390/84-28 (ADAMS Accession No. ML082261059) that closed the spray shield deficiency for Unit 1 (CDR 390/81-94) subsequent to the inspection of the constructed configuration of the spray shields.

For Unit 2, the applicant initiated PERs 172587 and 172669 to address the corrective actions. TVA issued EDCR 52312 and WO 1108412596 to address the Appendix R issues around the reactor coolant pumps to include the spray shields for the oil lift pumps.

Remaining Unit 2 Actions:

- Complete WOs associated with EDCR 52312.

Inspection Activities:

To address Unit 2 actions the inspectors performed the following:

- Reviewed PERs 172669 and 172587 to verify information regarding the requirements for the TVA to design and install spray shields to prevent reactor coolant pump (RCP) lube oil leaks from resulting in a potential fire scenario;
- Reviewed EDCR 52312, "Installation of Unit 2 Reactor Coolant Pump (RCP) Spray Shield Platforms", Rev. A, including associated FCRs and DRAs, to verify that the intended work scope for RCP spray shield installation for Unit 2 was similar to the constructed configuration for those in Unit 1;
- Reviewed latest revisions of spray shield as-designed drawings applicable to Unit 2 to verify that the design approach for the Unit 2 RCP spray shields and oil collection pans was similar to that previously approved for Unit 1;
- Reviewed WO 110841256, to verify that the planned work activities addressed the work scope of EDCR 52312; and
- Reviewed the as-designed Fire Protection Report dated March 13, 2013, to verify that the Appendix R requirements for providing RCP spray shields was incorporated within this program document and matches that which is used as the design basis for Unit 2.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The as-designed drawings for the Unit 2 RCP spray shields and oil collection pans consist of updated revisions of the as-constructed drawings used for the Unit 1 RCP oil collection system. EDCR 52312, and its associated DRAs and FCRs, along with WO 110841256, indicate that the spray shields that are to be installed on the RCPs for Unit 2 will be similar in design to those of Unit 1 that were previously inspected and approved by the NRC. Additional inspection activities are required prior to closure of CDR 391/81-88. The inspectors will inspect a sample of the oil spray shield installations to verify the as-built design configuration meets the Appendix R requirements.

.04 (Discussed) Construction Deficiency Report 391/82-04 Foam Seals in Mechanical Pipe Sleeves (IP 35007)a. Inspection Scope

Background: The deficiency was initially reported to the NRC on December 4, 1981, as NCR WBN CEB 8118 in accordance with 10 CFR 50.55(e). The issue was documented as CDR WBRD 50-391/81-04.

The CDR concerned the use of silicon sealants in pipe sleeves at certain locations that could be subjected to pipe movement. The maximum pipe movement at the sleeves could cause a failure of the sealant to perform its intended design function; serving as a pressure, water, and/or fire protection seal.

TVA performed an analysis that indicated that pipe movement could result in a failure of the silicone seals. TVA generally concluded that the deficiency resulted from the fact that the piping analyst had not considered the potential for increased pipe stresses and support loads caused by the silicone foam sealant. The cause for this lack of consideration was concluded as being twofold: 1) the drawings indicating the sleeve arrangements had not been checked by the piping analysts and; 2) there was no design criterion or other documentation to address the consideration of the foam sleeve seals, including inadequate procedures to control the analyst's activities.

To determine the resistance of the foam-to-pipe movement, TVA performed a series of tests to evaluate the spring constants of various pipe/sleeve configurations and used this data to compare the "stiffness" of the foam seals to that of the pipe supports; which is documented in civil engineering branch (CEB) reports 82-2 and 82-9. The data indicated that the foam seal stiffness was insignificant except for pipe movements exceeding one inch.

For Unit 1, TVA identified those pipe penetration seals with movements greater than one inch. To correct this deficiency, boot seals were installed that allowed for greater pipe movement with no detrimental impact on the seal integrity. On June 12, 1984, the NRC issued Inspection Report 50-390/84-39 (ADAMS Accession No. ML082390462) that closed the silicone foam pipe penetration seal deficiency for Unit 1.

For Unit 2, TVA initiated PER 172686 to address the corrective actions, including the issuance of ECN 4858. TVA subsequently issued EDCR 54431 to correct the silicone foam seals identified with Unit 2. TVA also issued EDCR 54423, which addresses aspects associated with this deficiency for both Units 1 and 2, and was used to support the closure of PER 172686. Two procedural documents were also developed to prevent recurrence of this deficiency: 1) Rigorous Analysis Handbook instructions were provided to the piping analysts and; 2) Mechanical Design Standard DS-M5.2.6, was issued to aid the designers in determining proper seal designs.

Remaining Unit 2 Actions:

- Complete WOs associated with EDCR 54431 and EDCR 54423.

Inspection Activities:

To address Unit 2 actions the inspectors performed the following to verify that the corrective actions for Unit 2 were identified and the design methodology met the commitment requirements:

- Reviewed PER 172686 to verify information regarding the requirements for TVA to design and install replacement penetration seals for those sleeves originally using silicone foam identified as being candidates for failure due to pipe movement;
- Reviewed EDCR 54431, "Seal Designs for Mechanical Sleeves", Rev. A, including associated FCR's and DRA's, to verify that the intended work scope for the replacement of the silicone foam seals included properly designed boot seals;

- Reviewed CEB Report 82-2, "Testing of Silicon Foam Seals," and reviewed CEB Report 82-9, "Effects of Silicone Penetration Seals on Piping Analysis," to verify that the silicon material was tested and approved;
- Reviewed Limited Scope Walk Down (LSWD) 1093 regarding information on the configurations of the penetration seals for Unit 2;
- Reviewed Completed WO 1128390029; associated with EDCR 54431, SYS 304 0-SLV-304-A0121AMA Breach and Reseal, to verify the procedures used to design, install, and qualify penetration seals;
- Reviewed TVA drawing series 47W470 and 47W471 to verify penetration sleeve locations and reviewed TVA drawing series 47A472 to assess the specific penetration seal designs; and
- Reviewed NUREG-0847 "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," Supplement 19 (SSER 19), Appendix FF, dated November 1995, and the As-Designed Dual Unit Fire Protection Report, March 13, 2013, to verify that the proposed designs for the various penetration seals were adequate to support the requirements of 10 CFR Part 50, Appendix R.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Limited scope walkdowns identified and documented the specific configurations of all barrier penetrations associated with the Unit 2 design, including those rated for pressure, water, and fire. The current procedures and processes used to govern both the design and installation of the penetration seals appear adequate to ensure the proper seal design; based on the type of mechanical penetration. The boot seals that have been designed to replace the silicone foam seals in Unit 2 that were identified as being in jeopardy of failure due to pipe movement are identical to those that were previously installed and were accepted by the NRC for Unit 1. Additional inspection activities are required prior to closure of CDR 391/82-04. The inspectors will inspect a sample penetration seal installations to verify the as-built configuration meets the Appendix R requirements.

.05 (Discussed) Construction Deficiency Report 391/84-34 Spurious Valve Operation due to Fire Damage (IP 35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on July 30, 1984, in accordance with 10 CFR 50.55(e) as NCR 5760. The issue was documented as CDR WBRD 50-390/84-39 for Unit 1 and WBRD 50-391/84-34 for Unit 2.

The CDR identified the spurious actuation of an affected valve(s) during a fire could prevent the safe shutdown of the plant. This could result by spuriously closing essential safety-related flow paths or by spuriously diverting flow from an essential path to another non-essential system or component. This could adversely affect the safety of operations of the plant.

As stated in TVA's Final Report, "Spurious Valve Operation Due to Fire Damage," dated February 1, 1985 (ADAMS Accession No. ML082190672): During July 1984, TVA performed a 10 CFR Part 50, Appendix R, review for WBN. During this review, several sets of redundant valves were observed to be capable of invalidating the safe shutdown analysis for WBN. This was due to potentially spurious valve operation as a result of fire damage to control circuitry. Three sets of valves were identified which affected the essential raw cooling water and the component cooling water systems.

TVA determined the cause of the deficiency to be a design oversight. This resulted from not having an established procedure for performing a fire protection analysis or for reviewing previously implemented design to ensure compliance with 10 CFR Part 50, Appendix R.

To resolve the issue for Unit 1, TVA completed a review of all 10 CFR Part 50, Appendix R, shutdown paths in accordance with OE-SEP 84-09, "Safe Shutdown Analysis for Postulated Fire at Watts Bar Nuclear Plant," which was issued to prevent recurrence of this deficiency. OE-SEP 84-09 was replaced with Design Criteria WB-DC-40-51 "Fire Protection of Safe Shutdown Capability (Unit 1/Unit 2)." All valves capable of invalidating the Appendix R safe shutdown analysis due to spurious operation as a result of fire damage to control circuitry were identified and corrected via ECNs 5317, 5046, 5047, 5229, and 5338. These ECNs were developed to reroute control cables, re-pull portions of control cables, relocate control cables, wrap control cables, or remove power to prevent spurious valve operation as a result of fire damage to control circuitry. CDR 390/84-39 was closed in NRC inspection Report 50-390/85-09 (ADAMS Accession No. MO082190704).

For Unit 2, TVA initiated PER 172596 which included all the corrective actions that were identified and included in NCR 5760 and addressed by Unit 1, to include the commitment to evaluate existing cable routing for valves (capable of invalidating the Appendix R Safe Shutdown paths) and to identify all required control circuit wiring modifications required to prevent spurious valve operation due to fire damage and do necessary modifications. Calculation EDQ00099920090012, "Unit 1 and 2 Appendix R Safe Shutdown Analysis," Rev. 2, was issued with WB-DC-40-51, "Fire Protection of Safe Shutdown Capability (Unit 1/Unit 2)," Rev. 6, to address the historical design control deficiencies. TVA issued Appendix J of calculation EDQ00099920090012, which lists 46 required component modifications for Unit 2. The resolutions for the 46 components were addressed in the following change documents: 52945, 53176, 53217, 53287, 53421, 53580, 53756, 54103, 54144, 54172, 54255, 54870, and 54912.

Remaining Unit 2 Actions:

- Preparation and issuance of remaining field WOs to make modifications as stated in Appendix J of calculation EDQ00099920090012 via the following design packages: 52945, 53176, 53217, 53287, 53421, 53580, 53756, 54103, 54144, 54172, 54255, 54870, and 54912; and
- Remove Unverified Assumption 2.1 from calculation EDQ 00099920090012, "Unit 1 and 2 Appendix R Safe Shutdown Analysis," which ensures all recommended resolutions have been addressed.

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

- Reviewed PER 172596 to verify that the corrective actions were identified to address the historical construction deficiency;
- Reviewed DCN 54912 and EDCRs 52945, 53176, 53217, 53287, 53421, 53580, 53756, 54103, 54144, 54172, 54255, 54870, associated drawings (DRAs) and field change requests (FCRs), and applicable sections of the Safe Shutdown Analysis EDQ00099920090012 to verify that the as-design method was completed in accordance with the design standard WB-DC-40-51, "Fire Protection of Safe Shutdown Capability (Unit 1/Unit 2)," Rev. 6;
- Reviewed a sample of valves from the above listed DCN and cables from the above listed EDCRs, specifically DCN 54912-A, (2-FCV-70-156A), EDCR 53217 (cable 2V8403A), EDCR 54144 (cable 2SG101A), EDCR 54870 (cable 2V3131A), reviewed Calculation EDQ00099920012 "Unit 1 and Unit 2 Appendix R Safe Shutdown Analysis," Rev. 2 and Calculation EDQ00299920090013 "Appendix R – Unit 2 Cables Required for Safe Shutdown Following a Fire," Rev. 2, to determine if the as designed changes had been incorporated; and
- Reviewed the applicable Integrated Cable & Raceway Design System (ICRDS), Rev. 14, reports for the selected cables to verify that the design changes and configuration management processes were established and implemented into the as-designed ICRDS.

b. Observations and Findings

No findings were identified.

c. Conclusions

The design controls were established to manage the Appendix R requirements for potentially spurious valve operation as a result of fire damage for Unit 2. The sampled valve and cable design changes reviewed by the inspectors were implemented into the as-designed fire protection safe shutdown analysis. Additional inspection activities are required prior to closure of CDR 391/84-34. The inspectors will inspect a sample of the component modifications, to verify the as-built configuration meets the Appendix R requirements. In addition, the NRC will review the actions associated with commitment No. 112549702 contained in TVA letter to NRC dated February 7, 2013, "Watts Bar Nuclear Plant (WBN) Unit 2 – Fire Protection Program (TAC No. ME0853) – Commitment to Provide Additional Information on Multiple Spurious Operation (MSO) Scenarios" which states that design changes will be implemented prior to fuel load or startup, as applicable for EDCR 53217, 53287, and 54103.

.06 (Discussed) Construction Deficiency Report 50-391/83-61: Failure to Provide Self Contained Lights as Committed to the NRC (IP35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on November 9, 1983, in accordance with 10 CFR 50.55(e) as NRC WBNMEB8305.

NCR WBNMEB8305 was written to document that TVA had committed to install fixed, self-contained lighting units that would provide an average illumination level of 0.5 foot candles; however, the lighting had not been provided in all areas as committed and the illumination levels

had not been maintained. This deficiency, reportable under 10 CFR 50.55(e) was tracked as CDR 390/83-66 (Unit 1) and CDR 391/83-61 (Unit 2).

The CDR concerned the deficiency of plant lighting systems with centralized power supplies that could fail due to direct fire damage. Without adequate backup lighting from self-contained lighting Units, access could be hindered to areas containing equipment which is required to operate for safe shutdown and to the fire area for manual firefighting activities. If plant operations personnel cannot gain timely access to these areas, safe shutdown capability could be jeopardized.

TVA concluded the cause of the deficiency was that engineering had failed to specify sufficient lighting units to satisfy the commitment and subsequent reviews had failed to identify the error.

For Unit 1, TVA issued engineering procedure (EP) 4.25, "Division of Engineering Design Engineering Procedure," in January 1983 to strengthen management controls over independent reviews on drawings and associated design efforts. Electrical Design Standard DS-E17.1.1, "Lighting Standards and Practices," was revised to include requirements for self-contained lighting units. ECN 4412, "Emergency Battery Pack Lighting," was issued to incorporate sufficient lighting into the plant design.

CDR 390/83-66 was adequately resolved for Unit 1 as documented in NRC Inspection Report 50-390/84-23 (ADAMS Accession No. ML082390210) dated April 11, 1984. At that time approximately 80 new battery lights had been installed and 60 existing lights had been relocated. The work had been completed in Unit 1 except the NRC noted that final inspection had only been completed on approximately 50 percent of the lighting units and inspection for the remaining units was in progress. TVA submitted the final closure package for CDR 390/83-66 on September 4, 1984.

In a letter dated February 5, 1992, TVA provided the NRC with a fire protection report for Unit 1. The report described WBN's program that was developed to comply with NRC regulatory requirements. It was noted in the submittal that the report superseded previous TVA fire protection commitments and submittals as well as the existing Fire Protection Program described in the Final Safety Analysis Report (FSAR). The report removed the 0.5 foot candle lighting requirement and superseded the commitment to require sufficient illumination to allow the operator safe access or egress to those plant areas where shutdown functions must be performed and sufficient illumination to enable operator to perform the required manual actions. The NRC acknowledged TVA's commitment in NUREG-0847 Supplement No. 18 "Safety Evaluation Report related to the operation of Watts Barr Nuclear Plant, Units 1 and 2," October 1995.

For Unit 2, the applicant initiated PER 172644 to address the corrective actions. The applicant issued ECN 4413, "Emergency Battery Pack Lighting", to incorporate sufficient lighting into the plant design. In addition to the design controls initiated for both Unit 1 and Unit 2, noted above, the applicant issued Calculation EDQ00099920090017, "Appendix R – Units 1&2 Emergency Lighting Requirements," Rev. 1, to identify the self-contained lighting requirements. The purpose of the calculation was to document the emergency lighting requirement to support the Appendix R manual operator actions outside the main control room. The calculation evaluated the existing lighting design and identified additional lighting that was required to meet Appendix R requirements. DCN 54871-A was subsequently written to show the locations of the Appendix R emergency lights and install new lighting.

Remaining Unit 2 Actions:

Preparation and issuance of remaining fieldwork orders to install the new lighting identified by calculation EDQ00099920090017 Rev. 1 and DCN 54871-A.

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

- Reviewed PER 172644 to verify the corrective actions were implemented for CDR 391/83-61;
- Reviewed calculation EDQ00099920090017, "Appendix R – Units 1&2 Emergency Lighting Requirements," Rev. 1, and DCN 54871-A to determine if the as-designed configuration met regulatory requirements, did not invalidate WBN commitments, and complied with the Watts Bar Safety Evaluation Report and the combined Unit 1 and 2 Appendix R safe shutdown analysis;
- Reviewed calculation EDQ00099920090017 "Appendix R – Units 1&2 Emergency Lighting Requirements" Rev. 1, to verify the methodology for selecting the placement of emergency lighting for Unit 1 and Unit 2 locations was the same;
- Reviewed DCN 54871A to verify the design, location, and materials were properly scoped to support successful installation; and
- Reviewed TVA commitment 112444572, "Fire Protection Commitments Open Commitments to be Completed for the Submittal of the As-Constructed Fire Protection Report," Enclosure 3, contained in WBN letter to NRC dated February 7, 2013 (ADAMS Accession No. ML13044A113). The commitment stated, "Emergency lighting and communications for the Unit 2 OMAs will be demonstrated during the Unit 2 OMA validation walkdowns." The review was completed to determine if the applicant had the appropriate processes in place to ensure the as-constructed emergency lighting would be verified to the as-designed commitments.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The engineering method of selecting light locations, fixtures, installation, and instructions are similar to the process that installed the emergency lighting in Unit 1 and appear to support compliance for Unit 2. Additional inspection activities are required prior to closure of CDR 83-61. The inspectors will inspect a sample of the emergency lighting as-built locations and lighting levels to determine if the as-built installations are adequate to support the approved OMAs.

.07 (Discussed) Construction Deficiency Report 391/84-44: Reactor coolant pump oil drain does not meet Appendix R requirement (Inspection Procedure 35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on October 29, 1984, in accordance with 10 CFR 50.55(e) as NRC WBN MEB 8414. NCR WBNMEB8414 was written to document the auxiliary sump for the RCP oil collection system had an inadequate free

volume to contain the required lube oil inventory. This deficiency was tracked as CDR 390/84-49 (Unit 1) and CDR 391/84-44 (Unit 2).

The CDR concerned the inadequacy of the RCP oil seal system auxiliary sump capacity that could result in oil backing up through the floor drains and onto the containment floor. This spilled oil could present a fire hazard. A fire inside containment could adversely affect the safe operation of the plant. TVA considered this failure to adhere the Appendix R commitments to be a design oversight error.

For Unit 1, TVA issued ECN 5218 to reroute the drain lines for the RCP oil drip collection pans from the auxiliary sump to the reactor building floor and equipment drain sump. TVA letter dated November 21, 1984, provided the final report for CDR 50-390/84-49. In the letter TVA stated that the equipment drain sump was a vented closed container which had adequate capacity to contain the entire lube oil capacity of one RCP and the lube oil system was qualified to seismic category I. For Unit 1, the NRC closed CDR 390/84-49 in Inspection Report 390/85-09 dated March 11, 1985.

For Unit 2 TVA issued PER 172614 to address the corrective actions. In addition TVA issued ECN 5219 to reroute the RCP drip collection pans from the reactor building auxiliary sump to the reactor building floor and equipment drain sump. EDCR 54318 and associated field change request, FCR 59395 AA01, were issued to complete the installation of the piping for all four RCPs.

Remaining Unit 2 Actions:

- Complete WOs associated with EDCR 54318 and FCR 59395.

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

- Reviewed PER 172614 to verify that the corrective actions were identified to address the historical construction deficiency;
- Reviewed calculation EPMBFS052395, "Fire Hazard Evaluation for the Reactor Coolant Pump Oil Collection System," Rev. 2, to verify the design for the oil collection system was sized to accommodate the maximum leak rate and the designed storage capacity was adequate; and
- Reviewed ECN 5219, EDCR 54318, drawing 47W476-7, "Mechanical Containment Drains & Embedded Piping", Rev. 9, Drawing 47W476-8, "Mechanical Containment Drains & Embedded Piping", Rev. 6, and FCR 59395 to ensure the as-designed oil collection piping system and storage capacity was adequate.

a. Observations and Findings

No findings were identified.

c. Conclusions

The Unit 2 RCP oil collection system design was based on the Unit 1 as-built configuration. The as-designed plant drawings and calculations for the sump volume to contain leakage from the RCPs are adequate and meet the requirements of Appendix R. Additional inspection activities are required prior to closure of CDR 391/84-44. The inspectors will review the seismic design of

the RCP oil collection system and inspect a sample of the RCP oil collection system piping, to verify the as-built configuration meets Appendix R requirements.

.08 (Discussed) Construction Deficiency Report 391/84-35: Unacceptable Electrical Cable Separation (Inspection Procedure 35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on July 23, 1984, as NCR WBN EEB 8422 and 5761 in accordance with 10 CFR 50.55(e). The issue was documented as CDR WBRD 50-390/84-37 and WBRD 50-390/84-40 for Unit 1 and WBRD 50-391/84-35 for Unit 2.

The deficiency concerned unacceptable electrical cable separation conditions that involved Appendix R fire protection horizontal spatial requirements between redundant trains of safe shutdown equipment. The NCRs identify several instances where various Unit 1 and common cables did not meet Appendix R separation requirements. A single exposure fire which involves redundant cables or intervening combustibles could produce effects (e.g., smoke, heat, or ignition) which could adversely affect other redundant cables of a safe shutdown system. Both affected redundant cables could be adversely affected in the event of a fire from intervening combustibles. Thus, a single postulated fire could prevent the accomplishment of operations necessary for safe plant shutdown. This could adversely affect the safe operation of the plant.

TVA determined the cause of the deficiency was a design oversight. This oversight was the lack of an established procedure for performing a fire protection analysis or for reviewing previously implemented design to ensure compliance with 10 CFR Part 50, Appendix R.

For Unit 1, TVA performed additional reviews and analysis of all Appendix R requirements. TVA issued the Appendix R Safe Shutdown Analysis for Unit 1 in Calculation WEBNOSG4031, "Equipment Required for Safe Shutdown PER 10CFR50 Appendix R." All equipment, circuits, and cables required for safe shutdown were identified along with any required separation between redundant trains for individual rooms and fire zones in the calculation. TVA issued ECNs 5338, 5229, and 5046 to reroute several cables to meet Appendix R requirements. In addition, TVA issued design criteria WB-DC-40-51, "Fire Protection of Safe Shutdown Capability (Unit1/Unit2)," and WB-DC-30-13, "10CFR, Appendix R, Type I, II, and III Circuits Unit1/Unit2)," to address the design control corrective actions. The NRC closed CDRs 50-390/84-37 and 50-390/84-40 in Inspection Report 50-390/85-09 and 50-391/85-09 (ADAMS Accession No. ML082190704) to Inspection Follow-Up Item (IFI) 390/84-55-01. IFI 390/84-55-01 was closed in IR 50-390/85-29 and 50-391/85-25 (ADAMS Accession No. ML0821705903).

For Unit 2, TVA issued PER 172795 to address CDR 391/84-35. TVA combined the Unit 1 and Unit 2 Appendix R Safe Shutdown Analysis, and has issued the as-designed Calculation EDQ00099920090012, "Unit 1 and Unit 2 Appendix R Safe Shutdown analysis," Rev. 0. Appendix J of the calculation identified all actions required to have the 10 CFR Part 50, Appendix R, separation requirements for safe shutdown of Unit 1 and Unit 2 satisfied. TVA issued DCNs 54912, EDCRs 54633, 54636, 54637, 54639, 54640, 55231, 55233, and 53217 to resolve all actions as identified in Appendix J of calculation EDQ00099920090012.

Remaining Unit 2 Actions:

- Preparation and issuance of remaining field work orders to resolve all actions identified in Appendix J of calculation EDQ00099920090012 via EDCRs 54633, 54636, 54637, 54639, 54640, 55231, 55233, 53217 and DCN 54912; and
- Remove Unverified Assumption 2.1 from calculation EDQ 00099920090012, which ensures all recommended resolutions have been addressed.

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

- Reviewed PER 172795 to verify that the corrective actions were identified to address the historical construction deficiency;
- Reviewed DCN 54912 and EDCRs 54633, 54636, 54637, 54640, 55231, 55233, 53217, associated drawings, FCRs, and applicable sections of the as-designed Safe Shutdown Analysis EDQ00099920090012, "Unit 1 and 2 Appendix R Safe Shutdown Analysis," Rev. 2, to verify that the as-design method was completed in accordance with the design standard WB-DC-40-51, "Fire Protection of Safe Shutdown Capability (Unit 1/Unit 2)," Rev. 6;
- Reviewed a sample of cables from the above listed EDCRs, specifically EDCR 54636 (cable 2V4035A); EDCR 54639 (cable 2NM386F); EDCR 54640 (cable 2PL4790B); and EDCR 55231 (cable 2A5769), reviewed Calculation EDQ00099920012 "Unit 1 and Unit 2 Appendix R Safe Shutdown Analysis" Rev. 2 and Calculation EDQ00299920090013 "Appendix R – Unit 2 Cables Required for Safe Shutdown Following a Fire" Rev. 2, to determine if the as-designed changes had been incorporated;
- Reviewed two cables, 2PM1416E and 2PM1223F, associated with the steam generator hi-hi level protection and the level control system routing used in the safe shutdown analysis calculations; the review included conduit and grounding drawings, fire protection compartmentation drawings, and associated ICRDS data, to determine if cable routing selection was accurate, cables met separation requirements, and the analysis supported safe shutdown;
- Reviewed the applicable ICRDS reports for the selected cables to verify that the design changes and configuration management processes were established and implemented into the as-designed ICRDS;
- Interviewed the fire protection engineer responsible for the safe shutdown analysis to determine if the data (equipment, cables, cable runs, and fire areas) used in the software program credited for safe shutdown fire analysis were accurate and the design control measures were established to manage the as-constructed safe shutdown fire analysis. In addition, the inspectors discussed with the fire protection engineer the safe shutdown design strategy for the planned use of manual actions to satisfy the Appendix R requirements for the steam generator hi-hi level protection and the level control system; and
- Reviewed the TVA quality assurance audit of the fire protection engineering contractor Engineering Planning, and Management, Incorporated, (EPM), to verify that TVA had evaluated the design controls for the contractor responsible for the safe shutdown analysis, and verified compliance with applicable sections of 10 CFR Part 50, Appendix B, requirements.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The design methodology to address the Appendix R commitments and the as-designed cable routing changes were correctly incorporated into the safe shutdown analysis calculations, the ICRDS database, and met the Appendix R requirements. The steam generator hi-hi level protection and the level control system routing met the fire protection requirements as-designed although, the applicant did not meet the separation criteria for the level instrumentation. The applicant's design includes the strategy to credit manual actions for stopping the auxiliary feedwater pumps to satisfy Appendix R requirements. The motor-driven auxiliary feedwater pumps were designed to stop from the motor control board (MCB) using their respective switches. The turbine-driven auxiliary feedwater pump was designed to stop by closing one of three in-series valves to isolate steam, Valves 2-FCV-1-17-A, or 2-FCV-1-18-B, or 2-FCV-1-52. The as-designed safe shutdown analysis accurately identified the cabling, routing, and fire areas for the listed valves. Additional inspection activities are required prior to closure of CDR 391/84-35. The inspectors will inspect a sample of the Appendix R as-built cable routing, to verify the as-built configuration meets the Appendix R requirements. In addition, the inspectors will review the approved manual action procedures associated with the steam generator hi-hi-level protection.

.09 (Discussed) Construction Deficiency Report 391/87-14: Sleeve-Sealing Program Deficiencies (IP 35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on May 27, 1987, as a Significant Conditions Report (SCR) WBN WBP 8780 for Unit 1 and WBN WBP 8781 for Unit 2 in accordance with 10 CFR 50.55(e). The issue was documented as CDR WBRD 50-390/87-13 for Unit 1 and WBRD 50-391/87-14 for Unit 2.

The CDR concerned the deficiencies in the TVA sleeve-sealing program for seismic category 1 buildings. TVA concluded that the root cause of the deficiency resulted from the fact that the sleeve seals were not being considered as a system. As such, no design criteria for the sleeve seal requirements were issued. This deficiency prevented TVA from demonstrating that the sleeve seals in seismic category 1 buildings would perform as per their intended design. This included a potential failure to maintain the integrity of fire and flooding barriers, along with the potential loss of water inventory during containment spray recirculation or the release of radioactive contaminants in excess of the 10 CFR 100.11 limits; all of which could negatively impact the ability to safely operate the plant.

On August 9, 1989, TVA submitted a final report to the NRC to address sleeve sealing deficiency, WBRD50-390/87-13, which committed TVA to taking a number of corrective actions to address this issue, including:

- Perform a walkdown of mechanical pipe sleeves in category 1 structures;
- Develop an Engineering Requirement (ER) Specification, ER-WBN-MEB-013, "Installation, Modification, and Maintenance of Penetration Seals" that will identify the requirements and limits of sleeve seal materials;

- Conduct tests to determine the capabilities and limits of sleeve seal materials;
- Repair or replace any sleeve seals found to be deficient; and
- Revise engineering drawings to add all new sleeve seal designs and/or correct any drawing errors.

For Unit 1, TVA issued Design Criteria WB-DC-40-66, "Penetration Assemblies and Seals for Category 1 Structures," and Technical Instruction TI-94.1, "Walkdown-Mechanical Sleeves and Seals." On July 18, 1995, the NRC issued Inspection Report 50-390/95-39 (ADAMS Accession No. ML072680875), which closed the Unit 1 mechanical pipe penetration seal issue. This closure was based on the NRC's evaluation of TVA actions, including:

- The issuance of WB-DC-66, TI-94.01, and ER-WBN-MEB-013;
- Conducting a walkdown of all mechanical pipe sleeves in seismic Category 1 structures;
- Obtaining a library of tested configurations from the penetration seal manufacturers for reference by design documents;
- Repairing/replacing all mechanical pipe sleeves found to be deficient; and
- Development of a plan to revise the engineering documents upon completion of all penetration seal rework.

For Unit 2, TVA initiated PER 143783 to address the necessary corrective actions. Limited Scope Walk Down LSWD-1093, dated July 10, 2009 was conducted; whereby the current configuration and condition of all penetrations within the auxiliary building were identified and documented. The results of the LSWD were compared to the design requirements and used to support the development of EDCR 54431. LSWD-1088, dated January 5, 2010, was conducted to identify and document penetrations within the reactor building in support of EDCR 54423.

TVA issued ECN 5761 and ECN 5762 to implement the necessary work requirements for the corrective actions. The ECNs are supported by a series of EDCRs that address not only the necessary corrective actions for this specific PER, but a variety of other identified penetration assembly issues. The corrective actions associated with mechanical seal requirements were addressed by EDCR 54423 and EDCR 54431, along with the results of LSWD-1088 and LSWD-1093. TVA issued EDCR-2 59512, using the results of LSWD-482, for the electrical penetration sealing requirements.

Remaining Unit 2 Actions:

- Complete WOs associated with EDCR 54423, EDCR 54431, and EDCR-2 59512.

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

- Reviewed PER 143783 to verify information regarding the requirements for the TVA to design and install penetration seal assemblies for the various fire-rated barriers;
- Reviewed EDCR 54431, Rev. A, and EDCR 54423, Rev. A, including associated FCR's and DRA's, to verify that the intended work scopes for the various penetration seal assemblies are appropriate and adequate to ensure the continued integrity of all Unit 2 fire barriers as required by 10 CFR Part 50, Appendix R;
- Reviewed Limited Scope Walk Down (LSWD) 1093 regarding information on the configurations of the penetration seals for Unit 2 auxiliary building;
- Reviewed Limited Scope Walk Down (LSWD) 1088 regarding information on the configurations of the penetration seals for Unit 2 reactor building;

- Reviewed TVA drawing series 47W470 and 47W471 to verify penetration sleeve locations;
- Reviewed TVA drawing series 47A472 to assess specific penetration seal designs; and
- Reviewed Safety Evaluation Report, Supplement 19 (SSER 19), Appendix FF, to verify that the proposed designs for the various penetration seals were adequate to support the requirements of 10 CFR Part 50, Appendix R.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Limited scope walkdowns were used to identify and document the specific configurations of all fire barrier penetration seals associated with the seismic Category 1 structures for Unit 2. Based on a review of the EDCRs, including the LSWD results, that addressed the documenting, evaluation, and design of all the mechanical penetration seal assemblies in the fire-rated barriers installed in the Unit 2 seismic Category 1 structures, the TVA design process appears adequate to ensure the future integrity of these fire barriers are maintained. Additional inspection activities are required prior to closure of CDR 391/87-14. The inspectors will inspect a sample of the penetration seal installations to verify the as-built configuration meets the design requirements and design controls are implemented to control field changes.

.10 (Discussed) Construction Deficiency Report 391/85-18: Fire Rated Penetration Assemblies Deficiencies (IP 35007)

a. Inspection Scope

Background: The deficiency was initially reported to the NRC on June 25, 1985, as NCR W-235-P in accordance with 10 CFR 50.55(e). The issue was documented as CDR WBRD 50-390/85-19 for Unit 1 and WBRD 50-391/85-18 for Unit 2.

The CDR concerned the breaching of various penetrations in fire rated barriers without proper or adequate ties to the necessary controls and guidance regarding their breaching. TVA concluded that the deficiency resulted from a lack of proper construction procedures that stated the methods for breaching penetrations and replacing fire stop assemblies and the documentation of such activities was also inadequate. This deficiency had the potential to result in a situation where a fire could be allowed to propagate from one compartment to another or facilitate the spread of the products of combustion. This could negatively impact the ability to achieve and maintain the safe shutdown of the plant in the event of a fire.

Identified during a walkdown by TVA personnel, several fire-rated penetration assemblies were found to be deficient in the actual installed configuration. Examples of the identified deficient conditions included: 1) penetrations that were breached without proper ties to work requirements for breaching such penetrations, 2) electrical penetrations and fire-stop assemblies were not sealed in accordance with TVA design drawings, and 3) TVA design drawings did not reflect the latest compartment information.

For Unit 1, TVA revised its breaching procedures and updated all compartment drawings to ensure that all rated penetrations are properly identified and procedures are in place and referenced by work orders to provide adequate guidance on the breaching and repairing of rated penetration assemblies. On October 11, 1991 the TVA provided a supplement to revised final report to CDR 50-390/85-19 that outlined the newly implemented administrative procedures for controlling breaches of rated barriers. On November 17, 1995, the NRC issued Inspection Report 50-390/95-72 which closed CDR 50-390/85-19 based on a review of the revised breaching procedures and compartmental drawings and inspection of selected penetration seal assemblies.

For Unit 2, TVA initiated PER 172776 to address the necessary corrective actions. TVA issued ECN 5761 and ECN 5762 to implement the necessary work requirements for the corrective actions. The ECNs are supported by a series of EDCRs that address not only the necessary corrective actions for this specific PER, but a variety of other identified penetration assembly issues. The corrective actions associated with mechanical seal requirements are addressed by EDCR 54423 and EDCR 54431, along with the results of LSWD-1088 and LSWD-1093. TVA issued EDCR-2 59512, using the results of LSWD-482, for the electrical penetration sealing requirements.

TVA issued NPG-SPP-18.4.6, "Control of Fire Protection Impairments", which is an update to the previous procedure that controls the fire protection breaching program.

Remaining Unit 2 Actions:

- Complete WOs associated with EDCR 54423, EDCR 54431, and EDCR-2 59512.

Inspection Activities:

To address Unit 2 actions the inspectors performed the following:

- Reviewed PER 172776 to verify information regarding the requirements for the TVA to design and install penetration assemblies for the various fire-rated barriers;
- Reviewed EDCR 54431, Rev. A, EDCR 54423, Rev. A, and EDCR-2, Rev. A, including associated FCR's and DRA's, to verify that the intended work scopes for the various penetration assemblies were appropriate and adequate to ensure the continued integrity of all Unit fire barriers are maintained as required by 10 CFR Part 50, Appendix R;
- Reviewed Completed Work Orders 111148448 and 113966405; associated with EDCR 54423 and EDCR-2 59512, respectively, to verify the procedures used to design, install, and qualify the various penetration seal assemblies;
- Reviewed TVA drawing series 47A472 to assess specific penetration seal designs;
- Reviewed DCN No. D-51255 that addresses modifications to Door A-36, which was one of the penetration assemblies identified in the original CDR, to verify that all station procedures were properly followed;
- Reviewed the completed annual Fire Door Operation Test check sheets, 0-FOR-410-2, Rev. 9, for the years 2010 and 2012 to verify that all fire door assemblies were being properly and regularly inspected and maintained;
- Reviewed recent sample Fire Protection Impairment Permit No.'s C13-0272 and C13-0658 to verify that work orders involving the need to breach fire barriers were properly implementing and following all appropriate station procedures; and

- Reviewed Safety Evaluation Report, Supplement 19 (SSER 19), Appendix FF, to verify that the proposed designs for the various penetration seals were adequate to support the requirements of 10 CFR Part 50, Appendix R.

Documents reviewed for this inspection are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

Limited scope walkdowns have been used to identify and document the specific configurations of all fire barrier penetration assemblies associated with the Unit 2 design. The current procedures and processes used to control the breaching and repair of all penetration assemblies in fire-rated barriers appear to be adequate and are being properly implemented by TVA. Based on a review of the EDCRs that are addressing the review and any as-needed repairs for all penetration assemblies in the Unit 2 fire barriers, the TVA process to ensure the integrity of all fire barriers are properly maintained appears adequate. Additional inspection activities are required prior to closure of CDR 391/87-14. The inspectors will inspect a sample of the penetration seal installations to verify the as-built configuration meets the design requirements and design controls are implemented to control field changes.

4OA6 Meetings, Including Exit

On September 27, 2013, the lead inspector presented the preliminary inspection results to Mr. Cleary, WBN Site Vice President, and other members of the licensee's staff, who acknowledged the results. Following completion of additional reviews in the Region II office, conference calls were held with Mr. Morgan on October 21, 2013 and November 4, 2013, to provide an update on changes to the preliminary inspection findings. The licensee acknowledged the findings. Proprietary information is not included in this inspection report.

4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which meets the criteria of the NRC Enforcement Policy, for being dispositioned as a Non-Cited Violation.

Watts Bar Operating License Condition 2.F requires that the licensee shall implement and maintain in effect all provisions of the approved fire protection program, as described in the Fire Protection Report for Watts Bar Unit 1, as approved in Supplements 18 and 19 of the SER (NUREG-0847). License Condition 2.F further states that the licensee may make changes to the approved fire protection program without prior NRC approval, only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

Contrary to the above, on July 18, 2012, the licensee identified that the site failed to meet the requirements of Watts Bar OLC 2.F, and the approved FPP, in that, an evaluation performed for a change made to the approved FPP was not adequate to ensure that the change would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. Specifically, new OMAs that were added by DCN 52033 did not include all necessary heat loads on the component cooling system. The licensee initiated PER 787426 to address this issue.

The finding was screened in accordance with NRC IMC 0609, "Significance Determination Process," dated June 2, 2011, Attachment 4, "Initial Characterization of Findings," dated June 19, 2012, which determined that, an IMC 0609, Appendix F, "Fire Protection Significance Determination Process," dated September 20, 2013, review was required. The issue was determined to be of very low safety significance (Green) because, despite the performance deficiency, the reactor would be able to reach and maintain safe shutdown conditions (Step 1.3.A of IMC 0609, App. F, Attachment 1).

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

T. Cleary, WBN Site Vice President
D. Guinn, Site Licensing Manager
J. Shea, Corporate Licensing
J. Sterchi, Fire Marshall
C. Brush, Appendix R Consultant
B. Simiril, Corporate Fire Protection
R. Egli, Corporate Fire Protection
J. Gore, Corporate PRA
J. Ricks, WBN Design Engineer – Electrical
E. Haston, WBN Design Engineer – Fire Protection
S. Rymer, WBN Design Engineer
E. Lisi, Fire Operations Lead
J. O'Dell, WBN Licensing
T. Morgan, WBN Licensing
H. Baldner, WBN Licensing
J. Bushnell, WBN Licensing
B. Hunt, WBN Operations
S. Hilmes, WBN Engineering – Electrical
B. Crouch, WBN Engineering

NRC Personnel

W. Monk, Senior Resident Inspector, WBN Unit 1
K. Miller, Resident Inspector, Watts Bar Nuclear, Unit 1
T. Nazario, Senior Resident Inspector, WBN Unit 2
M. King, Chief, Engineering Branch 2, Division of Reactor Safety, Region II

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Opened and Closed

05000390/2013008-01	NCV	Failure to Validate Appendix R Abnormal Operating Instructions in accordance with Station Procedures (Section 1R05.01)
05000390/2013008-02	NCV	Inadequate Compensatory Actions to Minimize the Effects of Impaired Fire Protection Equipment on Fire Safe Shutdown. (Section 1R05.10)

Closed

05000390/2010007-01	URI	Use of OMAs Potentially Not Consistent with the Fire Protection Licensing Basis (Section 4OA5.A.01)
05000390/2010007-03	URI	Questions Related to OMA to Establish RCP Seal Cooling in the Event of a Fire in AV-076, Computer Room (Section 4OA5.A.02)

Discussed

2006-03	GL	Potentially nonconforming HEMYC and MT fire barrier configurations (Section 4OA5.B.01)
1992-01	BL	Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Small Conduits Free from Fire Damage; Bulletin 1992-01 (Supplement 1): Failure of Thermo-Lag 330 Fire Barrier System to Perform Its Specified Fire Endurance Function; Generic Letter 1992-08: Thermo-Lag 330-1 Fire Barriers (Section 4OA5.B.02)
391/81-88	CDR	Fire Prevention Spray Protection for Oil Lift Assembly and Upper Bearing Cooler (Section 4OA5.B.03)

391/82-04	CDR	Foam Seals in Mechanical Pipe Sleeves (Section 4OA5.B.04)
391/84-34	CDR	Spurious Valve Operation due to Fire Damage (Section 4OA5.B.05)
50-391/83-61	CDR	Failure to Provide Self Contained Lights as Committed to the NRC (Section 4OA5.B.06)
391/84-44	CDR	Reactor coolant pump oil drain does not meet Appendix R requirement (Section 4OA5.B.07)
391/84-35	CDR	Unacceptable Electrical Cable Separation (Section 4OA5.B.08)
391/87-14	CDR	Sleeve-Sealing Program Deficiencies (Section 4OA5.B.09)
391/85-18	CDR	Fire Rated Penetration Assemblies Deficiencies (Section 4OA5.B.10)

LIST OF FIRE BARRIER FEATURES INSPECTED
(Refer Report Section 1RO5.02- Passive Fire Barriers)

Fire Barriers Floors/Walls/Ceiling Identification

Reinforced Concrete Walls, Floors & Ceiling
 Reinforced Concrete Walls, Floors & Ceiling
 Reinforced Concrete Walls, Floors & Ceiling
 0-SLV-304-A1694AM
 0-SLV-304-A2204AM
 0-SLV-304-A8222
 0-SLV-304-A8166
 0-SLV-304-A8172A
 0-SLV-304-A8173A

Description

Cable Spreading Rm., FA 48
 CRDM & PZR Htr. Tx. Rm., FA 25
 6.9KV & 480V Bd. Rm. 1A, FA 17
 Pipe Penetration, FA 17
 Pipe Penetration, FA 17
 Conduit Penetration, FA 17
 Conduit Penetration, FA 17
 Cable Tray Penetration, FA 17
 Cable Tray Penetration, FA 17

Fire Door Identification

A171
 A193
 A197

Description

6.9KV & 480V Bd. Rm. 1A, FA 17
 6.9KV & 480V Bd. Rm. 1A, FA 17
 6.9KV & 480V Bd. Rm. 1A, FA 17

Fire Damper Identification

0-IDS-31-2671
 0-IDS-31-2733
 0-IDS-31-4620
 0-IDS-31-4621

Description

6.9KV & 480V Bd. Rm. 1A, FA 17
 6.9KV & 480V Bd. Rm. 1A, FA 17
 6.9KV & 480V Bd. Rm. 1A, FA 17
 6.9KV & 480V Bd. Rm. 1A, FA 17

LIST OF COMPONENTS REVIEWED

(Refer to Report Sections 1R05.01 / 1R05.03 / 1R05.05 / 1R05.06)

1-FI-67-62, ERCW Supply Header Flow Train B Channel
2-FI-67-62, ERCW Supply Header Flow Train B Channel
1-PCV-68-334A, Pressurizer PORV
1-LI-63-50, RWST Level Indicator
1-MTR-26-1-A, HP Electric Driven Fire Pump 1A-A
1-MTR-26-11-B, HP Electric Driven Fire Pump 2B-B
1-FCV-3-33-A, SG#1 Main Feedwater Isolation Valve
1-FCV-3-236, SG#1 Main Feedwater Bypass Isolation Valve

LIST OF DOCUMENTS REVIEWED

Procedures

0-FOR-13-614, 6 Month Fire Detection Test Panel L614, Rev. 0013
 0-FOR-26-12A, Monthly Fire Pump 1A-A Test Run, Rev. 0014
 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification, Rev. 0018
 0-FOR-26-22, Diesel Fire Pump Fuel Oil Quality Check, Rev. 0007
 0-FOR-26-25, 18-Month Diesel Driven Fire Pump Capability Test, Rev. 0013
 0-FPS-510-SMOKE, Inventory of Smoke Removal Equipment, Rev. 6
 0-SI-18-1, Monthly Sampling of 7 Day Fuel Oil Storage Tanks, Rev. 15
 0-SI-18-2, Sampling of Fuel Oil Prior to Transfer to 7 Day Fuel Oil Storage Tanks, Rev. 14
 0-TRI-0-1, 18 Month Periodic Testing of Molded Case Circuit Breakers Protecting 1E Busses from Non-1E Loads and Associated Circuits, Rev. 17
 1-AOI-30.1, Plant Fires, Rev. 0
 1-AOI-30.2 Appendix B, Fire Safe Shutdown Elevation Diagrams, Rev. 0
 1-AOI-30.2 C.1, Fire Safe Shutdown Room 782-A1 or 782-A2, Rev. 0
 1-AOI-30.2 C.20, Fire Safe Shutdown Room 757-A2 or 757-A9, Rev. 1
 1-AOI-30.2 C.69, Fire Safe Shutdown Control Building, Rev. 1
 1-AOI-30.2, Appendix E- Fire Safe Shutdown Energizing Credited Equipment and Instrumentation, Rev. 0
 1-AOI-30.2, Fire Safe Shutdown, Rev. 2
 1-SI-0-53.2-A, 18 Month remote Shutdown Transfer Switch Verification Outage Performance-Train A, Rev. 2
 1-SI-0-53.2-B, 18 Month Remote Shutdown Transfer Switch Verification Outage Performance-Train B, Rev. 2
 1-TRI-211-3, Calibration and Functional Tests on 6900V Shutdown Board 1A-A Normal Supply Breaker Protective Relays, Rev. 9
 1-TRI-211-4, Calibration and Functional Tests on 6900V Shutdown Board 1B-B Normal Supply Breaker Protective Relays, Rev. 10
 EDMG-2, Serious Event Mitigation, Rev. 4
 FPI-0131, Smoke Removal, Rev.3
 MI-0.047, Appendix R Safe Shutdown Repairs, Rev. 3
 MI-17.018, Flood Preparation High Pressure Fire Protection System Spool Pieces, Rev. 14
 MMTP-102, Erection of Scaffolds / Temporary Work Platforms & Ladders, Rev.08
 NPG-SDP-FPDP-1, Conduct of Fire Protection, Rev.0003
 NPG-SPP-03.6, Fire Protection Program Change Regulatory Reviews, Rev. 0002
 NPG-SPP-07.6, NPG Work Control Planning Procedure, Rev. 0005
 NPG-SPP-18.4.4, Control of Ignition Sources, Rev. 0001
 NPG-SPP-18.4.5, Fire Protection Quality Assurance, Rev. 0000
 NPG-SPP-18.4.6, Control of Fire Protection Impairments, Rev. 0002
 NPG-SPP-18.4.7, Control of Transient Combustibles, Rev. 0003
 OPDP-7, Fuse Control, Rev. 5
 SOI-100.01, Communications Systems, Rev. 25
 SOI-26.01, High Pressure Fire Protection System, Rev.0027
 TI-109, Breaker Testing and Maintenance Program, Rev. 9
 TI-12.04, User's Guide for Abnormal and Emergency Operating Instructions, Rev. 13
 TI-12.19, Control of Time Critical Operator Actions, Rev. 6
 TI-2018, Appendix R Walkdown of Manually Operated Components Required Following a Fire, Rev. 3
 TI-211, Fire Protection, Rev. 0006

Calculations, Evaluations, & Specifications

3C38-1086-001, Moderate Energy Line Break Flood Level Calculations, rev. 1
 CDQ00029220120000001, Design and Evaluation of Appendix R Conduit and Supports at Platform 728ft for Thermo Lag, Conduit 2PLC582A and 2PLC583A, Rev. 0
 CDQ0002922013000187, Design and Evaluation of Appendix R Supports for Fire Zone 737-A12 Thermo Lag, Conduit 2PLC5137A, 2PLC138A, and 2PLC5164, Rev. 0
 Drawing 1-45A897-1, Manual Actions Required for Safe Shutdown Following a Fire – 10CFR50 Appendix R, Rev. 1
 E31850221300, 6.9-kV Shutdown Boards Normal and Alternate Feeders, Rev. 4
 EDQ00099920090012, “Unit 1 and Unit 2 Appendix R Safe Shutdown Analysis”, Rev.2
 EDQ00099920090016, “Appendix R – Unit 1 & 2 Manual Action Requirements”, Rev. 0
 EDQ002999200800002, Unit 2 Class 1E V4 Cable Ampacity, Rev. 22
 EPMAS031895, HPFP System Water Supply to the Auxiliary Building Pre-action Sprinkler System, Rev. 4
 EPM-DOM-012990, Combustible Load Summary, WBN Auxiliary Building, Room A802
 EPM-DOM-012990, Combustible Load Summary, WBN Auxiliary Building, Room A809
 EPM-DOM-012990, Combustible Load Summary, WBN Auxiliary Building, Room A901
 EPM-DOM-012990, Combustible Load Summary, WBN Auxiliary Building, Room A902
 EPM-DOM-012990, Combustible Load Summary, WBN Auxiliary Building, Room C301
 EPMOED606392, Summation of the Raw Service Water Loads, Rev. 07
 EPMRCT-072792, MEB WBN-26 Multi-flow Hydraulic Model, Rev.4
 General Engineering Specification G-98, Installation, Modification and Maintenance of Electrical Raceway Fire Barrier Systems, Rev. 8
 WBMEEBMSTI08008, 480V 1E Coordination/Protection, Rev. 152
 WBNOSG4031, Equipment Required For Safe Shutdown per 10 CFR 50 Appendix R, Rev. 47
 WBNOSG4031, Equipment Required for Safe Shutdown per 10CFR50 Appendix R, Rev. 48
 WBNOSG4099, Moderate Energy Line Break Flooding Study, Rev. 14
 WBN-OSG4-165, Manual Actions Required for Safe Shutdown Following a Fire – 10CFR50 Appendix R, dated 06/29/1993
 WBPEVAR9004001, Appendix R- Cables Required for Safe Shutdown Following a Fire, Rev. 43
 WBPEVAR9205004, Appendix R Analysis for Intraplant Communication Systems, Rev. 4
 WGC11876, Examination & Documentation of Architectural Doors, Rev. 0

Work Orders

08-817942-000, UPS VHF Distribution Panel Inspection and Battery Replacement PMUG 2838F, dated 2/10/10
 10-815769-000, 18 Month Remote Shutdown Transfer Switch Verification Outage Performance-Train A, dated 5/14/11
 10-815901-000, 18 Month Remote Shutdown Transfer Switch Verification Outage Performance-Train B, dated 5/12/11
 112678464, 18 Month Remote Shutdown Transfer Switch Verification Outage Performance-Train A, dated 10/19/12
 112678504, 18 Month Remote Shutdown Transfer Switch Verification Outage Performance-Train B, 10/20/12
 113650958, NSS HI Band Repeater Calibration and Functional Test PMUG 0045W, dated 1/28/13
 113651660, F4 Repeater Ann Test PMUG 0044W, dated 1/23/13
 113651662, F3 Repeater Ann Test PMUG 0043W, dated 1/18/13

113651665, F2 Repeater Ann Test PMUG 0042W, dated 1/28/13
 WO03829100, 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification
 WO-06-814951-000, 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification
 WO-09-816133-000, 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification
 WO11115694, 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification
 WO112040733, 0-FOR-26-25, 18-Month Diesel Driven Fire Pump Capability Test
 WO112381858, Install New Cable and Reseal of Penetration in 6.9kv Shutdown Board 2A-A
 WO113229714, 0-FOR-13-614, 6 Month Fire Detection Test Panel L614
 WO113447366, 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification
 WO114127043, 0-FOR-13-614, 6 Month Fire Detection Test Panel L614
 WO114394000, 0-FOR-26-12A, Monthly Fire Pump 1A-A Test Run
 WO114411876, 0-FOR-26-22, Diesel Fire Pump Fuel Oil Quality Check, 8/14/13
 WO114435487, 0-FOR-26-2, 3-Year HPFP Hydraulic Performance Verification

Drawings

1-15E500-1, Key Diagram Station Aux Power System, Rev. 37
 1-15E500-2, Key Diagram Station Aux Power System, Rev. 45
 1-45B1767-3D, Wiring Diagrams 480V Reactor MOV Board 1A2-A Connection Diagram- Compt 3D, Rev. 9
 1-45B1769-4D, Wiring Diagrams 480V Reactor MOV Board 1B2-B Connection Diagram- Compt 4D, Rev. 10
 1-45N1630-43, Wiring Diagrams Miscellaneous Valves Connection Diagrams- Sheet 42, Rev. 11
 1-45N1630-87, Wiring Diagrams Miscellaneous Valves Connection Diagrams Sheet 87, Rev. 1
 1-45N1643-4, Wiring Diagram, Unit Control Board Panel 1-M-4 Connection Diagram Sheet 4, Rev. 14
 1-45N1643-9, Wiring Diagrams Unit Control Board Panel 1-M-4 Connection Diagrams Sheet 9, Rev. 19
 1-45N1680-4, Wiring Diagrams Separation Aux Relay PNL 1-R-74 Connection Diagrams Sheet 4, Rev. 15
 1-45N1688-4, Wiring Diagrams Separation Aux Relay Panel 1-R-73 Connection Diagram Sheet 4, Rev. 22
 1-45N1689-4, Wiring Diagrams Separation Aux Relay PNL 1-R-74 Connection Diagrams- Sheet 4, Rev. 15
 1-45N1689-4, Wiring Diagrams, Separation Aux Relay PNL 1-R-74 Connection Diagram Sheet 4, Rev. 16
 1-45N1692-4, Wiring Diagrams Separation Aux Relay PNL 1-R-77 Connection Diagram Sheet 4, Rev. 18
 1-45N1693-4, Wiring Diagrams Separation Aux Relay PNL 1-R-78 Connection Diagrams Sheet 4, Rev. 20
 1-45W1769-4, Wiring Diagrams 480V Reactor MOV Board 1B2-B Connection Diagram, Rev. 17
 1-45W600-3-12, Wiring Diagrams Main & Auxiliary Feedwater System Schematic Diagram, Rev. 6
 1-45W600-3-2, Wiring Diagrams Main & Auxiliary Feedwater System Schematic Diagram, Rev. 12
 1-45W600-3-3, Wiring Diagrams Main & Auxiliary Feedwater System Schematic Diagram, Rev. 12
 1-45W724-1, Wiring Diagrams 6900V Shutdown Board 1A-A Single Line, Rev. 27
 1-45W724-3, Wiring Diagrams 6900V Shutdown Board 2A-A Single Line, Rev. 25
 1-45W724-4, Wiring Diagrams 6900V Shutdown Board 2B-B Single Line, Rev. 23

1-45W755-2, Wiring Diagrams 480V Reactor Vent BD 1A-A Single Line Sheet 2, Rev. 50
 1-45W755-3, Wiring Diagrams 480V Reactor Vent BD 1B-B Single Line Sheet 2, Rev. 43
 1-45W760-200-1, Wiring Diagrams 6900V Start Boards Schematic Diagram, Rev. 4
 1-45W760-211-1, Wiring Diagram 6900V Shutdown Power Schematic Diagram, Rev. 18
 1-45W760-211-18, Wiring Diagram 6900V Shutdown Power Schematic Diagram, Rev. 5
 1-45W760-26-1, Block Diagram Fire Protection, Sheet 1, Station Fire Pump 1A-A, Rev. 11
 1-45W760-26-1, Block Diagram Fire Protection, Sheet 4, Station Fire Pump 2B-B, Rev.11
 1-45W760-26-1, Wiring Diagram High Pressure Fire Protection System Schematic Diagram, Rev. 27
 1-45W760-26-3, Wiring Diagram High Pressure Fire Protection System Schematic Diagram, Rev. 8
 1-45W760-26-4, Wiring Diagram, High Pressure Fire Protection System, Schematic Diagram
 1-45W760-31-12, Wiring Diagrams Air Conditioning System Schematic Diagrams, Rev. 18
 1-45W800-3-4, Wiring Diagrams Main & Auxiliary Feedwater System Schematic Diagram, Rev. 11
 1-47W610-26-11, Electrical Control Diagram, High Pressure Fire Protection System, Rev.3
 1-47W610-26-2, Electrical Control Diagram, High Pressure Fire Protection System, Rev.23
 1-47W611-26-1, Electrical Logic Diagram, High Pressure Fire Protection, Rev.20
 1-47W611-3-5, Electrical Logic Diagram Feedwater System, Rev. 8
 1-47W611-3-6, Electrical Logic Diagram System, Rev. 20
 1-47W611-3-8, Electrical Logic Diagram Feedwater System, Rev. 3
 1-47W611-68-1, Electrical Logic Diagram Reactor Coolant System, Rev. 10
 1-47W611-68-2, Electrical Logic Diagram Reactor Coolant System, Rev. 7
 1-47W611-68-3, Electrical Diagram Reactor Coolant System, Rev. 8
 1-47W803-2, Flow Diagram Auxiliary Feedwater, Rev. 59
 1-47W809-1, Flow Diagram Chemical & Volume Control System, Rev. 64
 1-47W810-1, Flow Diagram Residual Heat Removal System, Rev. 19
 1-47W811-1, Flow Diagram Safety Injection System, Rev. 56
 1-47W832-1, Unit 1 & 2, Flow Diagram, Raw Service Water and Fire Protection System, Rev. 39
 1-47W843-1 Unit 1 & 2, Flow Diagram CO2 Storage, Fire Protection & Purging System, Rev. 20
 2-47W240-1, "Fire Protection Compartmentation-Fire Cells Plan EL 692.0," Rev. 2
 2-47W240-2, "Fire Protection Compartmentation-Fire Cells Plan EL 708.0 & 713.0,' Rev. 3
 2-47W240-3, "Fire Protection Compartmentation-Fire Cells Plan EL 729.0 & 737.0," Rev. 2
 45N824-11, "Conduit & Grounding EL 713 – Cols A11-A15, U-W Ceiling Plan and Details," Rev. 43
 45N824-16, "Conduit & Grounding EL 713.0 Details," Rev. 19
 45N824-8, "Conduit & Grounding EL 713 Cols A8-A15, Q-V Ceiling Plan and Details," Rev. 40
 45W3000-1 Cable/Wiring Separation Requirements Notes, Rev. 1
 45W812-3, "Conduit & Grounding Floor EL 708.0 Details," Rev. 15
 45W812-6, "Conduit & Grounding Floor Plan EL 708.0 Details," Rev. 27
 45W814-13, "Part Plan Detail A13," Rev. 30
 45W814-2, "Conduit & Grounding Floor Plan,"Rev.32
 45W816-1, "Floor Plan-EL 755.0 Unit 2," Rev. 36
 45W816-2 "Ceiling Plan EL 755.0 Unit 2," Rev. 40
 45W824-28, "Conduit & Grounding Floor EL 713.0 Details," Rev. 23
 45W826-11, "Conduit & Grounding Ceiling Plans EL 729.0 & 737.0," Rev. 34
 45W826-4, "Conduit & Grounding EL 729.0 & 737.0 – Cols A8-A15, U-W Floor Plan and Details," Rev. 35
 45W826-9, "Ceiling Plan EL 737.0," Rev. 53
 45W828-2, "Floor Plan EL 757.0," Rev. 24

45W828-6, Conduit & Grounding EL 757.0- Cols A1-A8, Q-U Ceiling Plan & Details, Rev. 43
 45W828-7, "Conduit & Grounding Floor Plan," Rev. 40
 45W874-4, "Conduit & Grounding Annuls Details Sheet 2," Rev. 31
 45W874-5, "Conduit & Grounding Annuls Details Sheet 3," Rev. 24
 45W886-14, Conduit & Grounding Cable Tray Node Diagrams EL741.0, NV-3A, NV-3B, NV-3, NV-2, NV-1, Rev. 4
 45W886-2, "Conduit & Grounding Cable Tray Node Diagrams EL708.0 NV-3, NV-3A, NV-3B, NV-2F," Rev. 13
 45W886-3, "Conduit & Grounding Cable Tray Node Diagrams EL708.0 NV-2, NV-2E," Rev. 15
 45W886-7, Conduit & Grounding Cable Tray Node Diagrams EL 729.0 NV-3, Rev. 9
 45W888-37, Conduit & Grounding Cable Tray Node Diagram, EL 737.0 Col A1-A8, Q-U-NV-3, NV-2, and Rev. 13
 45W888-38, Conduit & Grounding Cable Tray Node Diagram, EL 737.0 Col A8-A15, Q-U-NV-3, and Rev. 2
 46W454-7, Powerhouse & Auxiliary Building, Architectural Door & Hardware Schedule, Rev. 39
 46W454-8, Powerhouse & Auxiliary Building, Architectural Door & Hardware Schedule, Rev. 39
 47VD491-15, Valve Data Sheet, Auxiliary Building Fire Protection, Piping Bill of Material, Rev. 0
 47VD491-4, Valve Data Sheet, Auxiliary Building Fire Protection, Piping Bill of Material, Rev. 0
 47VD491-9, Valve Data Sheet, Auxiliary Building Fire Protection, Piping Bill of Material, Rev. 0
 47W240-4, Plan Elevation 755.0 & 757.0, Rev. 10
 47W240-5, Plan Elevation 772.0 & 782.0, and 786.0, Rev. 9
 47W240-7, Plan Elevation 729.0 & 755.0, Rev. 8
 47W491-100, U1 Mechanical Upper Level Spreading Room Fire Protection, Rev. 0
 47W491-101, U2, Mechanical Upper Level Spreading Room Fire Protection, Rev. 0
 47W491-23, U1 Powerhouse & Control Building, Mechanical Fire Protection, Rev. 09
 47W491-24, U1 Powerhouse & Control Building, Mechanical Fire Protection, Rev. 14
 47W491-25, U1 Powerhouse & Control Building, Mechanical Fire Protection, Rev. 11
 47W491-26, U1 Powerhouse & Control Building, Mechanical Fire Protection, Rev. 14
 47W491-36, U1 Powerhouse & Auxiliary Building, Mechanical Fire Protection, Rev. 11
 47W491-39, U1 & U2, Powerhouse & Auxiliary Building, Mechanical Fire Protection, Rev. 13
 47W491-41, U1 & U2, Powerhouse & Auxiliary Building Mechanical Fire Protection, Rev. 10
 47W491-41, U1 & U2, Powerhouse & Auxiliary Building Mechanical Fire Protection, Rev. 10
 47W491-82, U1 Powerhouse & Control Building, Mechanical Fire Protection, Rev. 1
 47W491-88, U1 Powerhouse & Control Building, Mechanical Fire Protection, Rev. 11
 47W491-98, U1 Mechanical Lower Level Spreading Room Fire Protection, Rev. 0
 47W491-99, U2 Mechanical Lower Level Spreading Room Fire Protection, Rev. 0
 47W850-1, Auxiliary Building Unit 1 & 2, Flow Diagram, Fire Protection & Raw Service Water, Rev. 27
 47W850-13, Power House Unit 1 & 2, Flow Diagram, Fire Protection, Rev. 13
 47W850-2, Auxiliary Building Unit 1 & 2, Flow Diagram, Fire Protection & Raw Service Water, Rev. 35
 47W850-5, Auxiliary Building Unit 1 & 2, Flow Diagram, Fire Protection & Raw Service Water, Rev. 27
 47W850-8, Power House & Control Building, Unit 1 & 2, Flow Diagram, Fire Protection & Raw Service Water, Rev. 19
 47W920-8, Power House & Auxiliary Building, Mechanical, Heating, Ventilation & Air Conditioning, Rev. 41
 48N1250-2, Auxiliary Building Unit 1, Miscellaneous Steel Hatch Frame and Covers, Rev. 6
 48N914-3, "Units 1 & 2 Miscellaneous Steel, Fire Protection, Miscellaneous Protection Covers", Rev. 8

48N914-4, "Units 1 & 2 Miscellaneous Steel, Fire Protection, Miscellaneous Protection Covers", Rev. 7
 48N914-5, "Unit 2 Miscellaneous Steel, Fire Protection, Miscellaneous Protection Covers", Rev. 0
 48W914-1, "Units 1 & 2 Miscellaneous Steel, Fire Protection, Reactor Coolant Pump Hood", Rev. 16
 48W914-2, "Units 1 & 2 Miscellaneous Steel, Fire Protection, RCP Oil Lift Assy Guard", Rev. 17
 48W914-6, "Units 1 & 2 Miscellaneous Steel, Fire Protection, Reactor Coolant Pump Hood", Rev. 4
 55W1393-1, Communications VHF Radio Antenna Distribution System Arrangement and Details, Rev. 5
 Nuclear Electric Insurance Limited (NEIL) General Arrangement Insurance Plan PXX-060, Rev.3
 Rev.10
 SD-E-15.3.4, Raceways, CA & W Identification Tag, Rev. 7

Completed Surveillance Procedures, Test Records

WO 08819014, Inventory of Appendix R Repair Equipment, dated 07/28/2009
 WO 111148448, "CCC EDCR 54423 SYS 304 0-SLV-304-R2S082 (SYS 067 Sleeves)", 21 December, 2010
 WO 111916403, Inventory of Appendix R Repair Equipment, dated 12/06/2011
 WO 114082196, Inspection of 125V DC Emergency Lighting, dated 08/24/2013
 WO113966405, "CCC EDCR 54637 59512 SYS 304 0-SLV-304-A1275AD", 30 October, 2012

Plant Modifications and Engineering Changes

DCN 27986A, Revise Fire Safe Shutdown Manual Action Requirements, dated 09/14/1995
 DCN 54871-A, "Install/Modify Emergency Lighting Required for Two Unit Operation to Comply with 10CFR Appendix R Requirements"
 DCN, 30567B, "Modify Sprinkler System per NFPA 13, 1975 Edition", 12/19/1994
 DCN, M-17638A, "Add Fire Protection Water Curtain", 12/11/1992

Fire Fighting Preplan Strategies

CON-0-729-0I, Control Building, Cable Spreading Room, El. 729.0 & 741.0 Rev. 1
 AUX-0-757-03, Auxiliary Building, 6.9KV & 480V Shutdown Board Rm. 1A, El. 757.0, Rev. 2
 AUX-0-772-02, Auxiliary Bldg., CRDM & Pressurizer Heater Transformer Rm., El. 772.0 Rev. 2

Applicable Codes & Standards

ASTM D-4057-95, Standard Practice for Manual Sampling of Petroleum and Petroleum Products
 NFPA 13, Automatic Sprinkler Systems, 1975
 NFPA 14, Standpipe and Hose Systems, 1974
 NFPA 20, Centrifugal Fire Pumps, 1973
 NFPA 24, Outside Protection, 1973

NFPA 72D, Proprietary Protective Signaling Systems, 1975
 NFPA 72E, Automatic Fire Detectors, 1974
 NFPA 80, Fire Doors and Windows, 1975

Technical Manuals, Vendor Information and Fire Tests

Harris Unity XG-100 Full-Spectrum Multiband Radio
 Harris Unity XG-100P Full-Spectrum Multiband Radio
 Motorola HT 1250 Professional Series Two-way Radio

Audits & Self-Assessments

CRP-ENG-F-08-006, Radio Communications System- Radiax and Nextel, dated 7/14/08
 System Health Report, System 26-High Pressure Fire Protection, 2/1/13 to 5/31/13
 TVA Quality Assurance Nuclear Power Group Watts Bar Nuclear Plant-Fire Protection Audit Report SSA 1214
 Watts Bar Nuclear Plant Quality Assurance-Fire Operations Assessment QAWB 12-012
 System Health Report, System 39-CO2 Fire Suppression, 2/1/13 to 5/31/13
 System Health Report, System 13-Fire Detection, 2/1/13 to 5/31/13

License Basis Documents

UFSAR
 NUREG-0847, Safety Evaluation Report, Supplement 26 (SSER 26), Appendix FF, dated June 2013
 Watts Bar Nuclear Plant Fire Protection Report, Part I, Rev. 10
 Watts Bar Nuclear Plant Fire Protection Report, Part II, Rev. 39
 Watts Bar Nuclear Plant Fire Protection Report, Part III, Rev. 10
 Watts Bar Nuclear Plant Fire Protection Report, Part IV, Rev. 10
 Watts Bar Nuclear Plant Fire Protection Report, Part V, Rev. 10
 Watts Bar Nuclear Plant Fire Protection Report, Part VI, Rev. 27
 Watts Bar Nuclear Plant Fire Protection Report, Part VII, Rev. 20
 Watts Bar Nuclear Plant Safety Evaluation Report Supplement No. 18, October, 1995
 Watts Bar Nuclear Plant Safety Evaluation Report Supplement No. 19, November, 1995
 Watts Bar Nuclear Plant Unit 1 Facility Operating License DFP 90

Other Documents

Day Shift Rosters, dated 07/06/2012, 09/01/2012, 01/13/2013 and 05/26/2013
 DS-E12.6.3, Electrical Design Standard for Auxiliary and Control Power Cable Sizing up to 15,000 Volts, Rev. 10
 EEB-CSTF-0001, Methodology Used as Basis for Cable Ampacities Shown in TVA Electrical Design Standard DS-E12.6.3, Rev. 0
 Fire Watch Route Query, Compensatory Measures Operating Requirements, dated 9/25/13
 ICRDS (Integrated Cable and Raceway Design System), TVAN Version 14.
 ICRDS for Cable 2A5769, Rev. 14
 ICRDS for Cable 2NM386F, Rev. 14
 ICRDS for Cable 2PL4790B, Rev. 14

ICRDS for Cable 2PM1223F, Rev. 14
 ICRDS for Cable 2PM1416E, Rev. 14
 ICRDS for Cable 2V4035A, Rev. 14
 Licensed Operator Roster for AOI-30.1 and 30.2 Classroom Training, dated 09/17/2013
 Log Entry Report-Applicable Out-of-Service Operating Requirements, Diesel Fire Pump (OR 14.2.1) and Detection (OR 14.1.1, 14.3.1) from 9/9/10 to 9/21/13
 MAI-2.2, "Watts Bar Nuclear Plant Unit 0 Modification/Addition Instruction - Mechanical Penetration Seals", Rev. 6, 19 January, 2010
 N3-250-4003, Automatic, Manual, and Public Telephone System- Unit 1/Unit 2, dated 10/20/83
 N3-251-4003, Shutdown Control Center Communications Systems (Sound Powered) Unit 1/Unit 2, dated 10/20/83
 N3-26-4002, System Description for High Pressure Fire Protection System, Rev. 13
 Night Shift Rosters, dated 07/06/2012, 09/01/2012, 01/13/2013 and 05/26/2013
 Non-Licensed Operator Roster for AOI-30.1 and 30.2 Classroom Training, dated 09/17/2013
 PER 786848, Significance Evaluation
 PER 787426, Significance Evaluation
 PER 788016, "NRC Identified – Documentation Error in Unit 2 V4 Ampacity Calculation," 10/2/2013.
 Qualification Matrix Individual Reports, J.E. Tate, 9/17/13
 Qualification Matrix Individual Reports, J.T. Hansen, 9/17/13
 Qualification Matrix Individual Reports, K.S. Allen, 9/17/13
 Qualification Matrix Individual Reports, K.V. Abdullah, 9/17/13
 Qualification Matrix Individual Reports, M.S. Caldwell, 9/17/13
 Qualification Matrix Individual Reports, T.G. Crowe, 9/17/13
 Reverification and Revalidation of Appendix R Manual Operator Actions, C.1 Room 782-A1 or 782-A2, dated 04/20/2009
 Reverification and Revalidation of Appendix R Manual Operator Actions, C.20 Room 757-A2 or 757-A9, dated 09/16/2010
 Reverification and Revalidation of Appendix R Manual Operator Actions, C.69 Control Building, dated 09/16/2010
 SDD-N3-253-4003, VHF Radio and MW Radio System- Unit 1/Unit 2, Rev. 12
 Shift Manager's Daily OR Tracking Log, System Nos. 13, 26, 304 and 410, dated 9/25/13
 Simulator Exercise Guide, Shutdown Board Fire, dated 9/23/2013
 System Description, WBN-SDD-N3-228-4003, Lighting, Rev. 9
 TI-2018, "Appendix R Walkdown of Manually Operate Components Required Following a Fire", Rev. 3
 TVA Fire Drill Evaluation Report, Crew "1", 692' CB, 24V & 48V Battery Room, 3/22/13
 TVA Fire Drill Evaluation Report, Crew "2", 692' CB, 480 Shutdown Board, 3/5/13
 TVA Fire Drill Evaluation Report, Crew "3", 692' CB, 480 Shutdown Board, 3/12/13
 TVA Fire Drill Evaluation Report, Crew "A", 757' AB, 480V Shutdown Board, 6/24/11
 TVA Fire Drill Evaluation Report, Crew "B", 757' AB, 480V Shutdown Board, 6/22/11
 TVA Fire Drill Evaluation Report, Crew "C", 757 AB, U2 Cable Spread Room, 3/17/12
 TVA Fire Drill Evaluation Report, Crew "C", 757' AB, 480V Shutdown Board, 6/25/11
 TVA Fire Drill Evaluation Report, Crew "D", 757 AB, U2 Cable Spread Room, 2/17/12
 TVA Fire Drill Evaluation Report, Crew "C", 757 AB, U2 Cable Spread Room, 2/11/12
 Validation Scenario Sheet, 1-AOI-30.2, C.20
 Validation Scenario Sheet, 1-AOI-30.2, C.69, dated 11/02/2012
 W43110622800 Nuclear Procurement Issues Committee (NUPIC) Joint Audit of Engineering Planning and Management, Inc. – TVA supplier Audit 2011-02/NUPIC Audit 22886, 6/23/2011

WDP-GEN-1, "Watts Bar Unit 2 Construction Completion Project Walkdown Procedure for General Walkdown Requirements, Appendix E – Limited Scope Walkdowns", Rev. 13, 13 July, 2009

Field Change Request

55378-A, Cable 2PP550A Reroute, 3/9/2010

55749-A, Route conduit 2PP3027A thorough Fire Zone 692.0-A25, 7/27/2010

Engineering Document Construction Release

54423, "Seal Designs for Mechanical Sleeves", Rev. A

54431, "Seal Designs for Mechanical Sleeves", Rev. A

54633-2, Install and reroute conduits to meet 10CFR50 Appendix R, 2/24/2010

54640-2, Install V4/V5 cable throughout the plant as part of the Bulk Cable Pulls, 1/27/2010

59512-2, "Electrical Raceway Penetration Sealing Requirements", Rev. A

List of Corrective Action Documents Reviewed During Inspection

PER 110690, NRC RIS 2006-10 Response

PER 116752, Time Critical Action Analysis

PER 637443, Appendix R Validation Time Studies not Performed per TI-12.19

PER 748052, WO to Fix Leak in 1C-A CRDM Cooler

List of Service Requests and Problem Evaluation Reports Generated as a Result of this Inspection

Service Requests

SR#	Description
771784	Perform PM 1-JB-291-6917 during NRC inspection
778922	Locking device for 0-ISV-26-848 is missing
785358	During the Triennial Fire Protection Inspection 2013, it was identified that not all of the 1-AOI-30.2 C series procedures list "required times" in the associated steps as in 1-AOI-30.2 C.69 procedure
785703	2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - An NRC inspector identified that certain performance times of manual operator actions (MOAs) exceeded 80% of the time required for the performance of the action
785804	During the 2013 WBN Triennial Fire Protection Inspection, it was noted that WBNOSG4031 (Equipment Required for Safe Shutdown per 10CFR50 APP R), Design drawing 45A897 (Manual Actions Required for Safe Shutdown following a Fire -10 CFR 50 APP R-), 1-AOI-30.2 C series instructions (Fire Safe Shutdown) and TI-12.19 (Time Critical Actions) are not aligned to ensure design output actions for an APP R Fire can be clearly identified and understood in 1-AOI-30.2 C series instructions
785824	2013 Triennial: MCR "time critical" actions not validated IAW TI-12.19

- 785833 2013 Triennial: Change for Drawing 1-45A897-1 Note A-52 inadequate
- 785925 2013 Triennial: Fire Protection Environmental Condition Impact Reviews Less Than Adequate
- 785928 2013 Triennial: Fire Drills not performed since start-up in 2 rooms
- 785930 2013 Triennial - Calculation error results in unanalyzed condition and failure to report
- 785941 2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 , DFP OOS and OR-14.10 actions

Problem Evaluation Reports

PER#	Description
767013	Review of 2 MW diesel generator (DG) testing is needed
769594	TI-2018 documentation was not found in RIMS
770218	The Nextel phone system is not available for LOLA response
770339	The FPR, Part II, Section 14.10.r.a lists the wrong hand switch
770794	2013 Triennial LO-ID: Security Gate D-33 Broken
770805	2013 Triennial NRC-ID: Plant walkdown issue
771548	2013 Triennial NRC-ID: Housekeeping in cable spreading room
778134	Triennial NRC-ID: Repair cracks in the CSST C and D retention dikes.
778619	2013 Emergency Lights Inside the U1 Annulus
778713	2013 Triennial Inspection 05000390/2013008 and 05000391/2013008, Emerg Lights inside the U1 Annulus
779303	2013 Triennial: The Diesel Pump should be listed in FPR.
779306	2013 Triennial Fire Protection inspection: Error found in calculation WBPEVAR9004001
779319	2013 Triennial: Tie wire exposed on Thermo-Lag
779839	2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - There is no periodic maintenance for the diesel fire pump fuel tank weather vent. Evaluate the need for a periodic inspection and implement the results of the evaluation as appropriate. This is an SR for a PER to the System 26 System Engineer
779840	2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - Evaluate the requirements and needs for periodic maintenance of the check valves that provide separation between System 24, Raw Cooling Water, and System 26, High Pressure Fire Protection. Check valves 0-CKV-25-561 and -650 provide separation between System 24 and 26 when a System 26 pump starts and elevates the System 26 pressure above the design pressure of System 24. The concern is over pressurizing System 24 and loss of firefighting capability should these two in series valves fail at the same time
780798	The WBN SSER 18 conflicts with the Fire Protection Report
780814	2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - The oil spill kit drum at the IPS, Electric Board Room, el 711, needs additional restraint to prevent tipping over in accordance with TI-276, Section 3.5.B

- 781373 2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - Evaluate placing a position retention device such as a lock or seal on the quarter turn manual valves for the diesel fire pump (DFP) engine cooling water supply. The cooling water supply has two quarter turn ball valves, 0-ISV-26-3181 and -3184, located about knee high that can isolate the DFP engine cooling water supply. Should either of these two valves be closed accidentally by striking them with a knee the DFP would overheat and fail. This was identified by a NRC inspector based on prior plant inspections. This is an SR for a PER to the System 26 System Engineer
- 781377 2013 Triennial: The CCS I-MTR-70-38-8 should be listed in FPR.
- 781377 DCN 52033 added local Manual Operator Action (MOA) # 727 for CCS 1-MTR-70-38-B for an Appendix R in Fire Zone 737-A1A (Fire Area 14 and Analysis Volume AV-36). This MOA should have been added to the Local MOA and Repairs Table
- 781827 During the U1 Triennial Fire Protection Inspection, the NRC Inspection questioned Step [3] of 1-AOI-30.2 C.20.3
- 781872 2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - Evaluate the diesel fire pump (DFP) engine's, 0-DIEG-26-3150, fuel tank sampling method of 0-FOR-26-22, "Diesel Fire Pump Fuel Oil Quality Check" for incorporation of proper industry standards for diesel fuel sampling
- 782976 2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - As part of the inspection, an NRC inspector asked the following question: "For a fire in Fire Area 17, one motor-driven and one diesel-driven fire pump are required. When the diesel-driven pump is out of service, OR 14.2.1.a allows the pump to remain out-of-service for up to 7 days with no compensatory measures. Is this adequate from a risk perspective?"
- 784013 2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 Calculation WBN26D054EPMR JW042992 Rev. 5, Design Flow and Pressure for the Auxiliary Building HPFP Sprinkler Systems, was submitted to the NRC for review to address questions raised during the inspection. Page 10 of Appendix F was found to be missing from the calculation by TVA personnel
- 785627 2013 Triennial Inspection 05000390/2013008 and 05000391/2013008 - The water curtain sprinklers at the equipment hatches at the Auxiliary Building, 757 to 772, column lines A3/S and A13/S are not designed in accordance with NFPA 13 (1975 edition) Section 4-4.19
- 786848 2013 Triennial Inspection 05000390/20133008 and 05000391/2013008, DFP OOS and OR-14.10 Actions
- 786976 2013 Triennial: Fire Protection Environmental Condition Impact Reviews Less Than Adequate
- 787426 2013 Triennial – Failure to Report Unanalyzed Condition
- 787990 2013 Triennial: Change for Drawing 1-45A897 Note A-52 Inadequate

LIST OF ACRONYMS AND ABBREVIATIONS

AOI	Abnormal Operating Instruction
AV	Analysis Volume
CAP	Corrective Action Program
CEB	Civil Engineering Branch
CDR	Construction Deficiency Report
CFR	Code of Federal Regulations
DCN	Design Change Notice
ECN	Engineering Change Notice
EDCR	Engineering Document Construction Release
EP	Engineering Procedures
ER	Engineering Requirement
ERFBS	Electrical Raceway Fire Barrier System
FA	Fire Area
FCR	Field Change Request
FHA	Fire Hazards Analysis
FPP	Fire Protection Program
FPR	Fire Protection Report
FSAR	Final Safety Analysis Report
GL	Generic Letter
HPFP	High Pressure Fire Protection
ICRDS	Integrated Cable & Raceway Design System
IP	Inspection Procedure
IP	Inspection Procedure
IR	Inspection Report
MCB	Motor Control Board
MCR	Main Control Room
NCR	Nonconformance Report
NCV	Non-cited Violation
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
OLC	Operating License Condition
OMA	Operator Manual Action
OR	Operating Requirement
RCP	Reactor Coolant Pump
RCW	Raw Cooling Water
RG	Regulatory Guide
SCR	Significant Condition Report
SER	Safety Evaluation Report
SSER	Supplemental Safety Evaluation Report
SSA	Safe Shutdown Analysis
SSD	Safe Shutdown
TFPI	Triennial Fire Protection Inspection
TFPI	Triennial Fire Protection Inspection
TSI	Thermal Science, Incorporated
TU	Texas Utility
WBN	Watts Bar Nuclear Plant
WO	Work Order