UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

July 30, 2007

Tennessee Valley Authority
ATTN: Mr. William R. Campbell
Chief Nuclear Officer and
Senior Vice President
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000390/2007007 AND 05000391/2007007

Dear Mr. Campbell:

On June 15, 2007, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Bar Nuclear Plant, Units 1 and 2. The enclosed report documents the inspection results, which were discussed on June 15, 2007, with Mr. M. Lorek and other members of your staff. Subsequently, additional in-office reviews were conducted and the final inspection results were discussed by telephone with Mr. A. Scales and other members of your staff on July 27, 2007.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents three NRC-identified findings of very low safety significance (Green) which were determined to involve violations of NRC requirements. However, because of the very low safety significance and because they were entered into your corrective action program, the NRC is treating the findings as non-cited violations (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest an NCV in this report, 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 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Watts Bar facility.

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

Sincerely,

/RA/

D. Charles Payne, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-390, 50-391
License No. NPF-90 and Construction Permit No. CPPR-92

Enclosure: NRC Inspection Report 05000390/2007007, 05000391/2007007
w/Attachment: Supplemental Information

cc w/encl:
Ashok S. Bhatnagar
Senior Vice President
Nuclear Generation Development
and Construction
Tennessee Valley Authority
Electronic Mail Distribution

Preston D. Swafford
Senior Vice President
Nuclear Support
Tennessee Valley Authority
Electronic Mail Distribution

Walter M. Justice, II, Interim Vice President
Nuclear Engineering & Technical Services
Tennessee Valley Authority
Electronic Mail Distribution

Michael D. Skaggs
Site Vice President
Watts Bar Nuclear Plant
Tennessee Valley Authority
Electronic Mail Distribution

General Counsel
Tennessee Valley Authority
Electronic Mail Distribution

(cc w/encl cont'd - See page 3)

(cc w/encl cont'd)
John C. Fornicola, General Manager
Nuclear Assurance
Tennessee Valley Authority
Electronic Mail Distribution

Robert H. Bryan, Jr., General Manager
Licensing & Industry Affairs
Tennessee Valley Authority
Electronic Mail Distribution

Beth A. Wetzel, Manager
Corporate Nuclear Licensing and
 Industry Affairs
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

James D. Smith, Acting Manager
Licensing and Industry Affairs
Watts Bar Nuclear Plant
Tennessee Valley Authority
Electronic Mail Distribution

Michael J. Lorek, Plant Manager
Watts Bar Nuclear Plant
Tennessee Valley Authority
Electronic Mail Distribution

Masoud Bajestani
Vice President
Watts Bar Unit 2
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

County Executive
Rhea County Courthouse
375 Church Street, Suite 215
Dayton, TN 37321-1300

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

(cc w/encl cont'd - See page 4)

(cc w/encl cont'd)
Lawrence E. Nanney, Director
TN Dept. of Environment & Conservation
Division of Radiological Health
Electronic Mail Distribution

Ann Harris
341 Swing Loop
Rockwood, TN 37854

James H. Bassham, Director
Tennessee Emergency Management Agency
Electronic Mail Distribution

Distribution w/encl:
B. Moroney, NRR
RIDSNRRDIRS
PUBLIC

accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

D. Charles Payne, Chief
Engineering Branch 2
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Electronic Mail Distribution

General Counsel
Tennessee Valley Authority
Electronic Mail Distribution

(cc w/encl cont'd - See page 3)

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ADAMS: Yes ACCESSION NUMBER: ___________

OFFICE	RII:DRS	RII:DRS	Contractor	RII:DRS	RII:DRS	RII:DRS	RII:DRP
SIGNATURE	RA	RA	RA	RA	RA	RA	RA
NAME	N. Staples	S. Walker	B. Melly	B. McKay	K. Miller	P. Fillion	G. McCoy
DATE	7/17/2007	7/26/2007	7/27/2007	7/26/2007	7/26/2007	7/26/2007	7/20/2007
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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-390, 50-391
License Nos.:	NPF-90, Construction Permit CPPR-92
Report No.:	05000390/2007007 and 05000391/2007007
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Watts Bar Nuclear Plant, Units 1 and 2
Location:	Spring City, Tennessee
Dates:	May 29 - June 1, 2007 (Week 1) June 11 - 15, 2007 (Week 2)
Inspectors:	P. Fillion, Senior Reactor Inspector (Lead Inspector) S. Walker, Fire Protection Team Leader N. Staples, Reactor Inspector B. Melly, Consultant, Fire Protection Engineer
Accompanying Personnel:	B. McKay, Reactor Inspector (Training) K. Miller, Reactor Inspector (Training)
Approved by:	D. Charles Payne, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000390/2007-007, 05000391/2007-007; 05/29 - 06/01/2007 and 06/11 - 15/2007; Watts Bar Nuclear Plant, Units 1 and 2; Triennial Fire Protection.

This report covers an announced two-week triennial fire protection inspection by three regional reactor inspectors from the U. S. Nuclear Regulatory Commission's (NRC's) Region II office located in Atlanta, Georgia, and a consultant fire protection specialist. Three NRC-identified Green findings, which were non-cited violations (NCV), were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609, "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The team identified a non-cited violation of Technical Specification 5.7.1, Procedures, in that post-fire safe shutdown procedure AOI-30.2, Revision 23, was not consistent with the underlying circuit analysis for a portion of Fire Area 8.

  The finding is more than minor because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. The finding was of very low safety significance due to the low likelihood of fires which could cause the type of cable damage that would challenge the procedure weaknesses. The licensee took immediate corrective action and initiated additional longer term corrective actions. (Section 1R05.5)

- Green. The team identified a non-cited violation of Unit 1 License Condition 2F and 10 CFR 50, Appendix R, Section III.G.2, for not enclosing vital inverter power supply cables in Fire Area 20 in a one-hour fire barrier.

  The finding is more than minor because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. The finding was of very low significance because it was a minor degradation of the safe shutdown capability and mitigating systems were not affected. The licensee took immediate compensatory measures and initiated permanent corrective actions. (Section 1R05.6)

- Green. The team identified a non-cited violation of Unit 1 License Condition 2F and 10 CFR 50, Appendix R, Section III J, for not providing an emergency light to illuminate the interior of a panel in which a local operator action to pull fuses was directed by the post-fire shutdown procedure for a fire in Fire Area 48.

The finding is more than minor because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. The finding was of very low significance because it was a minor degradation of the safe shutdown capability. The licensee took immediate compensatory measures and initiated installation of an emergency light at the problem location. (Section 1R05.8 (b) (2))

B. Licensee-Identified Violations

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R05 Fire Protection

This report presents the results of a triennial fire protection inspection conducted in accordance with NRC Inspection Procedure (IP) 71111.05T, Fire Protection (Triennial). The objective of the inspection was to review the Watts Bar Nuclear Plant, Units 1 and 2, fire protection program (FPP). The team selected five fire areas (FA) for detailed review to examine the licensee's implementation of the FPP. The selection of FAs was based on available risk information as analyzed onsite by a Region II Senior Reactor Analyst, data obtained in plant walkdowns regarding potential ignition sources, location and characteristics of combustibles, and location of equipment needed to achieve and maintain safe shutdown (SSD) of the reactor. The relative complexity of the post-fire safe shutdown procedure for the various FAs was also a consideration. Section 71111.05-05 of the IP specifies a minimum sample size of three FAs. Detailed inspection of the five FAs fulfills the procedure completion criteria. The five areas chosen were:

- FA 8, Fire Zone/Room 713.0-A27, AV 23 - Decontamination room. Fire protection is met using 10 CFR 50, Appendix R, Section III.G.2-type compliance with an automatic sprinkler system, but no cable wrap was used.

- FA 20, Fire Zone/Room 757.0-A1, AV 45, Auxiliary control room. Fire protection is met using 10 CFR 50, Appendix R, Section III.G.2-type compliance with one-hour cable wrap and an automatic sprinkler system.

- FA 21, Fire Zone/Room 757.0-A25, AV 46 - 1A auxiliary control instrument room. This is part of the alternate shutdown facility used for fires in the control building. It contains predominately Train A circuits and associated transfer/isolation switches. It has an automatic sprinkler system, one-hour cable wrap, and fire protection is met using 10 CFR 50, Appendix R, III.G.2-type compliance.

- FA 22, Fire Zone/Room 757.0-A26, AV 47 - 1B auxiliary control instrument room. This is part of the alternate shutdown facility used for fires in the control building. It contains predominately Train B circuits and associated transfer/isolation switches. It has an automatic sprinkler system, uses one-hour cable wrap, and fire protection is met using 10 CFR 50, Appendix R, III.G.2-type compliance.

- FA 48, Fire Zone/Room 708.0-C1, Analysis Volume (AV) 76 - Unit 1 auxiliary instrument room (contains reactor protection system (RPS)). Fire protection is met using 10 CFR 50, Appendix R, Section III.G.3-type compliance with a carbon dioxide (CO_2) suppression system.

The inspectors evaluated the licensee's FPP against applicable requirements, including Operating License Condition 2.F; Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix R; 10 CFR 50.48; commitments to Appendix A of Branch

Technical Position Auxiliary and Power Conversion Systems Branch 9.5-1; Watts Bar Plant Updated Final Safety Analysis Report (UFSAR); related NRC safety evaluation reports; and plant Technical Specifications. The inspectors evaluated all areas of this inspection, as documented below, against these requirements.

Specific documents reviewed by the inspectors are listed in the attachment.

.1 Safe Shutdown (SSD) Analysis and Protection of SSD Capabilities

a. Inspection Scope

The team reviewed those portions of the Fire Protection Report (FPR) dealing with the SSD analysis. One objective of this review was to evaluate the completeness and depth of the analysis which determined the strategy for accomplishing the various system functions necessary to achieve and maintain hot shutdown, accomplish long term cool down and achieve cold shutdown following a severe fire. Particular attention was paid to reactor coolant system (RCS) inventory control, reactivity control and steam generator inventory control. A second objective of reviewing the SSD analysis was to understand its details so it could be determined whether the operations post-fire safe shutdown procedure was consistent with the analysis.

Through a combination of design information review and in-plant inspection, the team ascertained whether the fire protection features in place to protect SSD capability satisfy the separation and design requirements of Appendix R, Section III.G. For example, a FA with one-hour fire barriers around the shutdown cables together with area wide automatic suppression and detection would meet the requirements.

b. Findings

No findings of significance were identified.

.2 Passive Fire Protection

a. Inspection Scope

The team inspected the material condition of all the fire barriers surrounding and within the FAs selected for review. Barriers in use included walls, ceilings, floors, mechanical and electrical penetration seals, doors, dampers and Thermo-Lag 330-1 Electrical Raceway Fire Barrier Systems. Construction details and fire endurance test data which established the ratings of these fire barriers and Electrical Raceway Fire Barrier Systems were reviewed by the team. Engineering evaluations related to fire barriers were reviewed.

Where applicable, the team examined installed barriers to compare the configuration of the barrier to the rated configuration. The overall criterion applied to this element of the inspection procedure was that the passive fire barriers had the capability to contain fires for one hour or three hours as applicable.

b. Findings

A problem was identified with the Electrical Raceway Fire Barrier Systems which is described below in Section 1R05.6, Circuit Analysis. Otherwise, no findings of significance were identified.

.3 Active Fire Protection

a. Inspection Scope

Through in-plant observation of systems, design document review and reference to the applicable National Fire Protection Association (NFPA) codes and standards, the team evaluated the material condition and operational lineup of fire detection and suppression systems. The detection and suppression methods for the category of fire hazards in the selected areas were evaluated. The team compared detector layout drawings, actual field location of detectors and NFPA 72E, "Automatic Fire Detectors," for spacing and placement requirements.

The preaction sprinkler systems in FAs 8, 20, 21, and 22 were inspected and evaluated. The preaction systems were evaluated from source to discharge device including hydraulic calculations performed by the licensee to demonstrate adequate flow, pressure and water distribution.

The total flooding CO_2 system in FA 48 was inspected and evaluated. The team walked down the entire CO_2 system except for inaccessible portions. The team reviewed the purchase specification, system design calculations, door fan test results and CO_2 discharge test results. Also, correspondence between the licensee and NRC, docketed at the time of plant licensing, concerning the acceptance criteria for the system was reviewed. The licensee's program of surveillances to ensure system readiness was reviewed. The two-phase flow calculations were reviewed to ensure the calculation matched the as-built system configuration. The calculation discharge time was compared to the CO_2 equipment discharge timer setting and the manual discharge time nameplate on the Electro Manual Pilot Control (EMPC).

The team also reviewed fire brigade staffing, fire brigade response strategy, fire fighting pre-plans, fire brigade training, and the fire brigade drill program procedures. Particular attention was given to location and capacity of hose stations and approach routes to the FAs. Fire brigade equipment lockers were inspected by the team. Documentation reviews were supplemented by discussion with persons responsible for fire brigade performance to assess the readiness of the fire brigade to suppress any and all fires that may occur.

The overall criterion applied to this portion of the inspection was that the fixed automatic and fire brigade fire suppression had the capacity and capability to suppress credible fires in the selected FAs.

b. Findings:

Alternate shutdown capability was provided to cope with a fire in FA 48, the auxiliary instrumentation room containing the RPS cabinets. Alternate shutdown was the chosen coping strategy for this room because it contained all channels of normally used instrumentation circuits and associated panels in close proximity, making it difficult to protect any one channel. A CO_2 suppression system was installed in this room to meet the requirements of Appendix R, Section III.G.3. Design basis documents applicable to the design of the CO_2 system were:

- National Fire Protection Association Standard on Carbon Dioxide Extinguishing Systems, NFPA No.12 - 1973,

- NRC Supplemental Safety Evaluation Report (SSER) No. 18 (NUREG 0847), and

- Watts Bar Fire Protection Report (FPR).

Review of these documents by the team identified an issue. The SSER states that the CO_2 system must achieve a concentration of at least 50 percent within seven minutes of initiation and hold that concentration for 15 minutes. This statement may be construed as meaning the concentration values must be achieved at any point in the room where combustibles capable of deep seated fires are located. The basis for these values in the SSER is testing performed by Sandia National Laboratory on deep seated fires and CO_2 systems as described in NRC Information Notice 92-28, Inadequate Fire Suppression System Testing, issued April 8, 1992. The FPR states that the system is capable of achieving 50 percent concentration within seven minutes and maintaining at least a 45 percent concentration for at least 15 minutes. NFPA No.12 - 1973 (the code of record) specifies 50 percent concentration for deep seated fires, but does not specify a definite hold time. The issue is: Given the difference between the SSER and the FPR with regard to the required concentration at the 15 minute point, does the CO_2 system meet the design basis?

The team reviewed records of a discharge test conducted at the time of initial system installation. The team found that it was a valid test, and that it confirmed the values stated in the FPR with regard to CO_2 concentrations. Records showed that a 45 percent concentration was held for 15 minutes measured at 75 percent of room height. Fifty-percent concentration for 15 minutes was achieved in the lower half of the room.

FA 48 contains a mixture of both thermoset and thermoplastic-type cables. Fire in fire resistant thermoset-type cables could be a deep seated fire. Fire in thermoplastic-type cables would be a surface fire. For the cable trays located in the upper 25 percent of the room, the team did not determine what percentage of these cables were of the thermoset-type.

The licensee considered the CO_2 system to be functional. Testing demonstrated that 50 percent CO_2 concentration for 15 minutes would be achieved in the lower half of the room where the ignition sources in the form of low-voltage, low-power, instrumentation cabinets were located. The possibility of a fire starting in the cabinets spreading to the upper portions of the room along the cables is unlikely because the great majority of the cables are routed in conduits or enclosed raceway as they exit from the tops of the cabinets (i.e. for the first five to seven feet). The only ignition sources in the upper 25 percent of the room would be these thermoplastic cables located in the cable trays. Because the coping strategy for a fire in this fire area is alternative shutdown, none of the cables in this room are used for SSD. Operation of transfer/isolation switches would be necessary to allow the alternative shutdown system to function properly.

The licensee initiated Problem Evaluation Report (PER) 125632 to address the issues described in this section. The team concluded that if the fire hazards and the suppression system in FA 48 were properly analyzed, there would be reasonable expectation that such analysis would show the suppression system to be adequate to extinguish any credible fire. In consideration of the above facts and circumstances, an unresolved item (URI) has been established to allow the licensee reasonable time to generate a documented analysis to show that the CO_2 system meets the intent of the design basis as stated in the SSER. For a plant licensed to operate after 1979, such an analysis would not have to be submitted to the NRC as a request for approval of modification of License Condition 2F if it does not adversely affect SSD. This issue is identified as URI 05000390/2007007-01, CO_2 System in FA 48 Appears to Deviate From Design Criterion in SSER.

.4 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

Through a combination of in-plant inspection and drawing reviews, the team evaluated the selected FAs from the viewpoint of whether redundant trains of systems required for post-fire safe shutdown could be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. The team considered the effects of water, drainage, heat, hot gasses, and smoke that could potentially damage redundant trains.

b. Findings

No findings of significance were identified.

.5 Operational Implementation of Shutdown from the Control Room and Alternate Shutdown

a. Inspection Scope

The team reviewed the operational implementation of the SSD strategy that would be used during a severe fire in any of the selected FAs. This review included the training program for licensed and non-licensed operators to verify that the training reinforced the shutdown methodology in the Safe Shutdown Analysis (SSA) and procedures for the selected FAs. The team also reviewed shift turnover logs and shift manning to verify that personnel required for SSD were available onsite, exclusive of those assigned as fire brigade members.

The team performed a walk through of Abnormal Operating Procedure AOI-30.2, Fire Safe Shutdown, Rev 23 paying attention to clarity and human factors aspects. Operator manual actions were evaluated to verify that the operators could reasonably be expected to perform the specific actions within the time required to maintain plant parameters within specified limits. Local operator actions were evaluated using the guidance provided in NRC IP 71111.05T, Section 11 (B) "Manual Actions." The shutdown procedure was compared to the SSA to check that any component that would be used by operators following the procedure had been subjected to circuit analysis. It was also checked that any component listed as unavailable in the circuit analysis was not "used" in the procedure.

b. Findings

Post-Fire Safe Shutdown Procedure for AV 23

Introduction: The team identified a Green NCV of Technical Specification 5.7.1, Procedures, in that post-fire safe shutdown procedure AOI-30.2, Revision 23, was not consistent with the underlying circuit analysis for a portion of Fire Area 8.

Description: With regard to AV 23, which is within FA 8, three different sections of AOI-30.2 applied depending on the location of the fire. Section C.46 applied to the open areas of the auxiliary building on elevation 713 feet defined by column lines A4, A1, control building wall and component cooling pump wall. Section C.52 applied to the decontamination room (A27). Section C.60 applied to rooms A24, A25 and A26 which contained waste gas equipment. All of these rooms were analyzed as AV 23, and therefore there did not appear to be any logical rationale for having multiple procedures. The team found differences in the three procedures and discrepancies between two of the procedures and conclusions of the circuit analysis which should have formed the basis for the procedure. These differences are:

- The circuit analysis stated that charging pump (CCP) 1A-A had cables running in the AV and therefore could be lost due to a fire. Procedure C.46 directed use of CCP 1B, which was consistent with the analysis. Procedure C.52 directed use of CCP 1A-A which was contrary to the analysis. It also directed that the Train B pump, CCP 1B-B, be placed in pull-to-lock. Procedure C.60 gave the operator a choice of which CCP train to use. Therefore procedures C.52 and C.60 could lead to a temporary loss of RCS inventory control and reactor coolant pump seal injection should CCP 1A-A fail as predicted by the analysis. It would take longer for the operator to reestablish the charging pump function if procedure C.52 was in use because it directed the operator to place the non-affected train in pull-to-lock, which would require the operator to obtain an emergency procedure change to start the Train B pump. Procedures C.52 and C.60 were corrected during the inspection.

- For the case of using CCP 1B-B, which is the credited pump for AV 23, it is necessary to run either component cooling pump 2B or CS, to provide CCP bearing cooling. The circuit analysis states that component cooling pump CS could be affected by a fire in AV 23, and pump 2B should be used. However, procedure C.60 did not direct starting of pump 2B. Pump 2B is provided with an automatic start function on low pressure, but that function was not analyzed in the circuit analysis. Procedures C.46 and C.52 had steps consistent with the circuit analysis with regard to component cooling pumps. If the operator did not notice that component cooling pump CS had failed, then the credited CCP pump would be damaged.

- All three auxiliary feedwater pumps may be affected by the fire, according to the analysis. Two motor driven pumps have feeder cables in AV 23 and the air operated steam inlet valve for the turbine driven also has cables in AV 23. The analysis resolved this problem by recommending a local operator action to open the steam inlet valve. In contrast, procedures C.52 and C.60 direct the operator to use motor driven auxiliary feedwater pumps.

- Procedures C.52 and C.60 each contain a table of instrumentation important to monitoring the shutdown which, according to the table, should be available. However, the circuit analysis indicated that some of this instrumentation would be affected by a fire in AV 23.

- The analysis states that cables for both volume control tank (VCT) outlet valves run in AV 23. The analysis resolves this problem by recommending one of these valves (1-LCV-62-133B) be locally manually closed with the power removed. Procedures C.52 and C.60 contained a step to close the VCT outlet valves from the control room, rather than locally, which raises the possibility of the valve to later spuriously open. Review of the elementary diagram for the VCT outlet valves reveals that the power cable and a control cable could run in AV 23. The power cable would not pose a problem with respect to spurious opening. The control cable contains wires for valve torque switches and limit switches, and damage to this cable could not result in spurious opening of the valve. Therefore, even if the VCT cables running in AV 23 sustained fire damage, use of procedures C.52 or C.60 could lead to one of the following scenarios. The operator attempts to close the valve from the control room but cannot due to cable damage. He would then instruct an Auxiliary Operator to close the valve locally. Also, the operator may be successful in closing the valve from the control room, but the cables could later be damaged by fire. This does not create a problem for shutdown because the valve would remain in the safe position.

Analysis: This finding is considered more than minor because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. All the cables related to the discrepancies described above run in the open area of AV 23, room 713-A1A. None of the cables run in the other four rooms within AV 23. For the case of a fire starting in one of the rooms and remaining restricted to that room, the only room of interest is room 713-A1A. The procedure that would have been used for this fire was C.46, and this procedure did not have any problems as it matched the analysis. For the case of a fire starting in the decontamination room, where procedure C.52 applies, and spreading to the open area, two procedures would apply, C.46 and C.52. As described above, these procedures conflict on a few steps, for example on which charging pump to use and which auxiliary feedwater pump to use. However, the spread of fire out of the walled in area of the decontamination room would not be credible due to the automatic suppression system and the relatively small amount of combustible material in the decontamination room. Similar arguments apply to a fire starting in rooms A24, A25 or A26. It is also possible the operator would realize that the open area is the more important area, and would be guided by procedure C.46 which would not cause any problems with SSD. In consideration of the above facts, the finding was found to be of very low safety significance consistent with the guidance in Inspection Manual Chapter (IMC) 0609F, Fire Protection Significance Determination Process, and its attachments. The licensee took immediate corrective action to revise procedures C.52 and C.60 to bring them into conformance with the analysis.

Enforcement: Technical Specification 5.7.1, Procedures, requires that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, and FPP Implementation. Regulatory Guide 1.33, Appendix A, Section 6, recommends procedures for combating emergencies such as plant fires. Procedure AOI-30.2, Fire Safe Shutdown, was an implementing procedure for the Facility FPP which specified the manual actions which may be required for fires potentially affecting safety equipment necessary to achieve and maintain post-fire safe shutdown.

Contrary to these requirements, Procedure AOI-30.2 did not specify all the manual actions required for fires in portions of FA 8 (i.e. room 713.0-A27) as specified in the FPR, Section VI, Fire Hazards Analysis. This condition has existed since at least November 19, 2004, when Procedure AOI-30.2, Revision 18, was issued. Because this finding is of very low safety significance and has been entered into the corrective action program (PER 125513), this finding is being treated as a non-cited violation (NCV), consistent with Section VI.A.1 of the NRC's Enforcement Policy. This finding is identified as NCV 05000390/2007007-02, Safe Shutdown Procedure for Portions of FA 8 Not Consistent With Underlying Analysis.

.6 Circuit Analysis

a. Inspection Scope

For each of the five selected FAs, the team reviewed selected SSD components, including a number of valves, instruments, and pumps, which the licensee credited for post-fire SSD. This review evaluated whether the circuit analysis properly categorized the selected components' availability. In cases where the circuit analysis indicated resolution of a potential problem was needed, the team inspected implementation of that resolution. Individual circuit analysis elements reviewed included the Safe Shutdown Equipment List, Survivability Report, the component cable versus AV matrix (45B900 sheets), and calculations. The team also evaluated the potential effects of open circuits, short circuits, and shorts to ground for the selected equipment. The criteria for acceptance was that a fire in any of the FAs would not defeat the capability to achieve and maintain SSD. The electrical schematics were also evaluated to verify that circuits which interconnected devices in the control building and the auxiliary control panel contained isolation/transfer switches. The list of components reviewed is contained in the Attachment.

The team performed in-plant inspections of the selected FAs to confirm that as-built routing of cables matched the routing shown on design documents upon which the circuit analysis was based. A list of components for which these walkdowns were performed is contained in the Attachment.

b. Findings

Protection of Cables

Introduction: The team identified a Green NCV for violation of Appendix R, Section III.G.2, for failing to protect cables important to SSD for vital inverter III.

Description: An objective of the circuit analysis was to protect at least three of the four vital inverters from fire damage to preclude a spurious safety injection signal which could complicate the SSD. Feeder cables for inverters II and III run in FA 20 (the auxiliary control room). The licensee intended to protect cables for inverter III in that FA, and initially those cables were protected. However, Design Change Notice 51370A issued on October 21, 2004, and completed on March 13, 2005, consisting of the installation of replacement inverters, resulted in the feeder cables for inverter III not being protected in FA 20. The cables in question were routed in conduits 2PV784F and B1057F. Immediately after this finding was identified, and pursuant to FPR, Part II, Section 14.8.1.b, the licensee implemented a once-per-hour fire watch.

Analysis: The finding is more than minor because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. For a fire in FA 20, SSD would be controlled from the main control room. When the instrumentation required for operator actions was reviewed, the team concluded that instrumentation powered from inverters I and IV, which do not have cables in FA 20, would be sufficient to provide the necessary information on system parameters to the operator. Loss of a portion of the redundant instrumentation and a spurious safety injection signal, should it occur, would somewhat complicate the shutdown evolution. The team concluded that these problems represented a low degradation of SSD capability and mitigating systems were not affected. Therefore, the finding was of very low safety significance consistent with the guidance in Inspection Manual Chapter (IMC) 0609F, Fire Protection Significance Determination Process, and its attachments.

Enforcement: Watts Bar Unit 1 License Condition 2F requires that the licensee implement and maintain in effect all provisions of the approved FPP. These documents incorporate the requirements of 10 CFR 50, Appendix R, Section III.G.2, which requires enclosure of cables important to SSD in a fire barrier having a one-hour rating.

Contrary to the above, conduits 2PV784F and B1057F were not protected, from fire damage. This condition has existed since March 13, 2005. Because this finding is of very low safety significance and has been entered into the corrective action program (PER 125950), this finding is being treated as an NCV, consistent with Section VI.A.1 of the NRC's Enforcement Policy. This finding is identified as NCV 05000390/2007007-03, Feeder Cables for Vital Inverter not Protected with One-Hour Fire Barrier.

.7 Communications

a. Inspection Scope

The team reviewed plant communication capabilities to evaluate the availability of the communication systems to support plant personnel in the performance of local operator manual actions to achieve and maintain SSD conditions. During this review the team considered the effects of ambient noise levels and reliability. The team also reviewed the communication systems available at different locations within the plant. Both fixed and portable communication systems were reviewed for the impact of fire damage in the selected FAs.

During a walkthrough of the SSD procedures with a plant operator, the team observed the availability of portable radios and fixed communication equipment. In addition, the team inspected the locker where extra batteries were stored and maintained on charging stations specifically for radios used by the operators performing the SSD procedures.

The team also reviewed preventive maintenance and surveillance test records to verify that the communication equipment was being properly maintained.

Similar reviews were made in relation to communications equipment needed by the fire brigade.

b. Findings

No findings of significance were identified.

.8 Emergency Lighting

a. Inspection Scope

The team observed the placement and coverage area of fixed eight-hour battery pack emergency lights throughout the selected FAs to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation and/or instrumentation monitoring for post-fire SSD actions. During walkdowns, the team requested that the licensee activate the test button on a sample of emergency light fixtures. The team reviewed a plant modification wherein a number of batteries for the fixed lights were replaced with a different model battery than the original.

Preventive maintenance procedures and completed surveillance tests were reviewed to ensure adequate surveillance testing and periodic battery replacements were in place to ensure reliable operation of the fixed and portable emergency lights. The team also reviewed vendors’ manuals to ensure that the emergency lights were being maintained consistent with the manufacturer’s recommendations.

b. Findings

(1) Eight-Hour Requirement for Emergency Lighting Units (ELU)

Introduction: The team identified an URI related to the licensee's failure to demonstrate, on a continuing basis, the eight-hour capacity of the emergency lights. The eight-hour capacity is required by 10 CFR 50, Appendix R, Section III.J.

Description: The licensee had 197 ELUs installed with three different battery types: 30 ELUs with LEC 361 batteries, 25 ELUs with LEC 36 batteries, and 142 ELUs with PM 6420 batteries. As described by the FPP and WBN 0-FOR-228 "Quarterly Inspection and Testing of Emergency Light Battery Packs," the licensee's program to ensure, on a continuing basis, the ELUs had eight-hour capacity was as follows:

- Perform an initial eight-hour discharge test,
- Perform a quarterly two to three-minute discharge test along with a voltage check, and
- Replace batteries at a conservative interval, based on vendor recommendations, with respect to the expected service life.

Part II of the FPR, the Fire Protection Plan, described how the various features of the Fire Protection Program meet the requirements. Section B.14.9.b gives the bases for the testing and inspection requirements of ELUs. It states: "A battery is replaced periodically as a function of its service life, the environmental conditions the battery will experience, and a safety factor." The service life and the environmental factors are based on information from the manufacturer. Part V of the FPR, Section 4.2, states that the battery replacement program is used in lieu of performing the periodic, deep discharge eight-hour test. A review of the manufacturer's published data for the PM 6420 indicated that the rated design life was eight years and expected service life for standby use was four to five years. The licensee's stated replacement interval for the PM 6420 was five years.

After the team questioned whether the five year replacement interval was conservative as intended by the program, the licensee acknowledged that the replacement interval should have been conservative with respect to the expected service life and not the design life. Immediately following the inspection, Sentry Corporation, manufacturer of the PM 6420 battery, informed the licensee that a conservative replacement interval for the PM 6420 battery would be three years. Therefore, the replacement time criterion of five years for the PM 6420 batteries in the licensee's program was not conservative.

The team also found that the licensee was starting the five-year replacement interval clock when they performed the on-site initial eight-hour discharge test. This practice did not take into account storage time prior to performance of the eight-hour discharge test. Storage time for an ELU battery could be up to two years at the licensee's warehouse and seven months at the manufacturer's location. Considering that a non-conservative replacement interval was being used (i.e. five years versus three years) and that shelf time (which could be more than two years) was not being accounted for, the licensee was not implementing the conservative replacement portion of their stated program which was intended to demonstrate, on a continuing basis, that the ELUs had eight-hour capacity.

After this discussion, the licensee reviewed all 142 PM 6420 batteries in service in the plant and identified 74 batteries for immediate replacement, based on a service time of more than three years or a total lifetime of more than four years from the manufacture date. Another longer term corrective action is to address the team's observation that the program for demonstrating the eight-hour capacity does not include any test which would help detect unusual degradation of the batteries (refer to PER 126210).

Analysis: This issue is a performance deficiency because the licensee did not follow its approved FPP for replacement of batteries in the emergency lighting units to demonstrate conformance with the eight-hour capacity requirement on a continuing basis. The finding is more than minor because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. Because the finding adversely affected to some degree the ability to carry out local operator actions required to achieve and maintain a SSD condition following a severe fire, the Phase 1 Significance Determination Process (SDP) for fire indicates that a Phase 2 analysis should be performed.

To what degree the finding affected the ability to carry out operator actions depended on how long the ELUs would have actually lasted. Preliminary evaluations by the team indicated that, if the ELUs would have provided adequate illumination for 60 to 90 minutes, the finding would be of relatively low significance. Because there was insufficient objective evidence at the time of this report to determine whether the ELUs would have provided adequate illumination for 60 to 90 minutes, the significance of the finding was considered indeterminate until that question can be resolved. The ELUs which were replaced as a result of this finding have been retained by the licensee. Testing of these ELUs could provide objective evidence important to resolving the issue. Since further information concerning the capacity of the ELU batteries was needed to begin the SDP, an unresolved item was established. It was identified as URI 05000390/2007007-04, Fire Protection Program did not Demonstrate Eight-Hour Emergency Light Unit Battery Capacity.

(2) Emergency Light for Local Operator Action in Battery Board Room

Introduction: The team identified a Green NCV for not providing an emergency light positioned to illuminate the interior of a panel in which a local operator action to pull fuses was part of the shutdown procedure for a fire in FA 48. This was a violation of 10 CFR 50, Appendix R, Section III.J.

Description: During a walkthrough of Abnormal Operation Instruction AOI-30.2, Fire Safe Shutdown, Section C.69, which directs the auxiliary operator to pull fuses located in 125 V vital battery boards I and II, the team observed that there was no emergency light positioned to illuminate the interior of the battery board cabinet. Responding to this observation, the licensee conducted a test wherein the normal lighting in the room was turned off and an auxiliary operator would attempt to perform the fuse pulling step. The result of this test was that the existing emergency lighting in other areas of the room was not sufficient to allow reading the fuse labels in the battery board cabinet. Therefore, the procedure step could not be completed without reliance on a flashlight or other portable light.

Part V of the FPR, Section 4.1, states that the adequacy of emergency lighting has been assessed at the manual action locations.

Analysis: The fact that the licensee failed to provide an emergency light which was needed to operate SSD equipment (in this case pull fuses as directed by AOI-30.2, Section C.69) is a performance deficiency. It is considered more than minor significance because it is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors (i.e. fire) and it affects the objective of ensuring reliability and capability of systems that respond to initiating events. Specifically, the finding adversely affected to some degree the ability to carry out local operator actions required to achieve and maintain a SSD condition following a severe fire. The SDP Phase 1 analyses indicated the finding was a minor degradation of SSD capability and therefore was of very low significance. The conclusion of minor degradation was based on the fact that the procedure step in question was not a time critical step. Consideration was also given to the fact that operators are required to carry flashlights and would have access to portable lanterns to provide the necessary lighting. The licensee took the immediate corrective action to issue an Operations Order, pursuant to Operating Requirement 14.9, to install an emergency light within 14 days and to require auxiliary operators to use hand held lanterns when performing AOI-32-2.

Enforcement: Watts Bar Unit 1 License Condition 2F requires that the licensee implement and maintain in effect all provisions of the approved FPP. These documents incorporate the requirements of 10 CFR 50, Appendix R, Section III.J, which requires emergency lighting units with at least an eight-hour battery power supply be provided in all areas needed for operation of SSD equipment and in access and egress routes thereto.

Contrary to the above, an ELU was not provided at 125 V vital battery boards I and II where SSD equipment needed to be operated. Because this finding is of very low safety significance and has been entered into the corrective action program (PER 125959), this finding is being treated as an NCV, consistent with Section VI.A.1 of the NRC's Enforcement Policy. The condition existed has since February 7, 1996, when Watts Bar received an operating license. This finding is identified as NCV 05000390/2007007-05, One Emergency Light Not Installed as Required by Appendix R, Section III.J.

.9 Cold Shutdown Repairs

a. Inspection Scope

The licensee's analysis did not identify a need for post-fire repairs to achieve a cold shutdown condition for fires in the selected FAs. Thus, cold shutdown repair procedures were not reviewed during this inspection.

b. Findings

No findings of significance were identified.

.10 Compensatory Measures

a. Inspection Scope

The inspectors reviewed the licensee's program for control of compensatory measures for out-of-service, degraded, or inoperable fire protection and post-fire safe-shutdown equipment, systems, or features. An independent technical review of the licensee's evaluation documentation completed in support of Fire Protection Impairment Permit Nos. C07-0024, C07-0067, C07-0079, and C07-0143, which affected detection systems and gaseous/water-based suppression systems, was reviewed. The review was performed to verify that the risk associated with removing fire protection and/or post-fire systems and components from service for maintenance, including hot work, was properly assessed and adequate compensatory measures were implemented in accordance with the licensee's approved FPP. The inspectors reviewed the adequacy of the licensee's completed short term compensatory measures to ensure that the actions satisfactorily compensated for a degraded function or feature until appropriate system/component restoration was completed.

b. Findings

No findings of significance were identified.

.11 Control of Combustibles and Ignition Sources

a. Inspection Scope

The team evaluated the licensee's program for control of combustibles and ignition sources through review of plant procedures and plant walkdowns. If transient combustibles were observed in an area, the team verified that a transient combustible permit was issued. The team verified that containers with combustibles were Underwriters Laboratories or Factory Mutual listed. The team checked that cylinders were properly labeled. The hot work permit program and its implementation was reviewed.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

a. Inspection Scope

The team reviewed recent independent licensee audits for thoroughness, completeness and conformance to requirements. Requirements for the independent audits are contained in Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," Generic Letter 82-21, "Technical Specifications for Fire Protection Audits," and the licensee's Nuclear Quality Assurance Plan." The team reviewed "TVA Nuclear Assurance - Fire Protection and Loss Prevention Program - Audit Report SSA0605," which was conducted December 11, 2006, through March 21, 2007. This report focused on FAs 1, 23, 43, 53 and 48. The team also reviewed portions of Audit Report 0501 which was conducted February 14 through May 12, 2005. Both of these audits were triennial scope audits. In addition, the team reviewed portions of "Corporate Nuclear Assurance - Assessment Report NA-CH-06-003 - Assessment of Valley-Wide Fire Protection Performance," which was performed during March 2006.

The team requested and reviewed a summary report of all Operating Experience documents received since January 1, 2005. This summary contained 15 items together with their disposition.

The team reviewed portions of Standard Programs and Processes Procedure SPP-1.6, "TVAN Self-Assessment Program." Snapshot Self-Assessment Report WBN-OPS-07-008 on the topic of transient combustible controls was reviewed.

The following PERs were reviewed and evaluated:

PER 121975, Vendor program, System Assurance and Fire Protection Engineering, report error.
PER 126311, Appendix R lighting, 24 May 2007
PER 96145, Licensee Event Report 2005-002-00, Beaver Valley CCP Suction Temperature Increase during Appendix R Event

b. Findings and Observations

No findings of significance were identified. The licensee's program for independent audits was to perform biennial audits, which have the scope of triennial audits as defined in Generic Letter 82-21, plus perform an assessment in the years between the full scope biennial audits. These audits were complete and comprehensive, and did identify some problems. One of the recommendations from the March 2006 Assessment report was that Watts Bar perform self assessments in the fire protection area in accordance with Standard Programs and Processes (SPP)-1.6. SPP 1.6, Section 3, states that: "Programmatic assessments are scheduled on a five-year structured basis." Discussions with the appropriate managers led to the conclusion that a self assessment in the fire protection area had not been conducted nor scheduled since the March 2006 recommendation. The licensee initiated PER 126279 to address this issue.

4OA6 Meetings, Including Exit

On June 15. 2007, the lead inspector presented the inspection results to Mr. M. Lorek, Plant Manager, and other members of his staff. Proprietary information is not included in this report. Subsequently, additional in-office reviews were conducted and the final inspection results were discussed by telephone with Mr. A. Scales, Operations Manager, and other members of your staff on July 27, 2007.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

P. Bumgardner, Fire Operations Supervisor
E. Haston, Fire Protection Safe Shutdown Analysis Engineer
M. Heatherly, Fire Protection Engineer, Corporate Office
D. Helms, Manager Engineering Programs
T. Lee, Fire Protection Engineer
M. McFadden, Site Nuclear Assurance Manager
T. Newman, Operations
P. Salkeld, Superintendent Operations Support
J. Smith, Manager of Licensing and Industry Affairs
S. Smith, Operations Superintendent
J. Sterchi, Emergency Preparedness Specialist
R. Stockton, Licensing Engineer
A. Taylor, Electrical Design Engineer
B. Thomas, Licensing Engineer

NRC Personnel

R. Monk, Senior Resident Inspector
C. Payne, Chief, Engineering Branch 2

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000390/2007007-01	URI	CO_2 System in FA 48 Appears to Deviate From Design Criterion in SSER (1R05.3)
05000390/2007007-04	URI	Fire Protection Program did not Demonstrate Eight-Hour Emergency Light Unit Battery Capacity (1R05.8 (b) (1))

Opened and Closed

05000390/2007007-02	NCV	Safe Shutdown Procedure for Portions of FA 8 Not Consistent With Underlying Analysis (1R05.5)
05000390/2007007-03	NCV	Feeder Cables for Vital Inverter not Protected with One-Hour Fire Barrier (1R05.6)
05000390/2007007-05	NCV	Failure to Provide Emergency Light at Location of Local Operator Action Important to Safe Shutdown (1R05.8 (b) (2))

LIST OF COMPONENTS INSPECTED
(Refer Report Section 1RO5.6 Circuit Analysis)

Circuit Analysis

1-BD-211-A-A	Diesel Generator Breaker 1912
1-BD-211-B-B	Diesel Generator Breaker 1914
1-FCV-1-51-S	Aux Feed Pump Turbine Trip & Throttle Valve
1-FCV-62-93	Charging Flow Control Valve
1-FCV-62-99-B	Lower Containment 1B Coolers Supply Isolation Valve
1-FCV-68-332-B	RCS Pressure Relief Flow Control Valve
1-FCV-68-333A	RCS Pressure Relief Flow Control Valve
1-LCV-62-132-A	VCT Outlet Isolation Valve
1-LCV-62-133-B	VCT Outlet IsolationValve
1-LCV-62-136-B	RWST Flow Control Valve
1-LI-68-335A	Pressurizer Water Level
1-MTR-62-108-A	Centrifugal Charging Pump 1A-A
1-MTR-62-104-B	Centrifugal Charging Pump 1B
1-MTR-70-38-B	Component Cooling System Pump 1B-B
1-PCV-68-334-B	Pressurizer Relief Valve
1-PCV-68-340A-A	Pressurizer Relief Valve
1-SC-46-57	Aux Feed Pump Turbine Speed Control

Routing Walkdown

1-FCV-1-15-A	Aux Feed Pump Turbine Speed Control Valve
1-MTR-70-46-A	Component Cooling System Pump 1A-A
1-LT-3-56	Steam Generator No. 2 Wide Range Level
1-MTR-3-128-B	Motor Driven AFW Pump 1B-B
1-MTR-3-118-A	Motor Driven AFW Pump 1A-A
1-FCV-1-52	Aux Feed Pump Turbine Speed Control Valve
1-FCV-3-355-A	AFW Pump 1A-A Recirculation Flow Control Valve
1-FCV-3-359-B	AFW Pump 1B-B Recirculation Flow Control Valve

LIST OF DOCUMENTS REVIEWED

Problem Evaluation Reports (PERs) Generated as a Result of the Inspection

125513, Discrepancy between AOI-30.2, Section C52 (Decon Room), and Fire Protection Report
125556, Emergency Lighting Battery Pack (1-BAT-228-1418/09) did not illuminate when test button was pushed
125632, CO_2 concentration in auxiliary instrument room is listed as 50 % for 15 minutes in SSER 18 and 45 % in for 15 minutes in Fire Protection Report
125950, Appendix R issue with vital inverter cable in auxiliary control room
125959, Emergency light does not illuminate fuse blocks when panel is open
126163, 1-MTR-70-38B not identified as either available or unavailable in Analysis Volume 23
126164, Control diagram 1-47W610-39-1 (FPR Figure II-21) Note 2 description lacks discussion of cross zone detection
126185, Incorrect CO_2 volume in system description and plant calculation
126210, Emergency light battery testing methods
126279, Lack of Fire Protection Program self assessments

Licensing Basis Documents

Watts Bar Nuclear Plant Fire Protection Report, Revision 36
Letter dated 09/15/93, from W. J. Museler (Tennessee Valley Authority) to U.S. NRC : Watts Bar Nuclear Plant - Submittal of the Revised WBN Fire Protection Report (TAC M63648)
Safety Evaluation Report, Operation of Watts Bar Nuclear Plant Units 1 and 2, SER Supplement 18, Dated October, 1995

Applicable Codes and Standards

NFPA 12, Carbon Dioxide Extinguishing Systems, 1973 edition.
NFPA 13, Automatic Sprinkler Systems, 1975 edition.
NFPA 14, Standpipe and Hose Systems, 1974 edition.
NFPA 72E, Automatic Fire Detectors, 1974 edition.

Calculations and Design Changes

DCN 52033-A, Component Cooling System
WB-OSG4-031, Equipment Required for Safe Shutdown per 10 CFR 50 Appendix R, Rev. 38
WBPEVAR8808035, Appendix R: Cables Required for Auxiliary Control System, Rev. 8
WBPEVAR9004001, Appendix R: Cables Required for Safe Shutdown Following a Fire, Rev. 13
EPM-THJ-102192 R2, CO_2 Fire Protection System Required Quantity Calculation
EPM-AST-031895 R2, HPFP System Water Supply to the Auxiliary Building Preaction Sprinkler System
EPM-OED-042392 R2, Equations for HPFP Pump Performance Curves
EPM-RJW-042992 R3, Design Flow and Pressure for the Auxiliary Building HPFP Sprinkler Systems
DCN 51370A, EPM Summary of Changes to Watts Bar Appendix R Data in SAFE Based on DCN-51370A Updates, pages 2459 thru 2500.

Pre-Operational Test Procedures

SPT-039-02, Rev. 0, CO_2 Fire Protection for Unit 1 and Unit 2 Aux Instrument Rooms
SPT-039-01, Rev. 1, CO_2 Enclosure Door Fan Testing

Procedures

Abnormal Operating Instruction AOI-30.2, Fire Safe Shutdown, Rev. 23
WBN-0-BAT-228-0001**,** Shop Instruction for the Initial Charging, Recharging, Testing and Repair of Emergency Light Battery Packs
Fire Operating Requirements Instruction, 0-FOR-39-1, Weekly CO_2 Storage Tanks Level Verification, Rev. 1
Fire Operating Requirements Instruction, 0-FOR-39-2, 18 Month CO_2 Fire Protection Inspection and Test for Powerhouse Areas, Rev. 16
Fire Operating Requirements Instruction, 0-FOR-39-4, Quarterly CO_2 Flow Path Verifications, Rev. 3
Fire Operating Requirements Instruction, 0-FOR-304-1, Fire Barrier/Mechanical, Conduit, Cable Tray, and Fire Damper (External), Rev. 7 Penetration Visual Inspection-Auxiliary, Control, Diesel Generator Bldgs and IPS
Fire Operating Requirements Instruction, 0-FOR-304-2, Electrical Raceway Fire Barrier Systems Visual Inspection-Auxiliary Building, Rev. 4
Fire Operating Requirements Instruction, 0-FOR-304-3, Fire Damper (Internal) Visual Inspection-Auxiliary, Control and Diesel Generator Building, Rev. 14
TVAN Standard Department Procedure, FPDP-2, Administration of Fire Pre-Plans, Rev. 0
TVAN Standard Department Procedure, FPDP-3, Management of the Fire Protection Report, Rev. 4
TVAN Standard Department Procedure, FPDP-4, Fire Emergency Response, Rev. 4
TVAN Standard Programs and Processes, SPP-10.9, Control of Fire Protection Impairments, Rev. 2W1
TVAN Standard Programs and Processes, SPP-10.10, Control of Transient Combustibles, Rev. 4
TVAN Standard Programs and Processes, SPP-10.11, Control of Ignition Sources (Hot Work), Rev. 3
Fire Protection Instruction TI-210, Fire Protection Engineer Periodic Inspection, Rev. 0
Fire Protection Instruction TI-210, Fire Protection Engineer Periodic Inspection, Appendix A (Field Inspection Completed 2/13/07), Rev. 0

Drawings

Active and Passive Fire Protection

47W240-2, Units 1 and 2 Fire Protection Compartmentation – Fire Cells Plan EL 708.0 & 713.0 Fire Protection Report, Rev. 10
47W240-4, Figure II-31, Aux. & Reactor Building, El. 755.0 & 7570, Rev. 9
47W240-6, Figure II-33, Aux. & Reactor Building, El. 692.0 & 708.0, Rev. 8
TVA Fire Protection P&IDs, Figures II-3 R24, II-4 R21, II-21 R7, II-25, Rev. 7

Safe Shutdown Analysis (Electrical)

45B1766-6D, 480V Reactor MOV BD 1A-1 Compartment 6D, Rev. M
45B1768-5E, 480V, Reactor MOV BD 1B1-B

45N1643-4, Unit Control Board-Panel 1-M-4 Connection Diagrams, Sh. 4, Rev. 14
45N1644-6, Unit Control Boards-Panel 1-M-5, Sh. 6, Rev. Z
45N1660-II, Unit Control Board Panel 0-M-27B, Sh. 14, Rev. W
45N1660-I4, Unit Control Board Panel 0-M-27B, Sh. 14, Rev. T
45N1676-4, SSP Sys Train A, Sh. 4, Rev. AA
45N1676-4 NSSS Protection System Train A, Rev. AAE
45N1677-4, SSP System Train B, Sh. 4, Rev. AAD
45N1688-4, Separation Auxiliary Relay Panel 1-R-73, Sh. 4, Rev. AAA
45N16830-3, NSSS Aux Relay Panel 1-R-54, Rev. HH

45W1614-9, Auxiliary Feedwater Pump & Turbine, Sh. 9, Rev. P
45W1614-9, AFW Pump and Turbine, Sht. 11, Rev. S
45W1614-10, Auxiliary Feedwater Pump & Turbines, Sh. 10, Rev. W
45W1614-11, AFW Pump and Turbine, Sht. 9, Rev. P
45W1635-84, Local Instrument Panels 1-L-381, Rev. M
45W1724-1, 6900V Shutdown BD 1A-A, 1B-B, Rev. K
45W1748-3, 480V Reactor MOV BD 1B1-B, Rev. X
45W1766-2, 480V Reactor MOV BD 1A, Rev. T
45W1766-3, 480V Reactor MOV BD 1A1-A, Rev. U
45W1766-5, 480V Reactor MOV BD 1A, Rev. T
45W1766-8B, 480V Reactor MOV BD 1A1-A Compt 8B, Rev. M
45W1768-2, 480V Reactor MOV BD 1B1-B, Rev. U
45W1768-3, 480V Reactor MOV BD 1B1-B, Rev. X
45W1768-6, 480V Reactor MOV BD 1B1-B, Rev. 9

47W240-2, Fire Protection Compartmentation - Fire Cells El 708 & 713, Rev. 10

1-15E500-1, Key Diagram Station Aux Power System, Rev. 29
1-15E500-2, Key Diagram Station Aux Power System, Rev. 33

1-45W600-46-6, Feedwater Pump and Turbines Schematic Diagrams, Rev. 24
1-45W600-62-3, Wiring Diagrams Chemical & Volume Control Sys Schematic Diagrams, Rev. 4
1-45W600-62-5, CVCS Schematic Diagrams, Rev. 9
1-45W700-1, Key Diagram 120 V AC and 125 V DC Vital Plant Control Power System, Rev. 24
1-45W700-2, Key Diagram 250 VDC, 120 VAC Preferred, 48 VDC & 120 VAC Misc Plant Power Sys, Rev. 17
1-45W703-3, 125 V Vital Battery Board III, Sh. 3, Rev. 38
1-45W703-4, 125 V Vital Battery Board IV, Sh. 4, Rev. 30
1-45W706-1, 120V AC Vital Inst PWR Boards 1-I & 2-I, Sh. 1, Rev. 63
1-45W706-4, 120V AC Vital Inst PWR Boards 1-IV & 2-IV, Sh. 4, Rev. 46
1-45W760-3-1, Main & Auxiliary Feedwater System, Rev. 2
1-45W760-3-7, Main & Auxiliary Feedwater System, Rev. 20

1-45W760-62-1, Chemical Volume Control System, Rev. 15
1-45W760-62-3, Wiring Diagrams Chemical & Volume Control Sys Schematic Diagrams, Rev. 9
1-45W760-62-6, Wiring Diagrams Chemical & Volume Control Systems Schematic Diagrams, Rev. 11
1-45W760-62-7, Wiring Diagrams Chemical & Volume Control Sys Schematic Diagrams, Rev. 12
1-45W760-68-5, Wiring Diagrams Reactor Coolant System Schematic Diagrams, Rev. 18
1-45W760-70-1, Component Cooling System, Rev. 22
1-45W803-2, Auxiliary Feedwater System, Rev. 49

1-47W611-3-1, Feedwater Pump Turbine Auxiliary, Rev. 12
1-47W611-3-2, Feedwater System, Rev. 19
1-47W611-3-3, Auxiliary Feedwater System, Rev. 10
1-47W611-3-4, Auxiliary Feedwater System, Rev. 17
1-47W611-3-4A, Auxiliary Feedwater System, Rev. 0
1-47W611-3-5, Feedwater System, Rev. 7
1-47W611-3-6, Feedwater System, Rev. 18

0123D4593, Metalclad Switchgear, Sh. 4, Rev. K
6947D02, LVME “DS” SWGR 480V Substation, Rev.G
6947D08, LVME “DS” SWGR 480V Shutdown BD 1A-1, Rev. 0
6947D08, LVME “DS” SWGR 480V Shutdown BD 1A1-A, Rev. E
6947D25, LVME “DS” SWGR 480V Shutdown BD 1B1-B, Rev. K

Cable Tray and Conduit

45N824-1, Conduit & Grounding EL 713.0-COLS C1-A8, Q-U Ceiling Plan & Details, Rev. 28
45N824-7, Conduit & Grounding EL 713.0-COLS C1-A8, Q-U Ceiling Plan & Details, Rev. 42
45W880-12A, Conduit & Grounding Cable Trays - EL713.0, COL C1-A8, xxx Plan & Details, Rev. X
45W880-16A, Conduit & Grounding Cable Trays - EL757.0, COL A1-A8, Q-U Plan & Details, Rev. 12
45W880-16B, Conduit & Grounding Cable Trays - EL757.0, COL A8-A15, Q-U Plan & Details, Rev. 6
45W880-25, Conduit & Grounding Cable Trays - EL692.0 & EL713.0 Plan & Details, Rev. 5
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Lighting and Communication

55W1393-1, Communications PSS Radio Repeater System Arrangement and Details, Rev. 5F
55W1393-2, Communications PSS Radio Repeater System Arrangement and Details, Rev. 11G
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Records of Completed Surveillances and Tests

0-FOR-228-1B, Quarterly Inspection and Testing of Emergency Light Battery Packs, Diesel Generator and Control Buildings, Common and Train B Areas (26 February 2007)
0-FOR-228-1A, Quarterly Inspection and Testing of Emergency Light Battery Packs, Diesel Generator and Control Buildings, Common and Train A Areas (12 March 2007)
0-FOR-228-3B, Quarterly Inspection and Testing of Emergency Light Battery Packs, Auxiliary Building Elevations Above 737 B Train and Common Areas (26 March 2007)

Vendor Supplied Information

LEC-361, Lightguard Exclusive Industrial Duty Sealed Lead Calcium Battery, L2081R4
Lightguard F100/F85, LEC-361 or LC-310 Battery Powered Industrial Duty Emergency Unit, L2034R7
Sentry Battery Corporation PM 6420 PM Type Sealed Lead Acid Battery Specification Sheet
WBN-VM-E353-1840, Exide Electronics Corp 8-Hour Emergency Lighting Battery Packs
RADCO Test Data for PM 6420 Battery X2-093, 14 October 2002

Audits and Self-Assessments

SPP 1.6, TVAN Self-Asessment Program, Rev. 13
WBN-OPS-07-008, Snapshot Self-Assessment Report, Transient Combustible Controls, conducted May 2007
NQA Plan Revision Request No. QAP-2001-14
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TVA-NQA-PLN89-A, Nuclear Quality Assurance Plan, Rev. 16, pages 65 & 66.

Misselaneous

Minutes from Watts Bar Nuclear Plant Maintenance Rule Expert Panel (Meeting 98-01), 22 January 1998

LIST OF ACRONYMS

AOI	Abnormal Operating Instruction
AV	analysis volume
CCP	coolant charging pump
CFR	Code of Federal Regulations
CO_2	carbon dioxide
CPPR	construction permit power reactor
ELU	emergency lighting unit
FA	fire area
FPP	fire protection program
FPR	fire protection report
IMC	Inspection Manual Chapter
IP	inspection procedure
NCV	non-cited violation
NFPA	National Fire Protection Association
NPF	nuclear power facility
NRC	Nuclear Regulatory Commission
NUREG	An explanatory document published by the NRC
PER	problem evaluation report
RCS	reactor coolant system
RPS	reactor protection system
SDP	significance determination process
SPP	standard programs and processes
SSD	safe shutdown
SSER	supplemental safety evaluation report
SSA	safe shutdown analysis
UFSAR	Updated Safety Evaluation Report
URI	unresolved item
VCT	volume control tank