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

August 11, 2008

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

SUBJECT: SEQUOYAH NUCLEAR PLANT - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000327/2008006 AND 05000328/2008006

Dear Mr. Campbell:

On June 27, 2008, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Sequoyah Nuclear Plant, Units 1 and 2. The enclosed report documents the inspection results, which were discussed on June 27, 2008, with Mr. T. Cleary and other members of your staff. Subsequently, additional in-office reviews were conducted and the final inspection results were discussed by telephone with Mr. T. Cleary and other members of your staff on August 8, 2008.

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 two 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 Sequoyah 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 Publically 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/

Rebecca L. Nease, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos.: 50-327, 50-328
License Nos.: DPR-77, DPR-79
Enclosure: Inspection Report 05000327/2008006 and 05000328/2008006
w/Attachment: Supplemental Information

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/RA/

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Engineering Branch 2
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Docket Nos.: 50-327, 50-328
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cc: w/encl: (See page 3)

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ADAMS: X☐ Yes ACCESSION NUMBER:ML082250098_____ X☐ SUNSI REVIEW COMPLETE

OFFICE	RII:DRS	RII:DRS	RII:DRS	Triad Fire	RII:DRP	RII:DRS	
SIGNATURE	RA	RA	RA		RA	RA	
NAME	P. Fillion	N. Staples	R. Rodriguez	F. McCreesh	E. Gutherie	S. Walker	
DATE	8/1/2008	8/8/2008	8/5/2008		8/8/2008	8/11/2008	
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	50-327, 50-328
License No.:	DPR-77, DPR-79
Report No.:	05000327/2008006 and 05000328/2008006
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Sequoyah Nuclear Plant
Location:	Sequoyah Access Road Soddy-Daisy, TN, 37379
Dates:	June 9 - 13, 2008 (Week 1) June 23 - 27, 2008 (Week 2)
Inspectors:	P. Fillion, Senior Reactor Inspector (Lead Inspector) F. McCreesh, Fire Protection Engineer (Consultant) N. Staples, Reactor Inspector R. Rodriguez, Senior Reactor Inspector
Accompanying	J. Montgomery, Co-Op Student
Approved by:	Rebecca Nease, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000327/2008006, 05000328/2008006; 06/09 - 13/2008 and 06/23 - 27/2008; Sequoyah Nuclear Plant, Units 1 & 2; Triennial Fire Protection Inspection.

This report covers an announced two-week triennial fire protection inspection by a team of three regional inspectors and one contract inspector. Two Green non-cited violations (NCV) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. 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: A Green NCV of Unit 2 License Condition 13, Fire Protection, was identified since fire detectors in the Unit 2 480 Volt shutdown board room 2B2 were not installed according to the applicable National Fire Protection Association code. Specifically, two detectors were located near forced ventilation fresh air inlets. The licensee entered this issue into their corrective action program and promptly posted a continuous fire watch in the fire area.

  This finding is a performance deficiency because the licensee did not properly locate the smoke detector or the heating, ventilating and air conditioning (HVAC) system supply air inlet registers to adequately comply with the applicable industry code of record for the facility. As a result two of the four smoke detectors would not be effective in detecting fires. 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 substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events. Considering the degree of system degradation, the length of time the problem existed, the calculated fire frequency for the fire area and shutdown systems independent of the fire area the finding was of very low safety significance.

- Green: A green NCV of Unit 1 License Condition 16 and Unit 2 License Condition 13, Fire Protection, was identified for failure to install the automatic suppression system (sprinkler system) in the cable spreading room according to the applicable National Fire Protection Association standard with regard to the ceiling to sprinkler head dimension. As a result, the fusible link type sprinkler heads may be significantly slower than originally intended after fire ignition. The licensee entered this problem into their corrective action program.

  This finding is a performance deficiency because the licensee did not locate the sprinkler heads according to the applicable industry code of record for the facility. 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 substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events. The finding was determined to be of very low safety significance when the likelihood of fires, the transients that could be initiated by fires and the probability of failure of mitigating systems for those transients were evaluated.

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 Sequoyah Nuclear Plant Units 1 and 2 fire protection program (FPP). The team selected three fire areas (FAs) for detailed review to examine the licensee's implementation of the FPP. The three FAs chosen for review were selected based on available risk information as analyzed onsite by a Senior Reactor Analyst from Region II, 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. Other considerations for selecting the FAs were the relative complexity of the post-fire SSD procedure, information contained in FPP documents, and results of prior NRC triennial fire protection inspections. Section 71111.05-05 of the IP specifies a minimum sample size of three fire areas. Detailed inspection of these three fire areas fulfills the procedure completion criteria. The three areas chosen were:

- Dual unit cable spreading room, identified as room number 706.0-C2, part of Fire Area FAC-017. Alternate shutdown type compliance was used for this FA. This room has smoke detectors and sprinklers.

- 480 V board room 2B, identified as room number 749.0-A15, Fire Area FAA-107. 10 CFR 50, Appendix R, III.G.2 type compliance was used for this area. This room has smoke detection and sprinklers and contains motor control centers, inverters, battery chargers.

- Fire Area FAA-029 in auxiliary building, includes one large room and 11 smaller rooms and compartments. This area contains much safety-related equipment. 10 CFR 50, Appendix R, III.G.2 type compliance was used for this area. The area has smoke detection and sprinklers.

For each FA selected, the inspection team evaluated the licensee's FPP against the applicable NRC requirements. The documents reviewed by the team are listed in the Attachment.

.01 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

cooldown and achieve cold shutdown following a severe fire. Particular attention was paid to reactor coolant system inventory control, reactivity control and steam generator inventory control. A secondary objective of reviewing the SSD analysis was to understand its details so it could be determined whether the operations post-fire 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 the SSD capability satisfy the requirements of Appendix R, Section III.G.

b. Findings

No findings of significance were identified.

.02 Passive Fire Protection

a. Inspection Scope

The team inspected the material condition of accessible passive fire barriers surrounding and within the fire areas selected for review. Barriers in use included walls, ceilings, floors, mechanical and electrical penetration seals, doors, and dampers. The team compared the fire barrier ratings in various design documents and drawings to the data contained in the FPR. Construction details and fire endurance test data which established the ratings of fire barriers were reviewed by the team. Engineering evaluations and relevant deviations described in licensee submittals and NRC safety evaluations related to fire barriers were reviewed. Electrical fire barrier raceway systems were observed in the plant to confirm that the appropriate materials and construction methods were used to assure that the respective fire barriers met their intended design function.

b. Findings

No findings of significance were identified.

.03 Active Fire Protection

a. Inspection Scope

The team performed in-plant observations of systems, reviewed design documents, and reviewed applicable National Fire Protection Association (NFPA) codes and standards, to assess the material condition and operational lineup of fire detection and suppression systems. The appropriateness of detection and suppression methods for the category of fire hazards in the various areas was reviewed.

The team reviewed the fire detection surveillance instructions as well as the most recently completed surveillance tests for each of the three selected FAs. The criteria applied to this portion of the inspection was that each detector has the capability to detect smoke and actuate a signal at its respective local fire alarm control panel as well as in the main control room.

The team reviewed the fire brigade staging and dress-out areas to assess the operational readiness of fire fighting and smoke control equipment. The fire brigade personal protective equipment and the self-contained breathing apparatuses were reviewed for adequacy and functionality. The team also reviewed operator and fire brigade staffing, fire brigade response, fire brigade qualification training, and the fire brigade drill program procedures. Two fire brigade response-to-drill scenarios that transpired over the last six months were reviewed. The team reviewed the pre-fire plans for the selected areas to verify that these plans were consistent with industry practice.

The team reviewed selected fire protection water delivery and supply system components required for manual fire fighting and/or water-based fixed automatic fire suppression systems to verify that the components would not be damaged or inhibited from fire-induced failures of electrical power supplies or control circuits. The team reviewed the fire hazards analysis to verify that the availability of the fire pumps was evaluated for the selected fire areas. The team reviewed the hydraulic calculations for the yard main underground piping loop supply system (plant hydraulic base model) and the hydraulic calculation for the 480 V board room 2B. The review included the checking of various nodes, elevations and pipe lengths to assure that the calculations were performed in a technically acceptable manner.

b. Findings

(1) Layout of Sprinkler System in the FAA-029

The team observed a number of water suppression sprinkler heads in the eastern portion of the Auxiliary Building Elev. 690' (Room 690.0-A1, Fire Area FAA-029) that were located approximately six feet below the ceiling. These sprinkler heads are part of an NFPA 13 preaction sprinkler system which requires that the sprinkler heads in this area be no more than 12 inches below the ceiling. The sprinkler system in this area would not be effective in a response to a fire since the time delay to fuse any particular sprinkler head could be significant due to the location of the sprinkler heads. This portion of the sprinkler system does not meet the requirements of NFPA 13 and the licensee could not produce an evaluation or analysis that demonstrated the capability of this system to adequately control a potential fire in this area. However, the licensee claimed that the installation had been previously approved by the NRC; therefore, considered the system non-degraded. They did, however, initiate a Problem Evaluation Report (PER) to evaluate the condition. In order to determine all the facts concerning the licensing basis of the system and to review the potential acceptability of the as-built system with its code deviation an URI was established: URI 05000327, 328/2008006-02, Sprinkler System in Room 690.0-A1 of the Auxiliary Building has NFPA Code Deviation.

(2) Smoke Detectors Located Near HVAC Supply Air Inlets

Introduction: A Green NCV of Unit 2 License Condition 13, Fire Protection, was identified since fire detectors in the Unit 2 480 V shutdown board room 2B2 were not installed according to the applicable NFPA code.

Description: The 480V Shutdown Boardroom 2B2 on elevation 734' of the Auxiliary Building (Room 734.0-A18, Fire Area FAA-082) contains four smoke detectors, which would be sufficient to meet the spacing requirements of NFPA 72E, 1974, Automatic Fire Detectors. However, two of the detectors were placed in proximity to the air inlet supply

stream of the heating ventilating, and air conditioning (HVAC) system for this room, which would interfere with their ability to detect and respond to smoke from a fire in the room. The Team observed that the flow of air emanating from the air inlets was of sufficient velocity and volume to divert any smoke away from the detector. This determination was based on the fact that hanging conduit tags near the detectors could be observed briskly swaying in the air stream. The NFPA code governing automatic fire detectors specifically addresses the issue. Section 4-5.1.5 of NFPA 72E, 1974, Automatic Fire Detectors, states in part that where forced ventilation is present, detectors shall not be mounted near fresh air inlets. In response to this finding, the licensee initiated PER 147263. This PER recognized that operability of the fire detection system in the room was affected and that a functional evaluation should be performed and completed by July 14, 2008. In the interim, a continuous fire watch was posted in the 480 V shutdown board room. The team verified that the fire watch was in place. The team considered the continuous fire watch to be an adequate temporary compensatory measure to approximate the intended defense in depth until the automatic detection system could be made code compliant.

Analysis: This finding is a performance deficiency because the licensee did not properly locate the smoke detection or the HVAC supply air inlet registers to adequately comply with their NFPA detection code of record. As a result two of the four smoke detectors would not be effective in detecting fires. 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 substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events.

The risk significance of the finding was determined using Manual Chapter (MC) 0609, Appendix F, Fire Protection Significance Determination Process. Pursuant to MC 0609, Appendix F, the degradation category was “fixed fire protection” and the degradation rating was “moderate.” The duration factor was equal to one. Ignition sources in the fire area were general electrical cabinets consisting of load centers and motor control centers. There were 33 sections of these cabinets. Through on-site examination of the fire area it was determined that only one train of SSD equipment and cables existed in the room. Therefore one train of SSD equipment remained unaffected by the fire. Using this data, the finding screened to very low safety significance, Green, at Task 2.4.4 of MC 0609, Appendix F.

Enforcement: Unit 2 License Condition 13, Fire Protection, 10 CFR 50.48 states:

> TVA shall implement and maintain in effect all provisions of the approved fire protection program referenced in the Sequoyah Nuclear Plant’s Final Safety Evaluation Report and as approved in NRC Safety Evaluation Reports contained in NUREG-0011, Supplements 1, 2 and 5, NUREG-1232, Volume 2, NRC letters dated May 29 and October 6, 1986, and the Safety Evaluation issued on August 12, 1997, for License Amendment No. 218, subject to the following provision: TVA may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

The Sequoyah FPR, Part VI, Section 3.3, states that NFPA 72E, 1974, Automatic Fire Detectors was used to evaluate the adequacy of existing fire protection features against

code requirements.

Contrary to the above, the installed configuration of the smoke detectors in the 480V Shutdown Boardroom 2B2 on elevation 734' of the Auxiliary Building did not meet the requirements of NFPA 72E, 1974, in that two detectors were located near forced ventilation fresh air inlets. This problem existed for many years. Because this degradation of the approved fire detection system is of very low safety significance and has been entered into the licensee's corrective action program as PER 147263, this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy. It is identified as NCV 05000328/2008006-01, Fire Detectors in 480 Shutdown Board Room 2B2 Not Installed According to NFPA Code.

.04 Protection from Damage from Fire Suppression Activities

a. Inspection Scope

The team walked down the selected FAs to verify that redundant trains of systems required for hot shutdown, where located in the same fire area, were not 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 all redundant trains. The team also reviewed engineering evaluations that addressed the inadvertent operation of fire protection systems and their effect on safety-related systems or components.

b. Findings

No findings of significance were identified.

.05 Methodology and Operational Implementation for Shutdown from the Main Control Room and Alternate Shutdown

a. Inspection Scope

The team reviewed the current version of the Sequoyah Nuclear Plant FPR to determine the systems and components credited for SSD in the three FAs selected, as well as those systems and components potentially affected by a fire in the FA. System piping & instrumentation and electrical one-line diagrams were also reviewed to check the accuracy of the FPR in identifying components and power sources. For a severe fire in the cable spreading room located in the control building, the FPR indicated that the main control room would be abandoned and SSD would be controlled from the auxiliary control room located in the auxiliary building. Therefore, the team reviewed electrical schematics to confirm that circuits which interconnected devices in the main control room and the auxiliary control room contained isolation/transfer switches to allow isolation of potentially fire damaged portions of the circuits. The team reviewed the program and its implementation for testing the isolation/transfer switches.

The team reviewed the operational implementation of the SSD strategy described in the FPR. The FPR strategy was compared to the SSD procedures. Each step in the SSD procedures was evaluated to determine the likelihood of successful completion using the guidance in Section 11(B) of IP 71111.05T. This evaluation included a walkthrough of each procedure step. In cases where the FPR specified that a particular operator action

should take place within a definite time period following detection of a fire, the team measured the time in simulated walkthroughs of those procedure steps.

The team inspected and evaluated the readiness of the operations staff to perform the SSD. This was done through a review of shift manning logs for a sample of days in the past two years, review of completed job performance measures, verification of protective gear availability and direct observation of operators' ability to locate the components involved in local, "outside the control room," procedural actions.

b. Findings

No findings of significance were identified.

.06 Circuit Analysis

a. Inspection Scope

For each of the three 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 Fire Hazards Analysis Calculation, the Major Equipment and Instrumentation Affected List, the Components' Block Diagrams, cable routing information, and calculations. The team also evaluated the potential effects of open circuits, short circuits, and shorts to ground for the selected equipment. The criterion for acceptance was that a fire in any of the FAs would not defeat the capability to achieve and maintain SSD. The list of components reviewed is contained in the Attachment.

b. Findings

No findings of significance were identified.

.07 Communications

a. Inspection Scope

The team reviewed the plant communications systems that would be relied upon to support safe shutdown, fire event notification, and fire brigade fire fighting activities. The team assessed selected fire brigade sites for portable radio storage to verify proper operation and effectiveness of communications during fire events and to identify any operational or performance problems with radio communications. The team assessed the capability of the sound powered phones and reviewed cable routing for plant radios and plant phones to verify that communication equipment would not be affected by a fire. The team requested a demonstration of the sound powered phones and periodic testing for the system as well.

b. Findings

No findings of significance were identified.

.08 Emergency Lighting

a. Inspection Scope

The team reviewed the adequacy of the emergency lighting units (ELUs) used to support plant personnel during post-fire safe shutdown for the selected FAs. The team performed plant walkdowns and observed the placement and coverage area of fixed 8-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. The team observed random testing of select emergency lighting to verify the functionality. The team also reviewed other lighting systems used in the plant such as the diesel lighting system, and the LD lighting circuit powered from the 125V Vital Battery Boards.

The team observed whether emergency exit lighting was provided for personnel evacuation pathways to the outside exists as identified in NFPA 101, Life Safety Code, and the Occupational Safety and Health Administration (OSHA) Part 1910, Occupational Safety and Health Standards. This review also included examination of whether backup ELUs were provided for the primary and secondary fire emergency equipment storage locker locations and dress-out areas in support of fire brigade operations should power fail during a fire emergency.

The team reviewed the design, operation, and testing of the ELUs to verify that they met the requirements of 10 CFR 50, Appendix R, Section III.J. The team also reviewed manufacturers' data sheets to check if they had at least an 8-hour capacity and the recommended maintenance was being performed. Copies of the last two performances of the 8-hour discharge test (conducted at 18 month interval) and the inspection/cleaning (conducted quarterly) were reviewed. In cases where an ELU failed the surveillance test, the team followed up on the corrective action and programmatic treatment. A sample of work requests written to replace ELUs which failed the surveillance was reviewed to confirm that the work was timely completed.

b. Findings

No findings of significance were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The team reviewed the licensee's safe shutdown procedures to determine if any repairs were necessary to achieve cold shutdown. The team also verified inventory in support of operations should cold shutdown repairs be necessary during a fire emergency. The team verified that the licensee had adequate measures described in Abnormal Operating Procedures AOP-C.04 "Shutdown from Auxiliary Control Room" and AOP-N.08 "Appendix R Fire Safe Shutdown" for achieving cold shutdown operations. The team also independently

verified equipment, tools, and supplies used for repairing equipment, following a fire, and needed to bring the units from hot standby to cold shutdown.

b. Findings

No findings of significance were identified.

10. Compensatory Measures

a. Inspection Scope

The team reviewed the administrative controls for out-of-service, degraded, and/or inoperable, fire protection features (e.g., detection and suppression systems and equipment, passive fire barriers, or pumps, valves or electrical devices providing post-fire safe shutdown functions or capabilities). The team reviewed selected fire protection impairment permits and compared them with the conditions and actions required in their fire protection program for degraded fire protection components. The compensatory measures that had been established in these impairments were compared to those specified for the applicable fire protection feature to verify that the risk associated with removing the fire protection feature from service was properly assessed and adequate compensatory measures were implemented in accordance with the approved FPP.

Additionally, the team reviewed the licensee's short term compensatory measures (compensatory fire watches) to verify that they were adequate to compensate for a degraded function or feature until appropriate corrective action could be taken and that the licensee was effective in returning the equipment to service in a reasonable period of time.

According to previously generated PER 145212, a fire watch was in place as part of a compensatory measure for a degraded Thermo-Lag fire barrier located on elevation 690' of the Auxiliary Building (Room 690.0-A1, Fire Area FAA-029). The fire watch was observed on one of his rounds in the area of concern. No issues were identified with the conduct or observations made by the fire watch for this degraded barrier.

b. Findings

No findings of significance were identified.

11. Control of Combustibles and Ignition Sources

a. Inspection Scope

The team reviewed the administrative control of combustible materials and ignition sources. Plant administrative procedures were reviewed to determine if adequate controls were in place to control the handling of in-situ and transient combustibles in the plant. The team inspected numerous areas in the plant for control of combustible materials, storage of in-plant materials, transient combustibles and general housekeeping. Plant materials appeared to be stored in heavy gauge steel containers with lids or doors to preclude the potential to involve these materials in a potential fire. Adequate controls were in place to control hot work in order to control the potential for

ignition sources. There were no hot work activities ongoing during the inspection so that observation of this activity could not be performed.

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 Nuclear Assessment Audits SSA 0501, dated June 1, 2005, and SSA 0605, dated April 27, 2007. Both these audits were triennial scope audits.

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. These audits were complete and comprehensive, and identified a number of problems, which were entered into the licensee's corrective action program. The 2005 audit, SSA 0501, identified an issue with the ability to carry out operator actions within the time frame of the limiting analysis. The level B PER, which requires a root cause analysis, was processed to address this issue.

4OA5 Other

(Open) URI 05000327, 328/2005011-06, Potential for Fire Damage to Spuriously Open a Containment Sump Isolation Valve.

The licensee's actions in relation to this URI were reviewed as well as the risk significance of the issue. The URI was originally established for the NRC to review the licensing basis related to multiple intra-cable short-circuits. The technical issue involved two fire-induced short-circuits within a multi-conductor control cable for flow control valve FCV-63-73 which could cause the valve to spuriously open and provide a flow path from the reserve water storage tank the containment sump. In the case of FCV-63-73, no single short-circuit within the control cables could cause spurious operation. Review of the licensee's circuit analysis documents revealed that the licensee's design basis was to design against one inter-cable short-circuit. Their design basis documents stated that two simultaneous short-circuits between specific sets of conductors, while other conductors in the same cable remained intact was not a credible event. The licensee stated that this approach had been reviewed and approved by the NRC and, therefore, was their licensing basis. The licensee did not present any documents that supported this licensing basis contention. NRC Regulatory Information Summary (RIS) 2004-03,

Rev.1, states that for any individual multi-conductor cable the fire-induced short-circuiting of any combination of conductors, regardless of number, may be postulated. This statement was based on the results of fire testing of cables that demonstrated that such an occurrence was credible as it actually occurred during the testing.

During the inspection, the inspector reviewed the control circuit in question and confirmed that it would take two short-circuits to produce the spurious operation. The inspector also made an in-plant inspection of the route of the cables in question. The cable ran from a motor control center in the auxiliary building to the main control room. This revealed that the only ignition sources in the vicinity of the cables were the particular motor control center section from which the circuit emanates and the control panel in the main control room where the valve control switch is located. The inspector, in consultation with the Senior Reactor Analyst, performed a qualitative analysis of the risk significance of the postulated scenario, i.e. fire-induced short-circuit results in spurious opening of valve FCV-63-73, incorporating the facts obtained during the inspection. The following would tend to make the finding very low safety significance:

- One ignition source in the auxiliary building portion of the route.
- An isolation transfer switch was provided to isolate the circuit from the control building.
- The relatively low probability of the postulated failure mode involving spurious actuation, two “smart” short-circuits in a circuit powered from a control transformer, which testing showed was the least likely type of control circuit to sustain a spurious operation.
- Fire at the motor control center in question would damage only a few circuits, and recovery from reserve water storage tank drain down to the containment sump would be possible.

The inspectors, in consultation with the Nuclear Reactor Regulation (NRR) program office for fire protection, concluded that characterization of this issue in terms of a performance deficiency or violation should wait until the generic industry issue of multiple spurious operations is resolved. Therefore this URI will remain open.

(Closed) URI 05000327, 328/2005011-03, Sprinklers Apparently too far below Ceiling in Cable Spreading Room

Introduction: A green NCV of Unit 1 License Condition 16 and Unit 2 License Condition 13, Fire Protection, was identified for failure to install the automatic suppression system (sprinkler system) in the cable spreading room according to the applicable National Fire Protection Association (NFPA) standard with regard to the ceiling to sprinkler head dimension. As a result, the actuation of the fusible link type sprinkler heads may be significantly slower than originally intended after fire ignition.

Description: This unresolved item concerning the design of the sprinkler system in the cable spreading room (room number 706.0-C2) was opened at the time of the 2005 triennial fire protection inspection for two reasons: (1) to determine if the as-built configuration had been approved by the NRC, and (2) to review the capacity and capability of the as-built configuration to suppress fires.

The team reviewed of all the licensing basis documents listed in License Condition 16 (Unit 1) and License Condition 13 (Unit 2) and did not find that the NRC had reviewed and approved the sprinkler head to ceiling dimension, nor did the team find that the NRC approved a deviation from the NFPA code of record. Supplement 1 of NUREG 011 (a Safety Evaluation Report), Section 9.5. II.A, states that the sprinkler systems are installed in accordance with NFPA Standard 13. Supplement 1, Section 9.5.IV, states that the cable spreading room has an automatic pre-action sprinkler system and a manual total flooding carbon dioxide system. These and other documents reviewed are listed in the Attachment to this report. The conclusion from the review of historical documents was that there is no documented approval of a sprinkler system in the cable spreading room or any other room deviating from the NFPA codes with regard to the sprinkler head to ceiling dimension.

The cable spreading room is installed directly below the dual unit control room. It contains the vast majority of cables running between points in the plant and the control room. The floor area of the room is approximately 219 feet by 42 feet and the height is 25 feet. There is one north-south girder running 219 feet down the center of the room and beams running perpendicular to the girder. A typical beam was measured by the team at 22 ½ inches deep. A typical "pocket" formed by the girder and beams is 21 feet by 6 ½ feet (136.5 sq. ft.), although some are 21 by 8 (168 sq. ft.). Sprinkler heads are installed at two levels. Sprinklers at the upper level are about 30 inches below the ceiling or about 22' – 6" from the floor. Their spacing varies but there is a maximum of 10 feet between sprinklers. There are two levels of sprinklers. Sprinklers at the lower level are about 12 feet from the floor. The lower level sprinkler heads are offset horizontally from the upper level. There are a total of 115 sprinkler heads in the upper group and 119 in the lower. All the sprinkler heads were fitted with square metal caps or covers of about 18 inches by 18 inches dimension just above the heads. The metal covers have edges turned down on three sides.

The type of construction for this room as defined by NFPA Std. 13-1975 is either "beam and girder" or "panel." As such, the maximum specified distance of sprinkler heads below the ceiling is 16 inches or 18 inches, respectively. Therefore, the upper level sprinklers are 12 to 14 inches greater distance below the ceiling than specified in the NFPA standard. For panel construction the NFPA standard would allow a sprinkler head to be 22 inches below the ceiling if it is located directly below a beam rather than in a bay, but the sprinkler heads in the spreading room are in the bays and not directly below a beam. In terms of the horizontal distance between sprinkler heads and coverage requirements, the spacing of the upper level is within the NFPA Std 13 requirements.

According to design documents, the sprinkler heads are Model QE manufactured by Star Sprinkler Corp. which are UL approved (or equal). They are large orifice type, standard release, upright pendent with a ½ inch National Pipe Thread (NPT) connection, rated 212 degrees F, intermediate temperature class. They are fusible link type, brass or bronze body, designed to operate in less than one minute. Since the cable spreading room is an air conditioned room, a sprinkler head of a lower temperature rating should have been used. While the 212 degree F rating is not a definite code deviation, it results in a slower response, especially since the sprinkler heads are not at the recommended distance from the ceiling.

In conclusion, the sprinkler heads are installed at 30 inches below the ceiling which

places them below the beams and below the ceiling jet. This installation results in a very slow system response, and does not meet NFPA Std 13-1975.

Analysis: This finding is a performance deficiency because the licensee did not locate the sprinkler heads according to the applicable industry code of record for the facility. 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 substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events. The risk significance of the finding was determined using Manual Chapter (MC) 0609, Appendix F, Fire Protection Significance Determination Process. Pursuant to MC 0609, Appendix F, the finding category was "fixed fire protection systems." The nature of the degradation of the water based suppression system is related to the response time of the system. The low placement of sprinklers together with the 212 degree F temperature rating of the sprinkler heads will result in a response time slower than that of a system that meets NFPA Std 13. A degradation rating of "high," as defined by MC 0609, Appendix F, must be assigned since a "moderate" degradation rating cannot be supported by technical reasoning. The duration factor was equal to one. The ignition source of interest is non-IEEE Std 383 qualified cables. Since the performance deficiency affects the automatic fire suppression system and the ignition source of interest is non-qualified cable, there is no obvious fire damage target. Therefore, a worst case scenario involving a loss of offsite power and shutdown from the auxiliary control room was evaluated to determine the significance. No credit was given for fire suppression since it could not be assured that a fire could be suppressed before operators would have to make the decision to implement the alternate shutdown procedure. This is based on the facts that the response time of the suppression system could be very long, the postulated fire is a self-ignited cable, and manual suppression would be delayed due to the difficulty in pinpointing the exact location of the fire in a large room. The generic fire frequency for self-ignited cable fires given in MC 0609, Appendix F, was adjusted with a weighing factor in accordance with Attachment 5. An initiating event likelihood of 1.4 E-4 was conservatively assigned. Once the initiating event likelihood was determined, the significance determination process worksheet for loss of offsite power was evaluated. A probability of failure of each safety function shown on the worksheet was assigned considering the operational lineup dictated by Abnormal Operating Procedure AOP-C.04, Shutdown from Auxiliary Control Room. This procedure requires local operator actions to be performed to accomplish certain functions which would otherwise be automatic functions, and failure probabilities were assigned accordingly. The result of the analysis was that the finding was of very low safety significance, Green.

Enforcement: Sequoyah License Condition 16 for Unit 1 and License Condition 13, Fire Protection, for Unit 2 require that TVA implement and maintain in effect all provisions of the approved fire protection program referenced in the Sequoyah Nuclear Plant's Final Safety Analysis Report (FSAR). FSAR Section 9.5.1.1 states that the Fire Protection System and fire protection features are described in the FPR. The FPR, Part II, Section 14.3, Page 54, requires that the sprinkler system for the cable spreading room be operable. The FPR, Part VI, Section 3.3 states that NFPA 13-1975, Automatic Sprinkler Systems, is the code used to evaluate the adequacy of the sprinkler systems. NFPA 13, Section 4-3.2.2 (beam and girder construction) states that sprinklers shall be located not more than 20 inches below floor decks and Section 4-3.4.2 (panel construction) states that sprinklers shall be located not more than 22 inches below the floor deck.

Contrary to the above, the cable spreading room has either “beam and girder” or “panel” construction and the sprinklers are located 30 inches below the floor deck. Because this finding is of very low safety significance and has been entered into the corrective action program as PER 147467, 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 05000327, 328/2008006-03, Sprinklers too far below Ceiling in Cable Spreading Room.

(Closed) URI 05000327, 328/2005011-07, Potential for Fire Damage to Spuriously Close the Charging Header Flow Control Valve

Flow control valve FCV-62-93 in the chemical and volume control system (CVCS) is an air operated valve. Its position in the CVCS is at the discharge of the charging pumps, and its spurious closure would shut off all flow to the reactor coolant pump (RCP) seals. The safe shutdown strategy is to maintain flow to the RCP seals (or re-establish flow within 13 minutes). Make-up to the reactor coolant system would be via seal injection. The normal charging path is shut off by operators in accordance with the SSD procedure. Air-operated valve FCV-62-93 would fail in the open position (the desired position) on loss of air or loss of electrical signal. However, the valve position is controlled with an instrumentation controller. The instrumentation loop works on a 10 – 50 milliampere signal: 10 milliamperes to open and 50 milliamperes to close. The instrumentation cables to the valve are shielded twisted pairs with drain wire and cross-linked polyethylene insulation with polyvinyl chloride jacket. The cables run in cable tray with other similar type cables carrying 10 – 50 milliampere signals. The URI was established to evaluate the possibility/credibility that a fire-induced cable to cable interaction could inject 50 milliamperes from a cable carrying 50 milliamperes into the target cable and cause the valve to close.

The team determined that the failure mode described above was not a credible failure mode for design consideration. Regulatory Issues Summary (RIS) 2004-03 documented the results of testing of fire-induced cable failures sponsored by the Nuclear Energy Institute and the Electric Power Research Institute. This testing and the RIS indicate that cable to cable interactions need not be postulated between two cables having thermosetting insulation such as cross-linked polyethylene. Evaluation of the equivalent electric circuit modeling the postulated cable interaction including the instrument loop components leads to the conclusion that 50 millampers carried by an aggressor cable would split between the aggressor and target circuits, and therefore it would be impossible for the valve to receive a full close signal. The URI is closed with no finding.

4OA6 Meetings, Including Exit

On June 27, 2008, the lead inspector presented the inspection results to Mr. T. Cleary, Site Vice President, and other members of the licensee’s staff. Post-inspection in-office reviews and analysis of significance of findings resolved certain open issues, and the final results of the inspection were presented to Mr. T. Cleary and other members of the licensee’s staff on August 8, 2008. The licensee acknowledged the findings. Proprietary information is not included in this report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel:

J. Campbell, Electrical Design Manager
M. Casner, Engineering Design Manager
C. Church, Plant Manager
T. Cleary, Site Vice President
L. Cross, Maintenance manager
R. Egli, Engineering Programs Engineer
M. Hicks, Performance Improvement Manager
K. Jones, Manager Site Engineering
P. Johnson, Fire Protection Supervisor
D. Porter, Operations Procedure Writer
R. Proffitt, Licensing Engineer
P. Simmons, Operations Manager
J. Smith, Licensing Manager
E. Turner, Electrical Design Engineer
G. Vickery, Manager Nuclear Assurance

NRC Personnel:

H. Barrett, Engineer, Fire Protection Branch, NRR
K. Kennedy, Director, Division of Reactor Safety, Region II
A. Klein, Branch Chief, Fire Protection Branch, NRR
R. Nease, Branch Chief, Engineering Branch 2, Region II
C. Young, Senior Resident Inspector, Sequoyah Nuclear Plant

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000327, 328/2008006-02	URI	Sprinkler System in Room 690.0-A1 of the Auxiliary Building has NFPA Code Deviation (1R05.03.b (1))

Opened and Closed

05000328/2008006-01	NCV	Fire Detectors in 480 V Shutdown Board Room 2B2 Not Installed According to NFPA Code (1R05.03.b (2))
05000327, 328/2008006-03	NCV	Sprinklers too far below Ceiling in Cable Spreading Room (4OA5)

Closed

05000327, 328/2005011-03	URI	Sprinklers Apparently too far below Ceiling in Cable Spreading Room (4OA5)
05000327, 328/2005011-07	URI	Potential for Fire Damage to Spuriously Close the Charging Header Flow Control Valve (4OA5)

Discussed

05000327, 328/2005011-06	URI	Potential for Fire damage to Spuriously Open a Containment Sump Isolation Valve (4OA5)

LIST OF COMPONENTS INSPECTED
(Refer Report Section 1RO5.06 Circuit Analysis)

1-FCV-062-054	Excess Letdown Isolation Valve
1-FCV-062-055	Excess Letdown Isolation Valve
1-FCV-062-056	Excess Letdown Isolation Valve
1-LCV-062-133	Volume Control Tank Outlet Isolation Valve
2-LCV-062-132	Volume Control Tank Outlet Isolation Valve
2-LCV-062-133	Volume Control Tank Outlet Isolation Valve
2-PMP-003-118	Motor driven Auxiliary Feedwater Pump A
2-PMP-003-128	Motor Driven Auxiliary Feedwater Pump B
1-PMP-003-142	Turbine Driven Auxiliary Feedwater Pump
1-PCV-001-012	Loop 2 Atmospheric Relief Valve
1-PCV-001-023	Loop 3 Atmospheric Relief Valve
2-PCV-001-012	Loop 2 Atmospheric Relief Valve
2-PCV-001-023	Loop 3 Atmospheric Relief Valve
1-FCV-068-332	Pressurizer Relief Block Valve
1-PCV-068-334	Pressurizer Power Operated Relief Valve
2-FCV-068-332	Pressurizer Relief Block Valve
2-FCV-068-333	Pressurizer Relief Block Valve
2-FSV-068-396	Reactor Vessel Head Vent Throttle Valve
2-FSV-068-397	Reactor Vessel Head Vent Throttle Valve
1-FCV-062-093	Charging Flow Control Valve & Flow Indicator
1-T-068-001	Loop #1 Hot Leg Temperature
1-T-068-065	Loop #4 Hot Leg Temperature
2-L-003-171	Steam Generator #4 Narrow Range Level
2-T-068-001	Loop #1 Hot Leg Temperature
2-T-068-065	Loop #1 Hot Leg Temperature

LIST OF DOCUMENTS REVIEWED

Applicable Codes and Standards

NFPA 72E-1974, Automatic Fire Detectors
NFPA 13, 1975, Installation of Sprinkler Systems
NFPA 13, 1983, Installation of Sprinkler Systems
NFPA 80, 1981, Installation of Fire Doors and Windows

Procedures

AOP-C.04, Shutdown from Auxiliary Control Room, Rev.15
AOP-N.01, Plant Fires, Rev. 26
AOP-N.08, Appendix R Fire Safe Shutdown, Rev. 18
0-SI-FPU-013-608.0, Rev. 0, Fire Detection Panel 0-L-608 Test
0-SI-FPU-410-703.0, Rev. 4, Inspection of FPR Required Fire Doors
0-SI-FPU-013-608.0, Rev. 4, Fire Detection Panel 0-L-608 Test
SQN Fire Drill Evaluation Manual, Rev. 4, issued 3/10/2005
SPP-10.9, Rev. 2, Control of Fire Protection Impairments
SPP-10.10, Rev. 4, Control of Transient Combustibles
SPP-10.11, Rev. 3, Control of Ignition Sources (Hot Work)
SPP-4.0, Rev. 0, TVAN Standard Programs and Processes – Materials and Services
FPDP-2, Rev. 0, Administration of Prefire Plans
Special Maintenance Instruction SMI-0-317-18 Appendix R – Casualty ProceduresC.1] Rev. 10
0-PI-FPU-317-538.0 Equipment Inventory Rev. 0007
0-SI-FPU-247-006.0 DGB App. R EL Discharge Test Rev. 6 & Rev. 8
0-SI-FPU-247-003.0 DGB App. R EL Quarterly Test Rev. 0005 & Rev. 0006
0-SI-FPU-247-005.0 T&CB App. R EL Discharge Test Rev. 7 & Rev. 9
0-SI-FPU-247-002.0 T&CB App. R EL Quarterly Test Rev. 7 & Rev. 8
0-SI-FPU-247-004.0 Aux. Buil. App. R EL Discharge Test Rev. 11 & 12
0-SI-FPU-247-001.0 Aux. Buil. App. R EL Quarterly Test Rev. 0014 & 0015
0-SI-OPS-070-032.B, Component Cooling Water Valves Position Verification Train B, Rev. 0012
0-PI-OPS-000-708.0, 10 CFR50 Appendix R Compliance Verification, Rev. 0012
0-PI-OPS-244-528.0, Sound Powered Telephones Annual Test, Rev. 2
0-SI-FPU-247-004.0, Auxiliary Building Appendix R Emergency Lighting Discharge Test, Rev. 0
2-PI-OPS-000-003.0, Periodic Stroking of Unit 2 Time Critical Valves, Rev. 0002
OPL273C0601, AOP-C.04 Control Room Inaccessibility
OPL273C0806, AOP-C.04 Control Room Inaccessibility
OPL273C0701, AOP-C.04 Control Room Inaccessibility
OPN218PS-AOP-C.04, AOP-C.04 Control Room Inaccessibility
JPM#6, Perform Boration of the RCS from Outside the MCR
JPM#14, Control Room Inaccessibility (Fire in the Spreader Room)
JPM#66, Control S/G PORVs from the Aux. Control Room
JPM#66AP, S/G PORVs from the Aux. Control Room
JPM#81, Respond to Decreasing RCS Pressure form the Aux. Control Room
JPM#91, Transfer Controls to the Auxiliary Mode per Checklist 3
JPM#91AP, Transfer Controls to the Auxiliary Mode per Checklist 3 (SD Bd De-Energized)
JPM#93, Transfer Controls to the Auxiliary Mode per Checklist 5 of AOP-C.04
JPM#217, Transfer Controls to the Auxiliary Mode per Checklist 6 of AOP-C.04

Completed Surveillance or Test

0-PI-OPS-000-708.0, Rev. 12, 10CFR50 Appendix R Compliance Verification (Verification of Radio Reception – Completed test of 6/7/08)
0-PI-OPS-000-708.0, Rev. 11, 10CFR50 Appendix R Compliance Verification (Verification of Motor Operated Valves – Completed test of 5/16/08)
0-PI-OPS-244-528.0, Rev. 2, Sound Powered Telephones Annual Test (Completed test of 7/11/07)
0-SI-FPU-247-006.0 DGB App. R EL Discharge Test Rev. 6, completed 8/6/06
0-SI-FPU-247-006.0 DGB App. R EL Discharge Test Rev. 8, completed 12/21/07
0-SI-FPU-247-003.0 DGB App. R EL Quarterly Test Rev. 0005 completed 12/15/07
0-SI-FPU-247-003.0 DGB App. R EL Quarterly Test Rev. 0006 completed 3/13/08
0-SI-FPU-247-005.0 T&CB App. R EL Discharge Test Rev. 7 completed 8/16/06
0-SI-FPU-247-005.0 T&CB App. R EL Discharge Test Rev. 9 completed 12/30/07
0-SI-FPU-247-002.0 T&CB App. R EL Quarterly Test Rev. 7 completed 12/21/07
0-SI-FPU-247-002.0 T&CB App. R EL Quarterly Test Rev. 8 completed 3/15/08
0-SI-FPU-247-004.0 Aux. Buil. App. R EL Quarterly Test Rev. 11 completed 4/3/06
0-SI-FPU-247-004.0 Aux. Buil. App. R EL Quarterly Test Rev. 12 completed 8/10/07
0-SI-FPU-247-001.0 Aux. Buil. App. R EL Quarterly Test Rev. 14 completed 12/23/07
0-SI-FPU-247-001.0 Aux. Buil. App. R EL Quarterly Test Rev. 15 completed 3/17/08
0-PI-EBT-244-001.0, Performance Testing of 48Vdc Telephone Batteries, 04/05/04
6.9kV SDBD 2A-A Normal Feeder Breaker 1818 Relay, Meter, Transducer and Remote Meter Calibration, 05/12/05
Containment Spray Pump 2A-A on 6.9kV SDBD 2A-A Relay, Ammeter, and Transducer Calibration, 12/21/05
1-PI-OPS-000-010.A, Verification of Remote Shutdown Transfer Switches, 11/02/07
1-PI-OPS-000-010.B, Verification of Remote Shutdown Transfer Switches, 05/29/03
1-PI-OPS-000-010.C, Verification of Remote Shutdown Transfer Switches, 11/16/04
1-PI-OPS-000-010.D, Verification of Remote Shutdown Transfer Switches, 06/09/06

Self-Assessments and Audits

SQN-ENG-08-001, Focused Self-Assessment on Specific Elements of 10CFR50 Appendix R
Pre-NRC Triennial Fire Protection Inspection
Nuclear Assessment Audit, SSA 0301, dated March 21, 2003
Nuclear Assessment Audit, SSA 0501, dated June 1, 2005
Nuclear Assessment Audit, SSA 0605, dated April 27, 2007

Miscellaneous Documents

Fire Drill Critique Report # FPT 218.530, dated 10/16/07
Fire Drill Critique Report # FPT 218.540, dated 11/29/07
Fire Drill Critique Report # FPT 218.540, dated 1/06/08
Fire Drill Critique Report # FPT 218.100, dated 4/25/08
Fire Drill Critique Report # FPT 218.520, dated 5/1/08
Fire Protection Impairment Permit #FOR 08-0146, Thermo-Lag Fire Wrap (Cables 1PP564B and 2PP552A)
Fire Protection Impairment Permit #FOR 08-0172, 0-VLV-39-545
Fire Protection Impairment Permit #FOR 08-0160, HPFP Fire Pumps
Fire Protection Impairment Permit #FOR 08-0164, Fire Detection Panel 0-L-609

Incident Investigation Final Event Report II No. SQ930417II, “Hinges on Swinging Hollow Metal Fire Doors Do Not Conform to Material Requirements of NFPA 80”.
Engineering Change Notice L5000, Modifications resulting from commitments made to the NRC in response to questions 1 & 11.B of 9-1-78
NEDP-10-21, Relay Information and Setting for RSS 8475, Rev.1
Relay Information Setting and Test Record for Overcurrent and Ground Relays, Sh. 7611
Sequoyah IPEEE-005

Drawings

Fire Protection

1,2-47W494-1, Rev. 13, Fire Protection Fire Cells - Aux. Bldg. Units 1 & 2, Plan El. 653.0 & 669.0
1,2-47W494-2, Rev. 10, Fire Protection Fire Cells - Aux. Bldg. & Reactor Bldg. Units 1 & 2, Plan El. 685.0 & 690.0
1,2-47W494-3, Rev. 7, Fire Protection Fire Cells - Aux. Bldg. Units 1 & 2, Plan El. 706.0 & 714.0
1,2-47W494-4, Rev. 7, Fire Protection Fire Cells - Aux. Bldg. Units 1 & 2, Plan El. 734.0
1,2-47W494-5, Rev. 9, Fire Protection Fire Cells - Aux. Bldg. Units 1 & 2, Plan El. 749.0, 759.0 & 763.0
1,2-47W494-6, Rev. 5, Fire Protection Fire Cells - Control & Turbine Bldg. Units 1 & 2, Plan El. 669.0 & 685.0
1,2-47W494-7, Rev. 7, Fire Protection Fire Cells - Control & Turbine Bldg. Units 1 & 2, Plan El. 706.0 & 732.0
1,2-47W850-24, Rev. 23, Mechanical Flow Diagram - Fire Protection
1,2-47W850-25, Rev. 3, Mechanical Flow Diagram - Fire Protection
1,2-47W850-27, Rev. 7, Mechanical Flow Diagram - High Pressure Fire Protection

Circuit Analysis

2-45E890-414-1 Rev. 0 – 10 CFR 50 App. R RCS Pressure Control Opr & Spurious Cables Key 28
1-45E890-124-1 Rev. 2 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Keys 4 & 5 Only
1, 2-45E890-794-1 Rev. 1 - 10 CFR 50 App. R ERCW Opr & Spurious Cables Keys 1, 3 & 19
1-45E890-204-1 Rev. 4 – 10 CFR 50 App. R SG Inventory Control Opr & Spurious Cables Keys 11, 12, 13, 14, 15 & 16
1-45E890-404-1 Rev. 0 - 10 CFR 50 App. R RCS Pressure Control Opr & Spurious Cables Key 28
1, 2-45E890-994-1 Rev. 1 - 10 CFR 50 App. R RCS Cold Shutdown Opr & Spurious Cables Keys 30, 31 & 40
1-45E890-104-1 Rev. 4 - 10 CFR 50 App. R RCS Pressure Control Opr & Spurious Cables Keys 1, 2, 4, 5, 6 & 9
1, 2-45E890-894-1 Rev. 1 - 10 CFR 50 App. R RCS Environmental Control Opr & Spurious Cables Keys 37A & 37O
1-45E890-304-1 Rev. 0 - 10 CFR 50 App. R Sec Side Pressure Control Opr & Spurious Cables Keys 25 & 26
1-45E890-124-3 Rev. 0 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Key 28
1-45E890-204-3 Rev. 0 - 10 CFR 50 App. R SG Inventory Control Opr & Spurious Cables Keys 11, 12, 13, 14, 15 & 16

2-45E890-114-3 Rev. 6 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Keys 1, 2, 3, 4, 5, 6 & 9
1-45E890-124-4 Rev. 0 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Keys 4 & 5 Only
1-45E890-124-3 Rev. 0 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Keys 4 & 5
1-45E890-124-1 Rev. 2 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Keys 4 & 5 Only
1-45E890-124-2 Rev. 1 - 10 CFR 50 App. R RCS Inventory Control Opr & Spurious Cables Keys 4 & 5 Only
1, 2-15E500-1, Key Diagram Station Aux Power System, Rev. 26
1, 2-15E500-2, Key Diagram Station Aux Power System, Rev. 12
1, 2-45N700-1, Key Diagram 120V AC & 125V DC Vital Plant Control Power System, Rev. 40
1, 2-45N765-10, Wiring Diagram 6900V Shutdown Aux Power Schematic Diagram, Sh. 10, Rev. 13
1,2-45N765-16, Wiring Diagrams 6900 Shutdown Aux Power Schematic Diagram Sh. 16, Rev. 24
2-33-47035-D674, Wiring Diagrams 6900 Shutdown 2B-B Internal Connection Diagram Panel 18, Rev. 3
1, 2-45N662-2, Wiring Diagram Chemical & Volume Cont Sys Schematic Diagrams, Sh. 2, Rev. 12
1, 2-45N779-40, Wiring Diagram 480V Shutdown Aux Power Schematic Diagrams, Sh. 40, Rev. 33
1, 2-45N779-29, Wiring Diagram 480V Shutdown Aux Power Schematic Diagrams, Sh. 29, Rev. 17
1, 2-45N779-23, Wiring Diagram 480V Shutdown Aux Power Schematic Diagram, Sh. 23, Rev. 37
1, 2-45E890-091-3, 10 CFR 50 Appendix R On-Site Electrical Power OPR and Spurious Cables 38 & 39, Rev. 8
Electrical Equipment Block Diagrams Calculation Series, BD-K1 to BD-K48
EX-SQN-DC-2.17-1, Control Circuit for CCS Pumps 1A-A, 1B-B, 2A-A, 2B-B

Conduit and Grounding

1,2-45N810-7, Conduit & Grounding Floor El. 669.0 Ceiling Plan, Rev. 0
1,2-45N822-7, Conduit & Grounding Floor El. 669.0 Ceiling Plan, Rev. 0
1, 2-45N881-11, Conduit and Grounding Cable Tray Single Line Node Voltage Level 3, Rev. 8
1,2-45N881-17, Conduit & Grounding Cable Tray Single Line Node Voltage Level 4, 12, & 13 (480V), Rev. 0
1,2-45N881-18, Conduit & Grounding Cable Tray Single Line Node Voltage Level 4, 12, & 13 (480V), Rev. 0
45N881-19, Conduit & Grounding Cable Tray Single Line Node Voltage Level 3, 10, & 11, Rev. 2
1, 2-45N881-20, Conduit and Grounding Cable Tray Single Line Node Voltage Level 3, 10, & 11, Rev. 8
1, 2-45N826-8, Conduit and Grounding Floor El 706.0 & 714.0 Ceiling Plan, Rev. 2
1, 2-45N826-9, Conduit and Grounding Floor El 706.0 & 714.0 Ceiling Plan, Rev. 2
1, 2-45N881-11, Conduit and Grounding Cable Tray Single Line Node Voltage Level 3, Rev. 8
1, 2-45N881-20, Conduit and Grounding Cable Tray Single Line Node Voltage Level 3, 10, & 11, Rev. 8

1, 2-45N826-8, Conduit and Grounding Floor El 706.0 & 714.0 Ceiling Plan, Rev. 2
1, 2-45N826-9, Conduit and Grounding Floor El 706.0 & 714.0 Ceiling Plan, Rev. 2
1,2-45N703-1, Wiring Diagrams 125V Vital Battery Board I Single Line, Sh. 1, Rev.54

System Flow, Control & Logic Diagrams

1, 2-47W610-62-2, Mechanical Control Diagram Chemical & Volume Cont Sys, Rev. 38
1, 2-47W610-63-2, Mechanical Control Diagram Safety Injection Sys, Rev. 29
1, 2-47W610-67-6, Mechanical Control Diagram ERCW System, Rev. 26
2-47W610-68-7, Mechanical Control Diagram Reactor Coolant System, Rev. 15
1, 2-47W494-5, Fire Prot-Compt-Fire Cells Liq Piping-Press. Ret. Bdy Plan El. 749.0, 759.0 & 763.0, Rev. 10

Lighting and Communication

1, 2-55W2792-7, Communications VHF Radio Repeater Cab. No. 1 Arrangement & Details, Rev. 2
1, 2-55W2792-6, Communications VHF Radio Repeater Cab. No. 2 Arrangement & Details, Rev. 2
1, 2-55W2793-2, Communications VHF Paging Radio Arrangement & Details, Rev0
1, 2-55W2792-5, Communications VHF Radio Combiner System CD, FV and Appl Schematic, Rev. 4
1, 2-55W2700-3, Communications Tel and Code Call Systems Single Line, Rev. 0
45N1418-1, Lighting Floor El. 734.0 Plan & Details, Sh. 1, Rev. 15
45N1419-1, Lighting Floor El. 749.0 Plan & Details, Sh. 1, Rev. 16

Calculations

AB-26-AADO, Rev. 1, Hydraulic calculation for the Aux. 690' fire suppression systems (This calculation was in the system but was later determined to be either voided or superseded)
MDQ0026-970001, Rev. 3, High Pressure Fire Protection Hydraulic Base Model.
MDQ0026-970001B, Rev. 3, Hydraulic Model for Sprinkler Control Valves 0-FCV-26-151 and 2006.
SQN-CSS-027, 48V Telephone Battery System Qualification For DCN M02140A, Rev. 3
SQN-EBB841003931, Appendix R Analysis for Intraplant Communication Systems, Rev. 2
SQN-26-D054/EPM-ABB-IMPFHA, SQN Fire Hazards Analysis Calculation, Rev. 47
SQN-APS-015, 6900 VAC Class 1E Load Coordination Study, Rev.

Licensing Basis Documents

SQN Fire Protection Report, Revision 22, effective date 10/31/2007
Letter dated 10/31/79 from C. Murphy (NRC) to H. Parris (TVA) regarding a Fire Protection Inspection
Letter dated 4/17/80 from L. Mills (TVA) to Eisenhut (NRC) regarding Fire Protection Documentation
Letter dated 4/14/80 from C. Murphy (NRC) to H. Parris (TVA) regarding a Fire Protection Inspection
Letter dated 12/18/84 from J. Domer (TVA) to E. Adensam (NRC) regarding Appendix R Deviation Requests
Letter dated 1/11/85 from J. Domer (TVA) to E. Adensam (NRC) regarding Appendix R Deviation Requests

Safety Evaluation Report, dated 5/29/86 from B. Youngblood (NRC) to S. White (TVA) regarding Appendix R Deviation Requests

PERs

129585, Communications Systems not Adequately Addressed in Appendix R Fire Safe Shutdown
129611, Appendix R Lighting Deficiencies
129657, Appendix R Calculation Deficiencies
133246, 1-FCV-1-16 Handwheel Orientation is Difficult to Operate
145212, Appendix R Safe Shutdown Deficiencies
146002, Grounding and Shielding Problems Identified with Fire Detection Panel Wiring
146097, Control of Combustibles Issue in Containment

PERs & Work Orders Generated as a Result of the Inspection

139918, Appendix R Analysis Deficiencies Identified by Licensee
144856, Safe Shutdown Analysis Problems in FAA-107
145212, Thermolag Fire Wrap Abandoned in Place Yet Analysis takes Credit for the Wrap
145269, Shutdown Procedure had Wrong Time Constraint Assigned to a procedure Step
146355, Appendix R Analysis has not Adequately Evaluated the Effects of Fire on Security Door Operation
146602, Fire Door A-143 was not Closing and Latching When Released
146603, Wiring for a Siren not Properly Installed
146624, Procedure AOP-N-08 Instrument List Incorrect
146628, Readability of Labels Questioned during Procedure Walkdown
146637, Documentation Problem with Recording Results of 8-hour Discharge test on ELU
146677, Fire Protection Report not Updated as Part of Corrective Action for Previous Problem
146682, Fire Drill Critique Records had Miscellaneous Errors
146683, Battery Powered Emergency Light R190 Not Working Properly
146696, Operators with Respiratory Training Deficiencies
146710, Confusing Labeling on Vital battery III breakers
146737, Operators Need Additional Training on use of Mechanical Close Lever for 6.9 kV Switchgear
146771, During Performance of a Surveillance there was Inadequate Lighting in the Unit 1 Aux Feed Water LCV Mezzanine
146772, Radio Stored in Area Where Radio Use is Restricted and Could be Used in Same Area
146967, Fire Hazards Analysis Administrative Error
147061, Calculation Presented as Calculation of Record should have been Voided
147062, Sprinkler System Deficiencies in Auxiliary Building
147108, Water Dripping on Light Fixture
147263, Fire Detection Spacing in the 480 V 2B2 Shutdown Board Room
147317, Analysis Documentation Problem with Communication System
147319, Fire Door A-144 Did Not have a UL Label
147333, NRC Identified Sound Powered Phone System Problem
147467, NFPA 2008 TFPI Spreading Room Issue
147447, Use of Diversity to Satisfy Appendix R Fire Safe Shutdown
08-775431-000, Door C-49 has deteriorated seal
08-775423-000, Dust Cover broken

Vendor Manuals

SQN-VM 4436 - Exide Model F100/F100RT ELUs, Fixtures, and Acc.
SQN-VM 4437 - Lightalarms EL Equipment
LIU User's Manual for Security Doors, Rev. 2.3

Work Orders

WO 05-776104-000- WO generated for the replacement of App. R EL parts for purposes of trending
WO 05-773692-000 - WO generated for the replacement of App. R EL parts for purposes of trending

Documents Reviewed In Relation to URI 05000327, 328/2005011-03

NUREG-011, Supplement 1, Section 9.5, February 1980 Sequoyah Nuclear Plant Safety Evaluation Report
NUREG-011, Supplement 1, Appendix A, February 1980 Sequoyah Nuclear Plant Safety Evaluation Report
NUREG-011, Supplement 5, Section 9.5, June 1981 Sequoyah Nuclear Plant Safety Evaluation Report
Letter from NRC to TVA, dated May 29, 1986, on the subject of Deviation Request from Appendix R of 10 CFR Part 50
Plant Modification and Design Control Package T-12557-A, Disabling the Carbon Dioxide System in the Cable Spreading Room, approved October 1996
Memorandum from H.D. Thornburg to V. Benaroya on the subject of Sequoyah Nuclear Facility I&E Notice of Deviation; Fire Protection, dated February 13, 1980
Inspection Report Nos. 50-327/79-34 & 50-328/79-19, transmitted October 31, 1979
Inspection Report Nos. 50-327/80-10 & 50-328/80-06, transmitted April 14, 1980
Inspection Report Nos. 50-327/81-14 & 50-328/81-14, transmitted April 28, 1981
Letter from TVA to NRC, dated January 24, 1977, transmitting TVA's reevaluation of the fire prevention and protection program for Sequoyah Nuclear Plants Units 1 & 2
Letter from TVA to NRC, dated November 9, 1978, transmitting TVAs response to questions by the NRC on the January 24, 1977, submittal
Letter from TVA to NRC, dated December 19, 1978, transmitting TVAs revised or additional response to questions by the NRC on the January 24, 1977, submittal
Letter from TVA to NRC, dated January 19, 1979, transmitting TVAs revised or additional response to questions by the NRC on the January 24, 1977, submittal
Letter from TVA to NRC, dated March 8, 1979, transmitting Revision 3 of TVA's response to the Auxiliary Systems Branch (ASB) fire protection review questions and the Enclosure Table 1-1, Questions 9 and 22 (this is referenced in NUREG 011, Supplement 1)
Sequoyah Nuclear Plant Fire Protection Report Revision Log
SQN Fire Protection Report Part I
SQN Fire Protection Report Part IV
SQN Fire Protection Report Part VII
SQN Fire Hazards Analysis Calculation Appendix A
Bill of Material 47W491, sheet 13
NRC IE Circular No. 78-18, UL Fire Test
45W814-7, Rev.5, Conduit and Grounding Floor EL 706.0 Details – Sheet 5 [smoke detectors]
45W814-8, Rev.2, Conduit and Grounding Floor EL 706.0 Details – Sheet 6 [smoke detectors]

1-47W491-23, Mechanical Fire Protection, Rev. 3 [sprinkler piping]
1, 2-47W491-24, Mechanical Fire Protection, Rev. 2 [sprinkler piping]
1, 2-47W491-25, Mechanical Fire Protection, Rev. 4 [sprinkler piping]
1-47W491-26, Mechanical Fire Protection, Rev. 0 [sprinkler piping]
NRC Information Notice 2002-24, Potential Problems with Heat Collectors on Fire Protection Sprinklers

Fire Doors

Underwriter Laboratories Building Material Directory, dated January 1973, Page 28, covering Russwin Div. of Emhart Corp. single point locks and latches

Records from contract No. 72C55-75322-2 for purchase of fire doors and hardware. TVA microfiche numbers 0658, 0661, 0665, 0697, 0698, 0703, 0706, 0707, 0709, 0714, 0717, 0718, 0719 and 0720

LIST OF ACRONYMS

AOP	abnormal operating procedure
CFR	Code of Federal Regulations
CVCS	chemical and volume control system
DPR	demonstration power reactor
ELU	emergency lighting unit
F	Fahrenheit
FA	fire area
FPP	fire protection program
FPPR	fire protection program reevaluation
FPR	fire protection report
HVAC	heating, ventilating and air conditioning
IMC	Inspection Manual Chapter
IP	Inspection Procedure
JPM	job performance measure
MC	Manual Chapter
NCV	non-cited violation
NFPA	National Fire Protection Association
NPT	national pipe thread
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NUREG	An explanatory document published by the NRC
PER	problem evaluation report
RCP	reactor coolant pump
SDP	significance determination process
SPP	standard programs and processes
SQN	Sequoyah Nuclear Plant
SSD	safe shutdown
Thermo-Lag	trade name for a fire barrier system for cables
UL	Underwriters' Laboratories, Inc.
URI	unresolved item