



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

May 18, 2017

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

**SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 – TRIENNIAL FIRE  
PROTECTION PROGRAM INSPECTION (NRC INSPECTION REPORT  
NO. 05000327/2017007 AND 05000328/2017007)**

Dear Mr. Shea:

On May 16, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection of the Sequoyah Nuclear Plant, Unit 1 & 2 Fire Protection Program. The enclosed inspection report documents the inspection results, which were discussed, with Matt Rasmussen, Plant Manager Sequoyah and other plant staff.

Inspectors documented two licensee-identified violations which were determined to be of very low safety significance in this report. Because of the very low safety significance and because the findings were entered into your corrective action program, the NRC is treating the violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC Enforcement Policy.

If you contest any NCV, 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 20555-001; and the NRC Resident Inspector at the Sequoyah Nuclear Plant.

This letter will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemption, Request for Withholding."

Sincerely,

*/RA/*

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

Docket Nos.: 50-327; 50-328  
License No.: DPR-77; DPR-79

Enclosure:  
NRC IR 05000327/2017007 and  
05000328/2017007 w/Attachment:  
Supplemental Information

cc: Distribution via Listserv

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 – TRIENNIAL FIRE PROTECTION PROGRAM INSPECTION (NRC INSPECTION REPORT NO. 05000327/2017007 AND 05000328/2017007) dated: May 18, 2017.

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 ADAMS:  Yes      ACCESSION NUMBER: \_\_\_\_\_       SUNSI REVIEW COMPLETE       FORM 665 ATTACHED

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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: 05000327/2017007 & 05000328/2017007

Applicant: Tennessee Valley Authority (TVA)

Facility: Sequoyah Nuclear Plant, Units 1 & 2

Location: Soddy Daisy, TN 37379

Dates: March 20 – 24, 2017  
April 3 – 6, 2017

Inspectors: R. Fanner, Senior Reactor Inspector (Lead inspector)  
P. Braaten, Reactor Inspector  
J. Dymek, Reactor Inspector  
D. Terry-Ward, Construction Inspector

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

Enclosure

## SUMMARY

IR 05000327/2017007 & 05000328/2017007, 03/20/2017 – 03/24/2017, 04/03/2017 - 04/06/2017, Sequoyah Nuclear Plant, Units 1 & 2, Inspection Procedure (IP) 71111.05T, Fire Protection (Triennial).

This report covered an announced two-week triennial fire protection inspection by a team leader and three regional inspectors. Two licensee-identified violations (LIVs) are documented. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. The NRC's program for overseeing the safe operation of commercial nuclear power reactors as described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### **A. NRC-Identified and Self-Revealed Findings**

None.

### **B. Licensee-Identified Violations**

Two violations of very low safety significance were identified by the licensee have been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. The violation and corrective action tracking number are listed in Section 4OA7 of this report

## REPORT DETAILS

### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

#### 1R05 Fire Protection

This report documents the results of a triennial fire protection inspection (TFPI) of the Sequoyah Nuclear Plant (SQN) Units 1 and 2. The inspection was conducted in accordance with NRC Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)," issued December 31, 2013. The objective of the inspection was to review a minimum sample of 3 risk-significant fire areas (FAs) to verify implementation of the fire protection program (FPP) and to verify site specific implementation of at least one B.5.b mitigating strategy as well as the storage, maintenance, and testing of B.5.b mitigating equipment. The four FAs chosen for review were selected based on available risk information as analyzed onsite by a senior reactor analyst (SRA) 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, review of the fire protection report (FPR), and results of prior NRC TFPIs. In selecting the B.5.b mitigating strategy sample, the inspectors reviewed licensee submittal letters, safety evaluation reports, licensee commitments, B.5.b implementing procedures, and previous NRC inspection reports. The four FAs chosen were:

- Fire Area FAC-011 / 685.0-C3, Computer Room
- Fire Area FAA-014 / 669.0-A09, Charging Pump Room 1A-A
- Fire Area FAA-056 / 714.0-A03, Heat and Vent Equipment Room
- Fire Area FAA-081 / 734.0-A24 - 6.9 Kv Shutdown Board Room B and 734.0-A17 - Personnel and Equipment Access Room

For each FA selected, the inspectors evaluated the licensee's FPP against the applicable NRC requirements. Specific licensing basis documents reviewed by the inspectors are listed in the Attachment.

#### .01 Protection of Safe Shutdown Capabilities

##### a. Inspection Scope

The inspectors reviewed applicable aspects of the FPP as described in the licensee's FPR. The inspectors assessed analysis, evaluations, administrative controls, and other defense in depth aspects necessary to protect fire hazards. The inspectors verified that fire protection features were in place to protect the SSD capability for the facility. This review included ensuring the necessary power, control, and instrumentation cables, satisfied the separation and design requirements specified by the applicable sections of the FPR.

##### b. Findings

No finding were identified.

## .02 Passive Fire Protection

### a. Inspection Scope

The inspectors evaluated the applicable FAs to ensure the adequacy of the fire resistance barriers met licensing basis commitments. Inspectors performed walkdowns of the applicable fire areas and assessed the attributes of the walls, ceilings, floors, and electrical raceways. The inspectors reviewed evaluations for fire barrier penetration seals, fire doors, fire dampers, and electrical raceway fire barrier systems (ERFBS) to ensure credited SSD equipment would be maintained free of fire damage. The inspectors reviewed applicable construction drawings to verify attributes as necessary. Where available, inspectors observed the as installed barrier assemblies and compared the as-built configuration to the approved construction to ensure consistency with the supporting fire endurance test data, standard industry practice, and licensing basis commitments.

### b. Findings

No findings were identified.

## .03 Active Fire Protection

### a. Inspection Scope

The inspectors reviewed the redundancy of the fire protection water sources and fire pumps to confirm they were installed in accordance with National Fire Protection Association (NFPA) codes of record specified in the applicable separation, design, and licensing requirements of the SQN FPP. The inspectors performed in-plant observations of the material condition for the credited fire water pumps. This included assessing the fire protection water supply distribution piping, manual fire hose and standpipe systems for the chosen FAs. The inspectors reviewed the operating and valve cycle/alignment procedures and engineering drawings to aid in the examination of the accessible areas fire main piping to verify the operational status and alignment/position of valves. The inspectors assessed these conditions with engineering drawings. The inspectors also examined the licensee's safe shutdown analysis (SSA), select electrical circuit routing drawings outlining the fire pumps' power and start capability to ensure the availability to support fire brigade response activities during a fire event.

The inspectors compared the installed fire detection and suppression systems for the chosen FAs to ensure conformance with applicable NFPA standards consistent with licensing basis commitments. The inspectors reviewed design documentation and compared this information with the as-installed configurations as observed during plant walkdowns. The inspectors observed the placement of the fire hose stations, fire extinguishers, fire hose nozzle types, and hose lengths as designated in the firefighting pre-plan strategies to verify they were adequate and accessible to provide the coverage needed. The inspectors reviewed completed periodic surveillance testing and maintenance program procedures of the fire detection and suppression systems and compared them to the operability, testing, and compensatory measures specified by the FPP commitments. This review was to assess whether the test program was sufficient to validate proper operation of the fire detection and suppression in accordance with design requirements.

The inspectors review included the fire brigade's personal protective equipment, self-contained breathing apparatuses, portable communication equipment, and other fire brigade equipment, to determine accessibility, material condition, and operational readiness of equipment. The inspectors performed plant walkdowns to assess firefighting pre-plan strategies and equipment configurations. The inspectors verified the staffing levels of the fire brigade to ensure conformance with existing requirements. The inspectors performed interviews of licensee personnel and randomly reviewed an operating fire brigade on shift during the inspection. The inspectors verified all members were qualified and current on their medical and training requirements. The inspectors reviewed the adequacy of the current mutual aid agreements with local outside fire departments credited with assisting for a postulated fire event.

b. Findings

No findings were identified.

.04 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

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

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

b. Findings

No findings were identified.

.05 Alternative Shutdown Capability

a. Inspection Scope

Methodology

The licensee credited an alternative shutdown capability for a postulated fire in fire area FAC-011/685.0-C3, Computer Room. The inspectors reviewed UFSAR Section 9.5.1, the SQN FPR, and corresponding abnormal operating procedures (AOPs), to ensure that appropriate controls provided reasonable assurance that alternative shutdown equipment remained operable, available, and accessible when required. In cases where local OMAs were credited in lieu of cable protection of SSD components, the inspectors performed a walk-through of the procedures to determine if the operators could reasonably be expected to perform the alternative safe shutdown procedure actions and that equipment labeling was consistent with the alternate safe shutdown procedures.



The inspectors reviewed applicable process and instrumentation diagrams (PI&D) to gain an understanding of credited equipment's flow path and function. The inspectors reviewed applicable licensee calculations to ensure the alternative shutdown methodology properly identified systems and components to achieve and maintain SSD for the FAs selected for review. Additionally, the team reviewed electrical schematics and one line diagrams to ensure that the transfer of SSD control functions to the alternate shutdown facility included sufficient instrumentation to safely shutdown the reactor. The inspectors reviewed test and surveillance procedures to ensure availability and functionality of the credited transfer switches. This review also included verification that shutdown from outside the main control room (MCR) could be performed both with and without the availability of offsite power.

### Operational Implementation

Inspectors reviewed various aspects of the operational program to verify that personnel required to place and maintain the plant in hot shutdown following a fire using the alternative dedicated shutdown system were properly trained and were available at all times among the onsite shift staff, exclusive of the fire brigade. The inspectors reviewed applicable steps in credited licensee procedures to verify that step were consistent with SSD analysis and commitments for alternative shutdown system components. The inspectors performed table-top reviews with licensee personnel to ascertain the knowledge and ability to implement actions contingent upon an Appendix R fire event. The inspectors performed walkdowns with operators to ensure the human factors attributes, feasibility and reliability, were addressed and implemented. The inspectors requested and reviewed training records of licensee staff as well as a sample of shift manning records to verify staffing requirements.

#### b. Findings

No findings were identified.

### .06 Circuit Analyses

#### a. Inspection Scope

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

The inspectors reviewed FHA calculation SQN26D054EPMABBIMPFA, Appendix A for fire areas FAC-011, FAA-014, FAA-056 and FAA-081. The inspectors selected the Motor Driven Auxiliary Feedwater Pumps A & B, Component Cooling Pumps (CCS) 1A-A & 1B-B, and Residual Heat Removal (RHR) Pumps 1A-A & 2A-A for inspection,

which are credited power system component for FAs FAA-014, FAA-056 and FAA-081 as required.

The inspectors also selected cables 2PP759A, 2PP750A, 2PP756A and others located in FAA-081 for review which have a 1-hour fire barrier along with a protected wrap to confirm compliance with NUREG 1232 and site procedures. The inspectors reviewed applicable drawings, circuit breaker selective coordination, cable protection, cable ampacity analysis which included cable derating factors, overload protection, and interrupting capacity of devices to determine if there was reasonable assurance that the circuit breakers would operate and protect the cables as intended and to determine if the cables were adequately sized and derated to comply with NUREG 1232 and site procedures. The specific components reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.07 Communications

a. Inspection Scope

The inspectors reviewed the communications capabilities used to support plant personnel in the performance of OMAs to achieve and maintain SSD, as credited in the SQN FPR. The inspectors performed plant walkdowns with the licensee's operations staff to assess the credited method of communications used to complete SSD actions as specified in post-fire SSD procedures for the selected FAs. The inspectors also verified where possible that portable radio communications and fixed emergency communication systems were available, operable, and adequate for the performance of designated activities to support fire event notification and fire brigade firefighting activities. The inspectors reviewed a completed surveillance procedure, 0-PI-OPS-000-708.0, "10CFR50 Appendix R Compliance Verification" dated March 04, 2016, calculation EEB841003931, "Appendix R Analysis for Intraplant Communications systems" and past condition reports to verify that the communication equipment was being properly maintained, tested and to determine if any communication deficiencies were entered into corrective action program as required.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The inspectors inspected maintenance and design aspects of the fixed 8-hour battery pack emergency lighting units (ELUs) required by the licensee's FPP. The inspectors performed plant walkdowns of the post-fire SSD procedures for the selected FAs to observe the placement and coverage area of the ELUs throughout the selected FAs. The inspectors also evaluated the adequacy of the ELUs to illuminate access and egress pathways to and from locations designated as requiring local operation and/or instrumentation monitoring needed for post-fire SSD. The inspectors reviewed preventive maintenance procedures and samples of completed surveillance tests to verify that adequate surveillance testing was in place. The inspectors reviewed

vendor manuals to ensure that the ELUs were being maintained consistent with manufacturer's recommendations. The inspectors reviewed samples of assessments and PERs to ensure that ELU surveillance test failures were addressed adequately.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The inspectors reviewed the licensee methodology for ensuring equipment damaged by a postulated fire could be repaired consistent with the Appendix R III.G and III.L. requirements. Inspectors reviewed the current SSD analysis, procedures, performed interviews of licensee staff, and walked down equipment storage locations to ensure repair components needed to implement these requirements were adequate and available. The inspectors verified that credited repair equipment, components, tools, and materials (e.g., pre-cut cable connectors with prepared attachment lugs) were available and accessible to licensee personnel on site.

b. Findings

No findings were identified.

.10 Compensatory Measures

a. Inspection scope

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

b. Findings

No findings were identified.

.11 Review and Documentation of Fire Protection Program Changes

a. Inspection Scope

The inspectors reviewed a sample of FPP changes made between July 2011 and January 2014 to determine if the changes to the FPP were in accordance with the fire protection license conditions and had no adverse effect on the ability to achieve SSD. The inspectors reviewed DCN D22547 "Reactor Head Vents and Pressurizer PORV and Block Valves, System 068," Rev. A, to assess the licensee's effectiveness review and to determine if the resulting changes to the FPP were in accordance with the fire protection license conditions.

b. Findings

No findings were identified.

.12 Control of Transient Combustibles and Ignition Sources

a. Inspection Scope

The inspectors conducted tours of numerous plant areas that were important to reactor safety, including the selected FAs, to verify the licensee's implementation of FPP requirements as described in applicable administrative procedure. Through discussions with plant staff, documentation reviews, and plant walk-downs, the inspectors verified engineering assumption and technical basis for the credited strategy to establish reasonable assurance that the makeup capacity could be provided. For the selected FAs, the inspectors evaluated generic fire protection training; fire event history; the potential for fires or explosions; the combustible fire load characteristics; and the potential exposure fire severity to determine if adequate controls were in place to maintain general housekeeping consistent with the FPP, administrative procedures, and other FPP procedures. There were no hot work activities ongoing within the selected FAs during the inspection and observation of this activity could not be performed.

b. Findings

No findings were identified.

.13 B.5.b Mitigating Strategy

a. Inspection Scope

The inspectors reviewed, on a sample basis, the licensee's utilization of the turbine driven auxiliary feedwater (TDAFW) pump during a total loss of internal distribution power (LIPD) event to verify that the measures were feasible, personnel were trained to implement the strategies, and equipment was properly staged and maintained. The inspectors reviewed the licensee's established program, applicable safety evaluation reports (SERs) and submittals which supported the elements outlined by the license condition. The inspectors reviewed inventory, surveillance testing, and maintenance records of required equipment. Through table-top discussions with plant staff, documentation reviews, and plant walk-downs, the inspectors verified engineering assumptions and the technical basis for the credited strategy to establish reasonable assurance that the makeup capacity could be provided.

The inspectors reviewed training records to ensure licensee staff were trained and familiar with the aspects of the strategy objectives and implementing guidelines were accomplished according to the established training requirements.

b. Findings

No findings were identified.

#### 4. OTHER ACTIVITIES

##### 4OA2 Identification and Resolution of Problems

###### a. Inspection Scope

The inspectors reviewed recent licensee audits for thoroughness, completeness and conformance to requirements. Requirements for the independent audits are contained in Generic Letter 82-21 "Technical Specifications for Fire Protection Audits" and the licensee's Quality Assurance Program, as well as Appendix A to BTP APCS 9.5-1 "Guidelines for Fire Protection for Nuclear Power Plants," Section C.10, "Audits." The inspectors reviewed other corrective action program (CAP) documents, including completed corrective actions documented in selected CRs to verify that fire protection problems potentially or actually affecting the plant were appropriately entered into and resolved by the licensee's CAP. The inspectors reviewed the timeliness, apparent cause determinations, proposed corrective action, and other attributes associated with a sample of PERs/CRs. The PERs/CRs reviewed are listed in the Attachment.

###### b. Findings

No findings were identified.

##### 4OA6 Meetings, Including Exit

On May 16, 2017, the lead inspector presented the inspection results to Mr. M. Rasmussen, Plant Manager, Sequoyah and other members of the licensee's staff. The licensee acknowledged the findings. Proprietary information is not included in this report.

##### 4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements, which meet the criteria of the NRC Enforcement Policy, for being dispositioned as an NCV.

- .1 The licensee identified examples of a failure to meet the requirements of the Facility Operating License (FOL) condition C.16 and C.13 for units 1 and 2 respectively. The license condition states, in part, that TVA shall implement and maintain in effect all provisions of the approved fire protection program referenced in the UFSAR and as approved by the NRC's Safety Evaluation Report (SER). Updated Final Safety Analysis Report (UFSAR), Section 9.5.1, Fire Protection System, states in part that the Fire Protection System and fire protection features are described in the Fire Protection Report (FPR).

Contrary to the above, the licensee failed to maintain the requirements prescribed in the fire protection program. Specifically, on February 7, 2017, the licensee identified numerous discrepancies and errors in the Fire Hazards Analysis, including multiple instances of inaccurate and non-conservative manual action time requirements. The deficiencies were associated with inaccurate assumptions based on loop-stagnation, head vent flow rates, and containment cooling which was inconsistent with FPR, Part III, Section 1.1, "Design Basis Evaluation." The finding was screened in accordance with IMC 0609 Appendix F, Significance Determination Process, and determined to be Green, by answering Yes on Task 1.3.1, Question 1.3.1. The issue into the CAP as CR

1259493, CR 1224829, and CR 1261866. Additionally, adequate compensatory actions have been implemented.

- .2 The licensee identified examples of a failure to meet the requirements of the Facility Operating License (FOL) condition C.16 and C.13 for units 1 and 2 respectively. The license condition states, in part, that TVA shall implement and maintain in effect all provisions of the approved fire protection program referenced in the UFSAR and as approved by the NRC's Safety Evaluation Report (SER). Updated Final Safety Analysis Report (UFSAR), Section 9.5.1, Fire Protection System, states in part that the Fire Protection System and fire protection features are described in the Fire Protection Report (FPR). FPR, Part III – Safe Shutdown Capabilities, Section 3.0, Analysis of Safe Shutdown Systems," stated that a minimum set of plant systems and components are selected to ensure the plant is capable of reaching and maintaining the applicable safe shutdown state.

Contrary to the above, the licensee failed to maintain the requirements prescribed in the fire protection program. Specifically, on February 13, 2017, the licensee identified non-conservative times for repair actions to achieve cold shutdown. The finding was screened in accordance with IMC 0609 Appendix F, Fire Protection Significance Determination Process, and determined to be Green, by answering Yes on Task 1.3.1, Question 1.3. The issue has been entered into the licensee's corrective action program as CR 1261868, and CR 11261881. Additionally, adequate compensatory actions have been implemented.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

#### Licensee

T. Williams, Vice President Sequoyah  
M. Rasmussen, Plant Manager Sequoyah  
M. Lovitt, Senior Manager Chemistry  
M. Halter, Senior Manager Radiation Protection  
T. Marshall, Director Nuclear Plant Operations  
H. Howle, Superintendent Nuclear Operations  
K. Michael, Superintendent Nuclear Operations  
C. Lockhart, Director Maintenance  
G. Garner, Director Work Management  
W. Pierce, Director Engineering  
C. Reneau, Senior Manager Design Engineering  
J. Hodge, Senior Manager Systems Engineering  
M. Henderson, Manager Site Engineering Programs  
C. Dahlman, Director Training  
D. Dimopoulos, Director Plant Support  
M. McBrearty, Manager Licensing  
J. Johnson, Senior Program Manager – Licensing  
B. Bashman, Manager Performance Improvement  
B. Brigman, Senior Manager Nuclear Site Security  
J. Moser, Senior Manager Projects  
D. Charlton, Senior Manager Quality Assurance  
M. Hunter, Consultant Nuclear Communications  
R. Egli, FP/Appendix R Manager, Corporate  
J. Pangle, Appendix R Program Engineer  
R. Kennedy, Fire Modeling  
D. Brady, Electrical Design Engineer  
D. Porter, Operations Procedures  
S. Bowman, Licensing Engineer  
J. Polickoski, Licensing CFAM

#### Nuclear Regulatory Commission

R. Fanner, Sr. Reactor Inspector  
P. Braaten, Reactor Inspector  
D. Terry-Ward, Construction Inspector

## LIST OF COMPONENTS REVIEWED

### Components

1-FCV-063-039  
 2-FCV-062-061  
 FCV-62-089  
 FCV-62-93A  
 PVC-1-030  
 LVC-3-171

## LIST OF DOCUMENTS REVIEWED

### Procedures

AOP-C.04, Shutdown form Auxiliary Control Room, Rev. 41  
 AOP-N.01, Plan Fire, Rev. 45  
 AOP-N.08, Fire Safe Shutdown, Part 1, Rev. 42  
 AOP-N.08, Fire Safe Shutdown, Part 2, Rev. 42  
 AOP-N.08, Fire Safe Shutdown, Part 3, Rev. 43  
 AOP-N.08, Fire Safe Shutdown, Part 4, Rev. 44  
 AOP-N.08, Fire Safe Shutdown, Part 5, Rev. 44  
 DS-E12.6.3, Electrical Design Standard, Auxiliary and Control Power Cable Sizing, Up to 15,000 Volts, Rev. 1  
 DS-M17.2.2, Mechanical Design Standard, Electrical Raceway Fire Barrier Systems, Rev. 7  
 EA-74-1, Placing RHR Shutdown Cooling in Service, Rev. 0009  
 EPM-4, User's Guide, Revision 29  
 ES-0.2, Natural Circulation Cooldown, Rev 0016  
 FPDP-3, Management of the Fire Protection Report, Rev. 0006  
 FPU-026-654Q, Fire Header Valve Line-up Inspection  
 M & AI-13.1, Installation of Electrical Cable Tray Penetration Seals, Pressure Seals, Flame Retardant Cable Coatings and Mechanical Seals, Rev. 0014  
 NEDP-2, Design Calculation Process Control, Rev. 20  
 NEDP-4, Q-List and UNID Control, Rev. 0024  
 NPG-SPP-01.2, Administrative of Site Technical Procedures, Rev. 0011  
 NPG-SPP-03.6, Fire Protection Program Change Regulatory Reviews, Rev. 0004  
 NPG-SPP-06.1, Work Order Process, Rev. 002  
 NPG-SPP-9.13, Fire Protection Program Change Regulatory Reviews, Rev. 0002  
 NPG-SPP-18.4.5, Fire Protection Quality Assurance (Q07), Rev. 0002  
 NPG-SPP-22.300, Corrective Action Program, Rev. 0000  
 SQNETAPAC, Auxiliary Power System, Rev. 077  
 0-SI-FPU-013-605.0, Fire Detection Panel 0-L-605 Test, Rev. 0006  
 0-SI-FPU-013-610.0, Fire Detection Panel 0-L-610.0 Test, Rev.0010  
 0-PI-FPU-026-001A, High Pressure Fire Protection Strainer Cleaning / Inspection, Rev. 2  
 0-PI-FPU-026-003H, Inspection of Alarm Check Valves, 0004  
 0-SI-FPU-026-167.M, Fire Header Valve Line-up Inspection, Rev. 0025  
 0-PI-FPU-026-803.4H, Disassembly and Inspection of Fire Pump "A" Discharge Check Valve, Rev. 0003  
 0-PI-FPU-026-804.4H, Disassembly and Inspection of Fire Pump "B" Discharge Check Valve, Rev. 0003

### Calculations, Evaluations, & Specifications

BD-K47, Electrical Equipment Block Diagram – Key 48, 10CFR50 Appendix R Electrical Equipment Block Diagram, Rev. 1



D2SDJ-P213350, Analysis of the Auxiliary Power System for 10CFR50, Appendix R, Rev. 059  
 EEB841003931, Appendix R Analysis for Intraplant Communications systems, Rev. 06  
 G-38, General Engineering Specification, Installation, Modification, and Maintenance of Insulated Cables Rated Up To 15,000 Volts, Rev 25  
 G-40, General Engineering Specification, Installation, Modification and Maintenance of Electrical Conduit, Cable Trays, Boxes, Containment Electrical Penetrations, Electric Conductor Seal Assemblies, Lighting and Miscellaneous Systems, Rev. 20  
 G-98, General Engineering Specification, Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems, Rev. 12  
 M&AI-13.1, Installation of Electrical Cable Tray Penetration Seals, Pressure Seals, Flame-Retardant Cable Coating, and Mechanical Seals, Rev. 13  
 R2778-003-001, Engineering Evaluation of Auxiliary Building Sprinklers NFPA 13 Code Deviations, Rev. 0  
 SQN-APS-003, 480V APS Class 1E Load Coordination Study, Rev. 93  
 SQNAPPR3, Electrical Fields in the Appendix R Database, Rev. 032  
 SQN-CPS-051, Circuit Protection Device Evaluation, Rev. 064  
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 WO 116978925, O-PI-OPS-000.-708.0, 10CFR50 Appendix R compliance Verification, Rev. 0024  
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 1-47W610-1-2, Mechanical Control Diagram, Main Steam System, Rev. 16  
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 1, 2-45N756-2, Wiring Diagrams, 480V Cont-Aux Bldg Vent BD 1A1-A, Single Line Sheet 2, Rev. 29  
 1, 2-45N1759-1, Wiring Diagrams, 480V Cont & Aux Bldg Vent BD 1A1-A, Connection Diagram SH-1, Rev. 3  
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 1, 2-47W490-5, Mechanical Services Air, Water and Fire Protection, Rev. 32  
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 1, 2-47W494 Sheet Nos. 1-9, Fire Protection-Comp.-Fire Cells Liquid Piping Pressure Retention Boundary Plan and Elevation, Latest Revisions  
 1, 2-47W843-1, Flow Diagram-CO2 Storage, Fire Protection and Purging System, Rev. 14  
 1, 2-47W850-1, Flow Diagram - Fire Protection, Rev. 37  
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 1, 2-47W850-11, Flow Diagram - Fire Protection, Rev. 16  
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 1, 2-47W850-26, Flow Diagram - Fire Protection and raw Service Water, Rev. 2  
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 1-45E890-102-1, 10 CFR 50 Appendix R, RCS Inventory Control OPR and Spurious Cables Keys 1, 2, 4, 5, 6 & 9, Rev. 5  
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1, 2-45N779-29, Wiring Diagrams, 480V Shutdown Aux. Power, Schematic Diagrams SH 29, Rev. 18

1, 2-45N751-5, Wiring Diagrams, Reactor MOV BD 1B1-B, Single Line SH 1, Rev. 66

1, 2-45N639-1, Wiring Diagram, CO2 Fire Protection System, Schematic Diagrams SH 1, Rev. 3

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1-45N1693-3, Mechanical Diagrams, Separation Aux Relay PNL 1-R-78 Connection Diagrams Sheet 3, Rev. 11

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- 1, 2-45N706-4, Wiring Diagram, 120V AC Vital Instrument Power Boards 1-IV & 2-IV, Connection Diagram-Sheet 4, Rev. 50
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- 1-45N1639-7, Wiring Diagrams, Aux Control Board-Panel 1-L-11B, Connection Diagram Sheet 7, Rev. 0
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- 1-45N1644-5, Wiring Diagrams, Unit Control Board-Panel 1-M-5, Connection Diagrams SH 5, Rev. 2
- 1-45N1644-4, Wiring Diagrams, Unit Control Board-Panel 1-M-5, Connection Diagrams SHT 4, Rev. 4
- 1-45N1666-2, Wiring Diagram, Process Instrument Control Group 2 Connection Diag. SH 2, Rev. 4
- 1-45N1635-52, Wiring Diagrams, Local Instrument Panels, Connection Diagrams-Sh 52, Rev. 4
- 1, 2-47W610-62-2, Mechanical Control Diagram, Auxiliary Feedwater Sys, Rev. 48
- 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, NV Level 4, 12 & 13 (480V), Rev. 0
- 1, 2-45N881-21, Conduit & Grounding Cable Tray Single Line, Node Voltage Level 3, 10 & 11, Rev. 1
- 1, 2-45N881-22, Conduit & Grounding Cable Tray Single Line, Node Voltage Level 3, 10 & 11 (Control), Rev. 0
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- 2- 45W822-17, Conduit and Grounding, Floor El. 669.0, Details Sheet 7, Rev. 2

### **Plant Modifications and Engineering Changes Reviewed**

- DCN 22542, Resolve Component Cooling Concerns relating to Appendix R, Rev. XXX
- DCN 22546, Resolve Multiple Spurious Operation Concerns with Aux Feedwater System Related to Appendix R, Rev B
- DCN 22584, Appendix R Lighting Modifications, Rev. A
- DCN 23096-A, Communications Systems 244 VHF Radio & Antenna Sys and System 247, dated 12/29/2014
- DCN 23236, Communications System 244, Issue RIMs date 04/03/15
- DCN 23311, Install Sensaphone on EL. 734 and 749 to detect internal flooding, closure RIMs dated 5/7/16

### **Fire Fighting Preplan Strategies**

- AUX-0-714-01, Fire Protection Pre-Fire Plans, Auxiliary Building – El. 714 (Col. A1-15, Q-U), Rev. 8

AUX-0-734-00, Fire Protection Pre-Fire Plans, Auxiliary Building – El. 734, Rev. 4

### **Applicable Codes & Standards**

DS-M17.2.2, Electrical Raceway Fire Barrier Systems, Rev. 7  
 NFPA No. 12 – 1973, Carbon Dioxide Extinguishing Systems

### **Technical Manuals and Vendor Information**

SQN-VTM-E353-4436, Exide Model F100/F100RT Emergency Lighting Units, Fixtures, and Accessories, Rev. 4

### **Audits & Self-Assessments**

SQN-ENG-FSA-17-001, Compliance with Regulations, Industry Guidelines or TVA NPG Commitments , dated November 22, 2016  
 Site Audit Report SSA1609, Fire Protection Sequoyah Nuclear Plant (SQN)

### **License Basis Documents**

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 SQN Fire Protection Report Part II, Fire Protection Plan, Rev. 33  
 SQN Fire Protection Report, Part III, Safe Shutdown Capabilities, Rev. 33  
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 SQN Fire Protection Report, Part V, Emergency Lighting and Reactor Coolant Pump Oil Collection, Rev. 35  
 SQN Fire Protection Report, Part VI, NFPA Code Evaluation, Rev. 31  
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 SQN Fire Protection Report, Part IX, Appendix R Compliance Matrix, Rev. 33  
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 SQN August 12, 1997 submittal titled, "Issuance of License Amendments for the Sequoyah Nuclear Plant, Units 1 and 2 (TAC Nos. M96996 and M96997) (TS 96-04)  
 TVA-NQA-PLN89-A, Nuclear Quality Assurance Plan, Rev.0033  
 TVA Updated Final Safety Analysis Report (UFSAR) dated October 30, 2014  
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 USNRC Safety Evaluation Report, Section 3.1, Fire Protection, May 1988  
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 Sequoyah Nuclear Plant Updated Final Safety Analysis Report, Section 13.9, Pages 68-71, Amendment No. 26  
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### **Other Documents**

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 Announced Fire Drill Evaluation Report, Crew B, 12/22/2016  
 Announced Fire Drill Evaluation Report, Crew C, 2/17/2017  
 Announced Fire Drill Evaluation Report, Crew D, 2/10/2017  
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 CO2 Purging/ CO2 Fire Protection System Health Report, 6/01/2016 to 9/30/ 2016

Diagram for Key 2, Equipment 1-FCV-62-93, 1-F-62-93, Rev. 2  
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 Fire Protection Pre-Fire Plan AUX-0-734-00, Rev. 4  
 Fire Protection Pre-Fire Plan CON-0-685-00, Rev. 7  
 Hot Work Permit 02-348, 1/03/2017  
 Hot Work Permit 02-349, 1/04/2017  
 HPFP System Health Report, 6/01/2016 to 9/30/ 2016  
 Impairment Permit 170127, 4/16/2017 Sheet BD-K2-1, Sequoyah Nuclear Plant Block TVA-  
 NPG FPDP5-3, Fire Drill Evaluation Report, 3/08/2017  
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 1-PI-1-1C Rev. 5  
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 Sheet BD-K26-10, Sequoyah Nuclear Plant Block Diagram for Key 26, Equipment 2-PCV-1-5  
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 Sheet BD-K26-14, Sequoyah Nuclear Plant Block Diagram for Key 26, Equipment 2-PCV-1-23 & 2-PI-1-19C, Rev. 5  
 Sheet BD-K26-15, Sequoyah Nuclear Plant Block Diagram for Key 26, Equipment 1-PCV-1-30 & 1-PI-1-26C, Rev. 5  
 Sheet BD-K26-16, Sequoyah Nuclear Plant Block Diagram for Key 26, Equipment 2-PCV-1-30, & 2-PI-1-26C, Rev. 5  
 Sheet BD-K28-23, Sequoyah Nuclear Plant Block Diagram for Key 28, Equipment 2-HTRA-68-341A-A Press BCKUP HTR 2A-A, Rev. 11  
 Sheet BD-K30-040, Sequoyah Nuclear Plant Block Diagram for Key 30, Equipment 2-LCV-063-008, Rev. 3  
 Sheet BD-K30-042, Sequoyah Nuclear Plant Block Diagram for Key 30, Equipment 2-FCV-063-011, Rev. 3  
 Sheet BD-K48-12, Sequoyah Nuclear Plant Block Diagram for Key 48, Equipment 2-FCV-062 SQN-VD-C285-4371, Carbon Dioxide Extinguishing Equipment  
 Task Force Tips Fire Fighting Equipment Manual, Blitz-Fire Portable Monitor Series, Rev. 019  
 Soddy Daisy Fire Department Offsite Fire Drill Evaluation Report, Crew A, 2/24/2017  
 Transient Combustible Permit 2017-009, 3/20/2017  
 Transient Combustible Permit 2017-008, 3/15/2017  
 TVA-NQA-PLN89-A, Nuclear Quality Assurance Plan, Rev.0033

**List of Corrective Action Documents Reviewed During Inspection**

ACE Report 324757, NRC Triennial Unresolved issue (URI) Lower Tier  
 ACE Report R2 589675, NRC Triennial Unresolved issue (URI) Lower Tier  
 CR240827, App. R calc deficiency (self-assessment issue)  
 CR324757, NRC Triennial Unresolved issue (URI) Lower Tier  
 CR589675, NCV - NRC Inspection Report 2012-002 Violation #06 LWR TIER  
 CR833779, FE requirements not incorporated into fire safe shutdown procedures  
 CR993968, Radio weak signal strength areas, dated 09/24/2015  
 CR1012662, Harris Radio issues in U1 669' pipe chase, dated 02/03/2016  
 CR1012664, Harris radio issues in the U1 690' penetration room, dated 02/02/2016  
 CR1224829, Conflicting fire safe shutdown analysis requirements  
 CR1224893, Fire safe shutdown analysis conflicts  
 CR1244628, Announced Fire Drill Learning Opportunities and Deficiencies  
 CR1244699, Inactive steam generators and stagnant loops during post-fire cooldown  
 CR1250625, HPFP Tank A Overflowing, 1/12/2017  
 CR1259493, Non-conservative Appendix R analysis due to loop stagnation  
 CR1261866, Head vent flowrate assumed in calculation APS2068 is non-conservatively high.  
 CR1261868, FHA Section 6.2.6.6 time to complete repair actions.  
 CR1261871, FHA needs to show available containment pressure indication.  
 CR1261874, FHA needs to show updated time to stop AFW pumps.  
 CR1261877, Appendix R analysis concern regarding containment pressurization  
 CR1261880, Loss of SFP during a fire.  
 CR1261881, Containment habitability for Appendix R repair actions.  
 CR1261883, Alternate shutdown fire timeline.  
 CR1266454, Appendix R Learnings  
 CR1267536, PZR PORV not Credited for some Rx Bldg Fires

CR1268240, Fire Alarm Horn Not Working Properly, 3/04/2017  
 CR1273463, App R concerns relating to spurious valve operation resulting SI signal  
 CR1273465, Revalidate thermal hydraulic analyses for SQN time-critical OMA's  
 CR1273466, The App R Function for the accumulator isolation valves is not documented in the MOV pop. Calc  
 CR1273468, Fire Safe Shutdown trigger values to stop AFW clarification  
 CR1275903, SQN TFPI 2017007 discrepancy with info in FE  
 CR1276522, Floor Drain Flow Calculation Assumption Basis, 3/28/2017  
 CR1278185, Controllers Failed to Conduct Fire Drill as Briefed During an Announced Fire Drill, 3/29/2017  
 CR1278188, Noncritical Objective not met During Announced Fire Drill, 3/29/2017  
 CR1278198, Controller Learning Opportunity During Announced Fire Drill, 3/29/2017  
 CR1279375, Administrative Change Needed for Drawing 0-47B491-70-7

**List of Condition Reports Generated as a Result of this Inspection**

CR1274704, SQN TFPI 2017007 Instrument identified incorrectly in calculation  
 CR1275195, SQN TFPI 2017007 Design Criteria SQN-DC-V-7.5 incorrect reference  
 CR1275560, SQNTFPI2017007 - Walkdown identified issues  
 CR1275729, SQNTFPI2017007 - Calculation administrative errors  
 CR1275903, SQN TFPI 2017007 discrepancy with info in FE  
 CR1275951, SQN TFPI 2017007 concern regarding alternate shutdown time validation  
 CR1275973, Appendix R triennial inspection TFPI 2017007  
 CR1276477, SQN TFPI 2017007 App R Lamp R081  
 CR1276516, SQN TFPI 2017007 AUO not signed in logs after assuming shift  
 CR1276522, Drainage of FP Discharge  
 CR1276596, Appendix R triennial inspection TFPI 2017007  
 CR1288002, SQN TFPI 2017007 NRC-identified potential NCV



## LIST OF ACRONYMS AND ABBREVIATIONS

ADAMS	Agency-wide Document Management System
AOP	Abnormal Operating Procedure
AP	Administrative Procedures
CAP	Corrective Action Program
CAQ	Condition Adverse to Quality
CFR	Code of Federal Regulations
CR	Condition Report
ELU	Emergency Lighting Unit
FA	Fire Area
FOL	Facility Operating License
FPP	Fire Protection Program
FPR	Fire Protection Report
IMC	NRC Inspection Manual Chapter
IP	NRC Inspection Procedure
KV	kilovolts
LIPD	Loss of Internal Distribution Power
LIV	Licensee-identified violation
NCV	Non-Cited Violation
NFPA	National Fire Protection Association
NRC	United States Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
OMA	Operator Manual Actions
PARS	Public Access Records
PER	Problem Evaluation Report
PI&R	Problem Identification and Resolution
P&IDs	Piping and Instrumentation Diagrams
Rev	Revision
SDP	Significance Determination Process
SER	Safety Evaluation Report
SSC	Systems, Structures and Components
SSD	Safe Shutdown
SRA	Senior Reactor Analyst
TDAFW	Turbine Driven Auxiliary Feedwater
TFPI	Triennial Fire Protection Inspection
UFSAR	Updated Final Safety Analysis Report
USNRC	United States Nuclear Regulatory Commission