UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8931

December 22, 2005

Tennessee Valley Authority
ATTN: Mr. K. W. Singer
Chief Nuclear Officer and
Executive Vice President
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR POWER PLANT - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000327/2005011 AND 05000328/2005011

Dear Mr. Singer:

On November 18, 2005, the Nuclear Regulatory Commission (NRC) completed an inspection at the Sequoyah Nuclear Power Plant. The enclosed report documents the inspection results, which were discussed on November 18, 2005, with Mr. D. Kulisek and other members of your staff.

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

Based on the results of this inspection, no findings of significance were identified.

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

Sincerely,

/RA/

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

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

Enclosure: Inspection Report 05000327/2005011 and 05000328/2005011
w/Attachment: Supplemental Information

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-327, 50-328
License Nos.:	DPR-77, DPR-79
Report No.:	05000327/2005011 and 05000328/2005011
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Sequoyah Nuclear Plant, Units 1 and 2
Location:	Sequoyah Access Road Soddy-Daisy, TN 37379
Dates:	October 31 - November 4, 2005 (week 1) November 14 - 18, 2005 (week 2)
Inspectors:	B. Melly, Fire Protection Engineer (Contractor) N. Merriweather, Senior Reactor Inspector R. Schin, Senior Reactor Inspector (Lead Inspector)
Accompanying Personnel:	J. Quinones-Navarro, Nuclear Safety Professional
Approved by:	D. Charles Payne, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000327/2005-011 and 05000328/2005-011; 10/31 - 11/4/2005 and 11/14 - 18/2005; Sequoyah Nuclear Power Plant, Units 1 and 2; Triennial Fire Protection Inspection.

This report covers an announced two-week period of inspection by two regional inspectors and one contractor. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG 1649, "Reactor Oversight Process" Revision 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings

None

B. Licensee-Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R05 Fire Protection

The purpose of this inspection was to review the Sequoyah Nuclear Plant fire protection program (FPP) for selected risk-significant fire areas. Emphasis was placed on verification that the post-fire safe shutdown (SSD) capability and the fire protection features provided for ensuring that at least one train of SSD systems was maintained free of fire damage. Another inspection focus was to verify that local manual operator actions were consistent with the licensing basis.

The inspection was performed in accordance with Inspection Procedure (IP) 71111.05T, Fire Protection (Triennial), dated 02/18/05, and the U. S. Nuclear Regulatory Commission's (NRC) Reactor Oversight Process, using a risk-informed approach for selecting the fire areas and attributes to be inspected. The selection of risk-significant fire areas to be evaluated during this inspection considered the licensee's Individual Plant Examination for External Events, information contained in licensee FPP documents, results of prior NRC triennial inspections, and observations noted during in-plant tours. The fire areas chosen for review during this inspection were:

- Fire Area FAA-070, Unit 1 480V Shutdown Board Room 1B2, located on the 734 foot (ft.) elevation of the auxiliary building. A severe fire in this area would involve shutdown of Unit 1 and Unit 2 from the main control room (MCR).

- Fire Area FAA-095, Unit 1 480V Board Room 1B, located on the 749 ft. elevation of the auxiliary building. A severe fire in this area would involve shutdown of Unit 1 and Unit 2 from the MCR.

- Fire Area FAC-017, MCR (part of area FAC-017), located on the 732 ft. elevation of the control building. A severe fire in this area would involve evacuation of the MCR and shutdown of Unit 1 and Unit 2 using alternative shutdown capability.

For each of the selected fire areas, the inspection team evaluated the licensee's FPP against the applicable NRC requirements. The specific documents reviewed by the team are listed in the attachment.

.01 Analysis for Shutdown From Outside or Inside the Main Control Room

a. Inspection Scope

The team evaluated whether the licensee's safe shutdown analysis (SSA) properly identified and categorized components in terms of functions to be performed for SSD of the units during a severe fire.

The team compared the list of available SSD equipment documented in the licensee's post-fire SSA to flow diagrams of selected SSD systems to assure that the licensee had properly identified the components and systems necessary to achieve and maintain SSD conditions.

The team reviewed appropriate electrical design calculations to verify that the licensee had evaluated the availability of offsite power for systems and components needed for shutdown from fires in Fire Areas FAA-070 and FAA-095. Additionally, the team reviewed portions of the Fire Protection Report and confirmed that a loss of offsite power as well as offsite power available were assumptions used in analyzing control building fires (including FAC-017), which may require alternative shutdown from outside the MCR.

b. Findings

No findings of significance were identified.

.02 Protection of Safe Shutdown Capabilities

a. Inspection Scope

For the selected fire areas, the team evaluated the potential for fires, the combustible fire load characteristics, potential fire severity, the separation of systems necessary to achieve and maintain SSD, and the separation of electrical components and circuits to ensure that at least one SSD train of equipment was free of fire damage.

The team toured the selected plant fire areas to observe: (1) the material condition of the protection systems and equipment, (2) the storage of permanent and transient combustible materials, (3) the location, control, and cleanliness of 20-foot horizontal separation locations and, (4) the licensee's implementation of the procedures for limiting fire hazards, housekeeping practices, and cleanliness conditions. These reviews were accomplished to ensure that the licensee was maintaining the fire protection systems, had properly evaluated in-situ combustible fire loads, controlled hot-work activities, and limited transient fire hazards in a manner consistent with the plant administrative and FPP procedures.

The team also reviewed the fire fighting fire emergency plans for the selected areas to determine if appropriate information was provided to the fire brigade members to identify equipment important to SSD and to facilitate fire suppression of a fire that could impact SSD capability.

In addition, the team reviewed the adequacy of the design and installation of the fire suppression systems located in the Unit 1 480V Shutdown Board Room 1B2 (FAA-070), Unit 1 480V Board Room 1B (FAA-095) and the Cable Spreading Room (FAC-017). This was accomplished by reviewing the engineering design drawings, suppression system vendor calculations & analyses, and the as-built system configurations to check that they were consistent with the code of record and code compliance documents.

b. Findings

1) Reliance on 20-foot Separations for Fire Protection in Unit 1 480V Board Room 1B

Introduction. The team identified an unresolved item (URI) associated with reliance on 20-foot separation zones between redundant SSD equipment in Unit 1 480V Board Room 1B (Fire Area FAA-095). The 20-foot zones did not meet the requirements of 10 CFR 50, Appendix R, Section III.G.2 and also appear not to meet the basis for NRC approval of Deviation #11 related to those requirements. This issue is unresolved pending further NRC review of the licensing basis and the potential for the condition to adversely affect SSD.

Description. The licensee's SSA for Fire Area FAA-095 relied on three separate 20-foot separation zones between redundant SSD equipment in the room. Fire Area FAA-095 contained three Unit 1 480V motor control centers (MCCs), all three Unit 1 battery chargers (train A, train B, & spare), two of four channels of vital inverters for Unit 1, and two of four channels of vital inverters for Unit 2. The SSA relied on at least two of the three Unit 1 battery chargers and one of the two channels of Unit 1 and Unit 2 inverters in the room not being damaged by a fire in the room. One 20-foot separation zone was located on the north side of the room, separating the train A battery charger (located in the north end of the room) from the spare battery charger (located in the middle of the room). Another 20 foot separation zone was located on the south side of the room separating the train B battery charger (located in the south end of the room) from the spare battery charger. The third 20-foot separation zone was located in the middle of the room, between the vital inverters 1-I and 2-I (located in the north end of the room) and vital inverters 1-II and 2-II (located in the south end of the room).

10 CFR 50, Appendix R, Section III.G.2 stated that redundant SSD cables and equipment could be separated by 20 feet, with no intervening combustibles or fire hazards, and with detection and automatic suppression installed in the area. Deviation #11 applied to the auxiliary building in general. It allowed 20-foot separation zones in this building with intervening combustibles in the form of cable trays provided that: 1) the cables had fuse and breaker coordination to minimize the potential for fires initiating from cable faults and 2) extra sprinklers were installed to compensate for cable trays partially blocking any sprinklers.

The team noted that the licensee had not identified in FAA-095 or in engineering documents exactly where the 20-foot separation zones were located. The team estimated the areas of the three 20-foot separation zones in FAA-095 and observed that each one did not meet the requirements of 10 CFR 50, Appendix R, Section III.G.2 and also appeared not to meet the basis for Deviation #11. In addition to intervening cable trays, each of the 20-foot separation zones included intervening ignition sources in the form of 480V MCCs and inverters. Also, two inverters located in the south end of the room, in the 20-foot separation zone between the Train A battery charger and the spare battery charger, did not have sprinklers installed above them.

Licensee personnel stated that the lack of sprinklers in the south end of the room had been approved by Deviation #4. Deviation #4 applied to the Appendix R, Section III.G.2 requirement that fire detection and automatic suppression be provided in areas containing redundant SSD equipment that is separated by less than a three-hour fire rated construction. Deviation #4 allowed the licensee to omit sprinklers at the south end of FAA-095 on the basis that inadvertent operation of a sprinkler system would cause unacceptable damage to the inverters and battery chargers. Also, fire loading in FAA-095 was considered to be low. However, the team observed that the battery charger and inverters at the north end of FAA-095 had sprinklers installed above them and that fire loading in FAA-095 was not low. The team found that, after Deviation #4 had been approved by the NRC, licensee engineers had recalculated the fire loading in FAA-095 and found it to be high. Apparently the original calculation of fire loading had failed to include the cable insulation inside of the 480V MCCs, inverters, and battery chargers. Licensee engineers determined the increased fire loading did not adversely affect SSD and and thus was acceptable without further review by the NRC. The team concluded that the licensee had inappropriately applied two separate NRC approved Deviations to the south end of FAA-095.

More importantly, the team was concerned that the three 480V MCCs that intervened in the three 20-foot separation zones represented significant fire hazards. They occupied most of the length of FAA-095, from the north end to the south end of the room. They included a total of 42 vertical sections, with each vertical section being a potential ignition source. Each vertical section had stacks of open cable trays directly above it, so that a fire that initiated in a vertical section could readily spread up to seven or more cable trays. NUREG-1805 fire models demonstrated that such a fire could cause a hot gas layer throughout the room which could damage the cables (all had non-qualified thermoplastic insulation) and the SSD equipment located in FAA-095, should the automatic sprinkler system fail. The team noted that the sprinkler system for FAA-095 had a higher likelihood of failure because it was a cross-zone preaction-type of system. The sprinkler piping in FAA-095 was normally dry. To put fire water into the piping, at least two smoke detectors from different zones in the room would have to activate and automatically open a valve. If the cross-zone detector circuit failed or the valve failed to automatically open, all of the sprinklers in FAA-095 would fail to deliver water.

Sequoyah's license condition for fire protection allowed changes to the fire protection program provided that the changes did not adversely affect SSD. The licensee's evaluation determined that the existing 20-foot separation zones were acceptable. Licensee personnel concluded that the existing 20-foot separation zones did not adversely affect SSD and were acceptable with no further review by the NRC, because there were sprinklers above the cable trays and MCCs.

This issue is considered an unresolved item pending further NRC review of the licensing basis and the potential for the condition to adversely affect SSD. This issue is identified as URI 05000327,328/2005011-01, Reliance on 20-foot separation zones for Fire Protection in Unit 1 480V Board Room 1B.

2) Unprotected Power Cables to Vital Inverters in Unit 1 480V Board Room 1B

Introduction. The team identified an URI associated with unprotected alternating current (AC) power cables to Unit 1 vital inverter 1-II and Unit 2 vital inverter 2-II. The cables were routed through the north end of the Unit 1 480V Board Room 1B (Fire Area FAA-095) without protection or separation from fire damage (as required by Appendix R, Section III.G.2). The licensee's SSA for SSD of Unit 1 and Unit 2 relied on the cables not being damaged by a severe fire in that area. To compensate for the unprotected cables, licensee personnel added a local manual operator action to the fire response procedures. This issue is unresolved pending further NRC review of the licensing basis.

Description. The licensee's SSA for FAA-095 divided the fire area into three fire zones identified by column lines A3-A4, A4-A6, and A6-A8. Based on these fire zone descriptions the licensee analyzed what electrical equipment would be impacted by a fire in the affected zone. The licensee's electric circuit analysis for a fire occurring between column lines A3 and A4 in FAA-095 (the north end of the room) concluded that vital inverters 1-II and 2-II, which were located in the south end of the room, would be available to support SSD. The analysis concluded that only vital inverters 1-I and 2-I, which were located in the north end of the room, would be lost for a fire in this zone. However, the 480V AC power cables to vital inverters 1-II and 2-II were routed through the north end of the Unit 1 480V Board Room 1B without protection or separation from fire damage (as required by Appendix R, Section III.G.2). The cables were approximately 11 feet from the 120V AC vital inverter 1-I and there were intervening 480V MCCs and cable trays in that 11 feet. Consequently, a fire in the north end of fire area FAA-095, between column lines A3 and A4, could result in loss of the 480V AC normal power supply cables to the 120V AC vital inverters 1-II and 2-II.

Loss of the 480V AC power supply cable from fire damage would cause the vital inverters 1-II and 2-II to use their direct current (DC) power supply. Because the load of the inverters on the DC power supply would exceed the capacity of the battery charger, it could result in the complete discharge of the 125V DC battery and cause the inverters and other loads on the DC bus to be lost. The licensee's analysis of record indicated that the battery charger and battery could maintain power to the 125V DC Vital Battery Board II and 120V AC Vital Instrument Power Board 1-II and 2-II loads for least four hours without the 480V AC power to the inverters.

The licensee entered this issue into their corrective action program in Problem Evaluation Report (PER) 91841. In addition, the licensee took prompt corrective action to revise the fire procedure to add local manual operator actions to energize the spare Inverter 0-II, transfer the 120V AC Vital Instrument Power Board 1-II to its alternate supply, and de-energize inverter 1-II, all within four hours. The licensee stated that walkdown data showed that the actual loading on the battery/charger combination would be low enough such that the loads could be maintained for more than 8 hours.

The team reviewed Design Change Notice (DCN) D-20071, Rev. a, which installed new vital inverters 1-II and 2-II and associated AC power cables (1PL4915B and 2PL4910A) in 2001. The DCN involved the installation of eight new inverters on the Unit 1 and Unit 2 vital power systems.

The DCN was approved for implementation on September 2, 1999, and the plant modifications were completed in 2001. The new inverters were physically located in the same rooms as the old inverters. The Nuclear Safety Assessment for Fire Protection in the DCN stated that "the new and existing cables routed (or rerouted) for this modification have been evaluated and found to be acceptable in accordance with the SQN Fire Hazards Analysis, see Mini-Calculation SQN-26-D054EPMABBIMPFHA6." It also stated the following:

> "A fire in some areas along the route requires manual actions as a result of new 480V feeders to the replacement 120V AC vital inverters. In each case, the spare inverter is to be energized, the 120V AC vital distribution panel is to be transferred to its alternate supply (spare inverter) and the Unit 1 inverter de-energized. The actions are to be completed within 4 hours."

Based on the above, the team concluded that the original design change had concluded that failure of the cable between columns A3 and A4 in FAA-095 was likely due to fire damage and that local manual operator actions would be necessary to mitigate the cable failure. However, after the modifications were completed, the required operator actions had not been added to the post-fire SSD procedure. The team also had a concern that the design change was not consistent with the licensing basis for the plant (i.e.,10 CFR 50, Appendix R , Section III.G.2) in that local manual operator actions were being used in lieu of separation or protection of the cables. The use of manual actions in lieu of separation or protection may require NRC approval prior to implementation if it affects SSD.

The design change analysis referenced NRC approved Deviation #11 to Section III.G.2.b of Appendix R to support acceptability of the DCN. Deviation #11 allowed intervening combustibles in the form of open ladder type cable trays, with sprinklers, to be installed between redundant cables which were separated by more than 20 feet. However, Deviation #11 did not allow redundant cables to be separated by only 11 feet, with intervening 480V MCCs and cable trays. This issue is considered an unresolved item pending further NRC review of the licensing basis and is identified as URI 05000327,328/2005011-02, Unprotected Power Cables to Vital Inverters in Unit 1 480V Board Room 1B.

.03 Passive Fire Protection

a. Inspection Scope

The team reviewed the selected fire areas to verify the adequacy of the fire resistance capability of fire area barrier enclosure masonry hollow block and poured concrete walls, ceilings, floors, fire barrier mechanical and electrical penetration seals, fire doors, and fire dampers in accordance with licensee commitments to NUREG 0800, Section 9.5.1.

The review was performed to verify that at least one post-fire SSD success path would remain free of fire damage in the event of a fire. This was accomplished by observing the material condition and configuration of the installed fire barrier features, as well as reviewing construction detail drawings and fire endurance tests for the installed fire

barrier features, to verify that the as-built configurations met design requirements, license commitments, standard industry practices and were either properly evaluated or qualified by appropriate fire endurance tests.

The team also reviewed the fire barriers shown on the fire plan drawings for the selected fire areas and walked down these areas to evaluate the adequacy of the fire resistance of the installed barriers. The team reviewed selected fire barrier penetration seals installed in the Unit 1 480V Board Room 1B boundary walls and performed a vertical slice evaluation to verify proper installation, configuration maintenance and qualification of these penetration seal.

Additionally, the team reviewed licensing documentation, and engineering evaluations for the fire barrier features to verify that the fire barrier installations met design requirements and licensing commitments.

b. Findings

No findings of significance were identified.

.04 Active Fire Protection

a. Inspection Scope

The team reviewed the Sequoyah Fire Protection Report which is comprised of the fire protection plan, SSD capabilities, alternate shutdown capability, emergency lighting, reactor coolant pump oil collection, National Fire Protection Association (NFPA) code evaluations, deviations and evaluations to Appendix R, BTP 9.5-1- Appendix A, and NFPA Code requirements. This review was performed to verify that the objectives established by the NRC-approved fire protection program were being satisfied. The team also toured the selected plant fire areas to observe the licensee's implementation of these requirements.

The team reviewed the adequacy of the design and installation of the preaction water sprinkler systems providing protection to FAA-070 and FAA-095, the open head water spray system protecting the Train A cable tray(s) in FAA-070, and the preaction sprinkler system protecting the cable spreading room.

Team members performed a walkdown of these systems to determine the arrangement of the sprinkler heads and spray nozzles, and the hydraulic calculations for these systems. Selected engineering evaluations for NFPA code deviations were reviewed and compared with the physical configuration of the system.

The team reviewed the adequacy of the design and installation of the automatic fire detection and alarm system for the selected fire areas. This was accomplished by reviewing the as-built configuration of the detector layout relative to the construction characteristics of the ceiling beam locations for the selected fire areas and reducing the detector area coverage based on room air exchange rates.

Field tours were conducted in fire areas FAA-070, FAA-095, and FAC-017 to confirm detector locations agreed with those shown on engineering drawings.

The team reviewed the hydraulic calculations for the systems in the selected areas to ensure that adequate flow and pressure was available to ensure effective water distribution would be provided in accordance with the design basis of the system. The team performed this review to confirm that the suppression system demand could be met by the fire pump output.

The team reviewed the fire protection pre-plans and fire strategies to confirm the proximity of the fire hose locations to adequately reach the selected fire areas for manual fire fighting efforts. The team reviewed the manual suppression standpipe and fire hose system to verify adequacy of design, installation, and operation in the selected fire zones. Hose stations in the selected areas were inspected to ensure that hose lengths depicted on engineering documents were also the hose lengths located in the field. This was done to verify that installed fire hoses could effectively support manual fire fighting efforts in the selected fire areas.

b. Findings

Sprinklers Apparently Too Far Below Ceiling in Cable Spreading Room

Introduction. The team identified an URI related to the design of the sprinkler system in the cable spreading room, in that, the sprinklers were apparently installed too far below the ceiling. This issue is unresolved pending further NRC review of the licensing basis and the suppression capability of the installed sprinkler system.

Description. The team observed that all of the installed sprinklers in the cable spreading room were 30 inches or more below the ceiling. However, the NFPA code requires that sprinklers be installed within 18 inches of the ceiling. Positioning the sprinklers farther below the ceiling results in a delayed sprinkler response and allows a fire to grow larger in size.

The Sequoyah FPP stated that sprinkler systems comply with the NFPA Code for installation of sprinkler systems. The “SQN Fire Protection Report, Part VII - Deviations and Evaluations,” paragraph 5.1.1, stated that sprinkler systems comply with NFPA 13-1975, with certain exceptions. The list of exceptions did not include any sprinklers being installed farther below the ceiling than allowed by the NFPA code. NFPA 13-1975, Section 4-3.1, requires that for smooth ceiling construction, deflectors of sprinklers in bays shall be located 1 inch to 12 inches below noncombustible ceilings. For panel construction, the code allows sprinklers to be as much as 18 inches below the ceiling; however, in no case does the code allow sprinklers to be 30 inches below the ceiling.

In a Safety Evaluation Report (SER), (NUREG-011, Supplement 1), the NRC approved the licensee’s sprinkler system design for the cable spreading room, including the use of an upper level near the ceiling and an intermediate level approximately halfway between the floor and the ceiling. However, the NRC SER did not specifically recognize that the upper level of sprinklers was more than 18 inches below the ceiling.

The team concluded that the SER did not appear to approve a deviation from the NFPA code.

In Generic Letter (GL) 86-10, the NRC stated a staff position that licensees may deviate from NFPA code requirements with an evaluation approved by a fire protection engineer. GL 86-10 stated that such deviations from the NFPA code should be identified in the FSAR or FHA. However, GL 86-10 also stated an NRC staff position that sprinkler heads should be located at the ceiling.

The team observed that the cable spreading room contained cables for both units and was very large in volume (approximately 219 feet long by 42 feet wide and 25 feet high). Rows of intermediate sprinklers were located between rows of upper sprinklers such that most fires that could start near the floor would generate a wide heat plume that would impact at least one upper or intermediate level sprinkler. The sprinklers had metal heat collectors installed above them; however, NRC Information Notice 2002-024 describes potential problems with such heat collectors. Also, sprinklers that were not directly in the heat plume of a fire could potentially have a significantly delayed response to the fire.

This issue remains open for further NRC review of the licensing basis and the suppression capability of the installed sprinkler system. The issue is identified as URI 05000327,328/2005011-03, Sprinklers Apparently Too Far Below Ceiling in Cable Spreading Room.

.05 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The team walked down the selected fire areas to verify that redundant trains of systems required for hot shutdown, which are located in the same fire area, are 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.

b. Findings

No findings of significance were identified.

.06 Operational Implementation of Safe Shutdown Capability

a. Inspection Scope

The team reviewed the operational implementation of the SSD strategy that would be used during a significant fire in any of the selected fire areas. The team interviewed operators and reviewed lesson plans, job performance measures, plant procedures,

and training records for licensed and non-licensed operators. These reviews were performed to verify that: 1) the procedures were available for immediate use; 2) the operators could reasonably be expected to perform the procedures, including local manual operator actions, within applicable shutdown time requirements; 3) the local manual operator actions in place for fire areas requiring SSD from the MCR met the feasibility criteria listed in NRC IP 71111.05T; 4) the training program for operators included local manual operator actions relied on for SSD from the MCR or from the alternate shutdown locations; 5) personnel required to achieve and maintain the plant in hot standby following a fire could be provided from normal onsite staff, exclusive of the fire brigade; and 6) the licensee conducted periodic operational tests of the alternate shutdown transfer capability and instrumentation and control functions.

The team also reviewed the licensee's SSA and walked down the selected fire areas to evaluate the adequacy of the licensee's strategy for post-fire SSD for a severe fire in the MCR. In addition, the team reviewed electrical schematic wiring diagrams, block diagrams, and cable routing information on the control circuits of selected SSD components to verify that the control circuits could be isolated from the main control room and still remain functional for post fire SSD. The team reviewed records of the surveillance tests performed on the Unit 1 remote shutdown transfer switches to verify that the switches were being tested at a frequency consistent with the surveillance test program which specified that 25% of the switches be tested every outage. The team also reviewed the test deficiencies to verify that they were being entered into the corrective action program for tracking and resolution. The documents reviewed are listed in the attachment.

The team reviewed and walked down applicable sections of the following fire response abnormal operating procedures (AOPs):

- AOP-N.01, Plant Fires, Rev. 20
- AOP-N.08, Appendix R Fire Safe Shutdown, Rev. 7
- AOP-C.04, Shutdown From Auxiliary Control Room, Rev. 8

b. Findings

1) Appendix R Operator Action to Throttle Auxiliary Feedwater (AFW) in the Main Steam Valve Vault Room

Introduction. The team identified an URI related to a potentially non-feasible local manual operator action that was relied upon for SSD during a large fire in each of the three fire areas that were the focus of this inspection. The local manual action was to throttle AFW in the main steam valve vault room with or without lights. This issue is unresolved pending further NRC review of the licensing basis.

Description. During plant walkdowns of local manual operator actions that would be needed to mitigate a severe fire in FAC-17, FAA-070, or FAA-095, the team identified a potentially non-feasible local manual operator action. The local manual action was for an auxiliary unit operator (AUO) to throttle AFW flow to two steam generators in the Unit 1 main steam valve vault room and another AUO to perform a similar action in the Unit 2 main steam valve vault room.

The action was required by AOP-N.08, Appendix G and AOP-C.04, Appendix J.

During the walkdowns, the team observed that the Unit 2 main steam valve vault room was completely dark. All of the normal lights were extinguised and the installed Appendix R emergency lights were off. Licensee investigation determined there was no lighting because all of the normal light bulbs were burned out. The emergency lights were designed to come on only when electrical power to the normal lights was lost. Because electrical power had not been lost, no lighting was illuminated in the room. The lack of normal lighting had not been recognized because plant safety rules did not allow operators to go into the main steam valve vault rooms alone due to heat stress concerns, and there was no plant requirements to routinely enter the rooms during plant operation to check on the conditions in the rooms.

As a result of the licensee not maintaining the normal lighting, had a severe (Appendix R) fire occurred in FAA-070, FAA-095, FAC-017, or any of many other fire areas, an AUO may have had to locally control AFW flow in the Unit 2 main steam valve vault room in the dark. The team walked down the operator action in the dark Unit 2 main steam valve vault room with an operator (using flashlights), and judged that the action was not feasible. The action was found to be too difficult and had a high likelihood of failure. Difficulty factors included: complete darkness except for a flashlight, heat stress, climbing ladders in the dark while holding a flashlight and avoiding hot pipes and head-knocking steel supports, loud noise from steam generator relief valves that would be lifting nearby, no local indications for throttling the valves, poor communications (the AUO would need to climb down a ladder and exit the valve room repeatedly to talk on the radio to the main or auxiliary control room), throttling with a gate valve (which would provide very uneven flow control), the action was time critical (to be performed within 30 minutes), and one AUO would have to perform the action alone.

Licensee personnel stated that one AUO could be assigned to perform this action because plant safety rules related to heat stress did not apply during emergencies such as Appendix R fires. The team noted that if both units were affected by an Appendix R fire, then all available on-shift AUOs would be needed to perform SSD actions. There would be no extra AUOs available to send more than one to a main steam valve vault room. After the walkdowns, licensee personnel documented that they considered the action to be feasible for one AUO to perform even without lighting.

The licensee promptly replaced the normal light bulbs in the Unit 2 main steam valve vault room and the team verified that the lights were on. The team noted that the licensee had installed backup air supply bottles (located outside the main steam valve vault rooms) that could enable the control room to operate the AFW air-operated flow control valves if the normal instrument air was lost; however, that backup air supply was not used in the Appendix R SSD procedures. In lieu of protecting cables to the AFW flow control valves from fire damage, the licensee was relying on the local manual actions in the main steam valve vault rooms.

The team reviewed standards related to maintaining normal lighting for Appendix R SSD actions. Where the approved fire protection program allows certain local manual operator actions, those actions are expected to be capable of being reliably performed under the anticipated circumstances.

Where licensees are relying on unapproved local manual actions, the actions can be considered adequate temporary compensatory measures if they are feasible. Feasibility and capability of being reliably performed

involve adequate lighting. 10 CFR 50, Appendix R requires that operators be able to safely shut down the plant with or without offsite power (i.e., with or without normal lighting). Appendix R, Section III.J, Emergency Lighting, requires that emergency lighting be provided in all areas needed for operation of SSD equipment and for access and egress thereto. The statements of consideration (SOC) for Appendix R, Section III.J indicate that the basis for the emergency lighting assumed that normal lighting would also be available. The SOC stated: "...operators involved in safe plant shutdown should not also have to be concerned with lighting in the area," and "it is prudent to provide 8-hour emergency lighting capability to allow sufficient time for normal lighting to be restored with a margin for unanticipated events."

The acceptability of the local manual operator action to throttle AFW flow in the main steam valve vault room, with or without lighting, is unresolved pending further NRC review of the licensing basis for the action. This issue is identified as URI 05000327,328/2005011-04, Appendix R Operator Action to Throttle AFW in Main Steam Valve Vault Room.

2) Reliance on Local Manual Operator Actions for Appendix R Fires

Introduction. The team identified an URI related to licensee reliance on many local manual operator actions for mitigation of Appendix R, Section III.G.2 fires, where operators would be shuting down the plant from the main control room. This issue is unresolved pending further NRC review of the licensing basis.

Description. The team noted that the licensee's procedure AOP-N.08, Appendix R Fire SSD, relied on many local manual operator actions to mitigate a fire in FAA-070 or FAA-095 in lieu of protecting or separating cables per Appendix R, Section III.G.2. The licensee had no approved NRC deviations from the requirements of Appendix R, Section III.G.2 for these manual actions. However, licensee personnel believed that some of the actions had been specifically reviewed and accepted by the NRC, as documented in Inspection Report 05000327,328/88-24, which was referenced by NRC SER (NUREG-1232). The licensee also stated that the NRC had approved a general reliance on local manual operator actions instead of protecting or separating cables per Appendix R, Section III.G.2. The licensee had reviewed and walked down each action, and considered each action to be feasible.

With the exception of the action to locally control motor driven AFW pump flow (described above), the team found these actions to be feasible. This issued is unresolved pending further NRC review of the licensing basis. This issue is identified as URI 05000327,328/2005011-05, Reliance on Local Manual Operator Actions for Appendix R Fires.

.07 Circuit Analysis

a. Inspection Scope

The team reviewed how systems would be used to achieve SSD during and after a postulated fire in the fire areas selected for review. Portions of the licensee's SSD analysis which described the methodology and systems relied upon to achieve SSD were reviewed.

The evaluation focused on the cabling of selected components for the chemical and volume control system, emergency raw cooling water system, main steam system, emergency core cooling system, and other components whose inadvertent operation due to fire damage could significantly affect the post-fire SSD capability. For the sample of components selected, the team reviewed electrical schematic and block diagrams and identified power, control, or instrument cables necessary to support their operation. In addition, conduit and cable tray layout drawings and cable routing information were reviewed to verify that fire protection features were in place as needed to satisfy the separation and design requirements of Section III.G of Appendix R. The team walked down the selected fire areas to compare the actual plant configuration to the layout indicated on the drawings. On a sample basis, the team reviewed the licensee's analysis of electrical circuit breaker coordination for 480V AC motor control centers subject to fire damage from a postulated fire in the areas selected. The components which were reviewed for operability during and after a fire in each of the selected fire areas are listed in the attachment. Drawings and operating procedures reviewed are also included in the attachment.

b. Findings

1) Potential for Fire Damage to Spuriously Open a Containment Sump Isolation Valve

Introduction. The team identified an URI associated with potential fire-induced electrical circuit failures in the containment sump flow isolation valve 1-FCV-63-73 control circuit. Postulated fires in FAA-095 and FAA-070 could result in electrical circuit faults in the control cables and control logic of the isolation valve. These fire-induced faults could cause the valve to spuriously open and drain the refueling water storage tank (RWST) to the containment sump. This issue is unresolved pending further NRC review of the licensing basis.

Description. The team reviewed cable routing information for both containment sump flow isolation valves 1-FCV-63-72 and -73, and determined that containment sump isolation valve 1-FCV-63-73 had two control cables that were routed in fire areas FAA-070 and FAA-095. These multiconductor control cables were identified as 1V3141B and 1V3142B, and were 9 and 12 conductor cables with thermoplastic jackets, respectively. In reviewing the electrical schematics, block diagrams, and the Appendix R Hot Short Analysis, the inspectors concluded that two intra-cable hot shorts in either cable could cause the valve to spuriously open and drain the RWST to the containment sump. For example, concurrent hot shorts between conductors 13A5 and 13A6 and between 13A3 and 13A08 in cable 1V3141B could spuriously open the valve.

Spurious opening of the valve would drain the RWST to the containment sump and adversely affect SSD by removing the suction source for the charging pumps.

The licensee's hot short analysis assumed that only one hot short was credible. The licensee had previously modified the design of the control circuit to prevent spurious operation with only one hot short. The licensee stated that its licensing basis required a design assuming only one hot short. However, the team could not confirm this statement. The team noted that NRC Regulatory Information Summary (RIS) 2004-03, Rev. 1, states in part that: "For any individual multiconductor cable (thermoset or thermoplastic), failure that may result from intra-cable shorting, of any possible combination of conductors within the cable may be postulated to occur concurrently regardless of number." This issue is unresolved pending further NRC review of the licensing basis related to intra-cable hot shorts. The issue is identified as URI 05000327,328/2005011-06, Potential for Fire Damage to Spuriously Open a Containment Sump Isolation Valve.

2) Potential for Fire Damage to Spuriously Close the Charging Header Flow Control Valve

Introduction. The team identified an URI associated with potential fire-induced electrical circuit failures in the charging header flow control valve control circuit. A postulated fire in fire area FAA-070 could result in fire-induced electrical circuit faults in the control cables and control logic of the charging flow control valve causing the valve to close and shut off cooling flow to the reactor coolant pump (RCP) seals. This issue is unresolved pending further NRC review of whether the licensee is required to design against such a failure mode.

Description. The team reviewed cable routing information for charging header flow control valve 1-FCV-62-093 and determined that two cables in the control logic for the valve were routed in fire area FAA-070 without appropriate separation or protection. These cables were identified as 1PM108 and 1PM110. Both cables provided a 10-50 milliamp signal for control of the charging pump discharge air operated valve (AOV). A cable-to-cable hot short of 50 milliamps in either cable could spuriously close the AOV and stop all RCP seal injection flow. The team determined that both cables were routed in trays with other signal cables of 10-50 milliamps so that a cable-to-cable hot short of this type could potentially occur.

However, because the cables were shielded twisted pairs with drain wires, it is not likely a failure of this type could occur without the cables shorting to each other or to ground. This item is unresolved pending further NRC review to determine whether the licensee is required to design against such a failure mode. This issue is identified as URI 05000327,328/2005011-07, Potential for Fire Damage to Spuriously Close the Charging Header Flow Control Valve.

.08 Communications

a. Inspection Scope

The team reviewed the adequacy of the communication systems to support plant personnel in the performance of SSD functions and fire brigade duties. This included the portable radios that were the primary means of communication for the fire brigade,

sound powered phones, public address system, and plant telephones. During walk downs of post-fire response procedures, the team checked the availability of communication equipment at the auxiliary control panels and at locations where operators performing local manual actions would need to communicate with the MCR. The team also reviewed design drawings depicting the as-built radio repeater and antenna system and associated cables to verify that the radio communication system would be available to support post-fire SSD activities in the selected fire areas.

b. Findings

No findings of significance were identified.

.09 Emergency Lighting

a. Inspection Scope

The team reviewed the location, design, operation, and testing of the area emergency lighting units (ELUs) to verify that they met the requirements of 10 CFR 50, Appendix R, Section III.J. During plant walk downs of selected areas where operators performed SSD local manual actions, the team observed the locations of ELUs and checked the directional aiming of lamp heads to determine if adequate illumination was available to perform the actions required by the procedures and also for access and egress pathways. The team also reviewed manufacturers' data sheets and periodic testing results for the direct current, self-contained, battery-powered ELUs to check if they had at least an 8-hour capacity.

b. Findings

No findings of significance were identified.

.10 Cold Shutdown Repairs

a. Inspection Scope

The team reviewed existing cold shutdown repair procedures for fires in the selected areas, materials and tools, and potentially damaged plant equipment to check that they were adequate to enable licensee personnel to complete any needed repairs within 72 hours, as required by 10 CFR 50, Appendix R, Section III.G. The team reviewed inventories of replacement electrical power and control cables and other repair equipment that was stored in the warehouse to check if the equipment was appropriately labeled, maintained in good condition, and in sufficient quantity to successfully accomplish all required repairs. The team also evaluated the estimated manpower and the time required to perform post-fire repairs for reasonableness.

b. Findings

No findings of significance were identified.

.11 Compensatory Measures

a. Inspection Scope

The team conducted a review to verify that adequate compensatory measures were put in place by the licensee for out-of-service, degraded, or inoperable fire protection and post-fire SSD equipment, systems, or features. The team also verified that short term compensatory measures were adequate to compensate for a degraded function or feature until appropriate corrective actions were taken.

The team interviewed fire protection personnel to determine that the licensees effectiveness in returning equipment to service was being performed in a reasonable period of time.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems

a. Inspection Scope

The team reviewed corrective action program documents, including completed corrective actions documented in selected PERs to verify that problems were appropriately entered into, and resolved by, the corrective action program process. The team evaluated the effectiveness of the corrective actions for the identified issues.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On November 18, 2005, the team presented the inspection results to Mr. D. Kulisek and other members of his staff, who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel:
M. Heatherly, Corporate Fire Protection Engineer
D. Kulisek, Plant Manager
M. Palmer, Operations Manager
D. Porter, Operations Procedures
R. Proffitt, Licensing Engineer
R. Rogers, Engineering Manager
B. Simril, Fire Protection Engineer
J. Smith, Licensing Supervisor
R. Travis, Electrical Engineer
E. Turner, Electrical Engineer

NRC Personnel:
S. Freeman, Senior Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000327,328/2005011-01	URI	Reliance on 20-foot Separation Zones for Fire Protection in Unit 1 480V Board Room 1B (Section 1R05.02.b.1)
05000327,328/2005011-02	URI	Unprotected Power Cables to Vital Inverters in Unit 1 480V Board Room 1B (Section 1R05.02.b.2)
05000327,328/2005011-03	URI	Sprinklers Apparently Too Far Below Ceiling in Cable Spreading Room (Section 1R05.04.b)
05000327,328/2005011-04	URI	Appendix R Operator Action to Throttle AFW in Main Steam Valve Vault Room (Section 1R05.06.b.1)
05000327,328/2005011-05	URI	Reliance on Local Manual Operator Actions for Appendix R Fires (Section 1R05.06.b.2)
05000327,328/2005011-06	URI	Potential for Fire Damage to Spuriously Open a Containment Sump Isolation Valve (Section 1R05.07.b.1)

05000327,328/2005011-07	URI	Potential for Fire Damage to Spuriously Close the Charging Header Flow Control Valve (Section 1R05.07.b.2)

Discussed

None

LIST OF INSPECTED COMPONENTS

Section 1R05.07: Circuit Analysis

Chemical and Volume Control System

Component	Description
1-LCV-62-132	VCT Outlet Valve
1-LCV-62-133	VCT Outlet Valve
1-LCV-62-135	Charging Pump Suction Valve from RWST
1-LCV-62-136	Charging Pump Suction Valve from RWST
1-FCV-62-090	Charging Flow Isolation Valve
1-FCV-62-091	Charging Flow Isolation Valve
1-FCV-62-093	Charging Header Flow Control Valve

Emergency Core Cooling System

Component No.	Description
1-FCV-63-072	Containment Sump Flow Isolation Valve
1-FCV-63-073	Containment Sump Flow Isolation Valve

Essential Raw Cooling Water System

Component No.	Description
1-FCV-67-66	Emergency Diesel Engine Heat Exchanger Supply Valve
2-FCV-67-66	Emergency Diesel Engine Heat Exchanger Supply Valve
1-FCV-67-67	Emergency Diesel Engine Heat Exchanger Supply Valve
2-FCV-67-67	Emergency Diesel Engine Heat Exchanger Supply Valve
1-FCV-67-162	CCS and AFW Pumps Cooler Fan A-A
1-FCV-67-164	CCS and AFW Pumps Cooler Fan B-B

Main Steam System

Component No.	Description
1-PCV-001-012	SG Loop 2 Atmospheric Relief Valve
1-PCV-001-023	SG Loop 3 Atmospheric Relief Valve

LIST OF DOCUMENTS REVIEWED

Procedures

0-AR-M-29, Annunciator Response, Fire Detection System, Rev. 8
0-SI-13-1, System Operating Procedure, Fire Detection System, Rev. 32
0-SI-FPU-013-647.0, Surveillance Instruction, Fire Detection Panel 0-L-647 Test

0-SI-FPU-302-002.R, Fire Barrier Visual Inspection - Auxiliary Building Elevation 706' and Above, Rev. 3
0-SI-FPU-302-003.R, Fire Barrier Visual Inspection - Control Building, Rev. 4
AOP-N.01, Plant Fires, Rev. 20
AOP-N.08, Appendix R Fire Safe Shutdown, Rev. 7
AOP-C.04, Shutdown From Auxiliary Control Room, Rev. 8
Special Maintenance Instruction SMI-0-317-18, Appendix R Casualty Procedures, Rev. 10

Completed Surveillance Procedures and Test Records
0-PI-FPU-317-538.0, Appendix R Equipment Inventory, Rev. 1, Completed 10/12/04
0-PI-FPU-317-538.0, Appendix R Equipment Inventory, Rev. 2, Completed 4/5/05
0-PI-FPU-317-538.0, Appendix R Equipment Inventory, Rev. 3, Completed 10/4/05
0-SI-FPU-013-617.0, Surveillance Instruction,, Fire Detection Panel 0-L-617 Test, completed 04/03/05
0-SI-FPU-013-623.0, Surveillance Instruction, Fire Detection Panel 0-L-623 Test, completed 07/29/05
0-SI-FPU-013-625.0, Surveillance Instruction, Fire Detection Panel 0-L-625 Test, completed 06/11/05
0-SI-FPU-026-241.R, Surveillance Instruction, Visual Inspection of the Fire Protection Sprinkler Systems in the Auxiliary Building, completed 07/20/04
0-SI-FPU-026-242.R, Surveillance Instruction, Visual Inspection of the Fire Protection Sprinkler Systems in the Control Building, completed 07/22/04
0-SI-FPU-247-004.0, Auxiliary Building Appendix R Emergency Lighting Discharge Test, Rev. 9, Completed 10/17/04
1-PI-OPS-000-010.C, Verification of Remote Shutdown Transfer Switches, Rev. 2, Completed 11/6/04
1-PI-OPS-000-010.B, Verification of Remote Shutdown Transfer Switches, Rev. 5, Completed 5/29/03
1-PI-OPS-000-010.A, Verification of Remote Shutdown Transfer Switches, Rev. 1, Completed 11/13/01

Fire Brigade Pre-Plans and Fire Drill Critique Reports
FPT 218.100, SQN Fire Drill Critique Report, Cable Spreading Room, 04/14/2005, Crew A
FPT 218.100, SQN Fire Drill Critique Report, Cable Spreading Room, 03/29/2005, Crew C
FPT 218.100, SQN Fire Drill Critique Report, Cable Spreading Room, 04/20/2005, Crew D
FPT 218.100, SQN Fire Drill Critique Report, Cable Spreading Room, 03/30/2005, Crew E
FPT 218.200, SQN Fire Drill Critique Report, Unit 2 Lower Containment & FP & MA Review, 06/29/2005, Crew A
FPT 218.200, SQN Fire Drill Critique Report, Unit 2 Lower Containment & FP & MA Review, 07/05/2005, Crew B
FPT 218.200, SQN Fire Drill Critique Report, Unit 2 Lower Containment & FP & MA Review, 07/05/2005, Crew C
FPT 218.200, SQN Fire Drill Critique Report, Unit 2 Lower Containment & FP & MA Review, 07/05/2005, Crew D
FPT 218.200, SQN Fire Drill Critique Report, Unit 2 Lower Containment & FP & MA Review, 06/29/2005, Crew E
FPT 218.400, SQN Fire Drill Critique Report, Intake Pump Structure, 12/09/2004, Crew E
FPT 218.400, SQN Fire Drill Critique Report, Intake Pump Structure, 12/10/2004, Crew B

FPT 218.400, SQN Fire Drill Critique Report, Intake Pump Structure, 12/24/2004, Crew C
FPT 218.400, SQN Fire Drill Critique Report, Intake Pump Structure, 12/27/2004, Crew D
FPT 218.510, SQN Fire Drill Critique Report, Chemical Storage Area, 03/09/2005, Crew B
FPT 218.530, SQN Fire Drill Critique Report, 480V 1B2B Shutdown Board Room, 08/24/2005, Crew A
FPT 218.530, SQN Fire Drill Critique Report, 480V 2B RX MOV Shutdown Board Room, 10/05/2005, Crew C
FPT 218.530, SQN Fire Drill Critique Report, Diesel Building - 1A Cell, 09/22/2005, Crew B
FPT 218.530, SQN Fire Drill Critique Report, Diesel Building - 1A-a Cell, 09/02/2005, Crew E
FPT 218.540, SQN Fire Drill Critique Report, Unit 1 Main Turbine Oil Tank, 12/21/2004, Crew A

Calculations, Evaluations, and Specifications

0-SI-FPU-013-617.0, Surveillance Instruction,, Fire Detection Panel 0-L-617 Test, completed 04/03/05
0-SI-FPU-013-623.0, Surveillance Instruction, Fire Detection Panel 0-L-623 Test, completed 07/29/05
0-SI-FPU-013-625.0, Surveillance Instruction, Fire Detection Panel 0-L-625 Test, completed 06/11/05
0-SI-FPU-026-241.R, Surveillance Instruction, Visual Inspection of the Fire Protection Sprinkler Systems in the Auxiliary Building, completed 07/20/04
0-SI-FPU-026-242.R, Surveillance Instruction, Visual Inspection of the Fire Protection Sprinkler Systems in the Control Building, completed 07/22/04
SQNAPPR38&39, Appendix R Key 38 & 39, Electrical Power Analysis, Rev. 2
SQNAPPR10, Appendix R Hot Short Analysis for Non RCS Interfaces, Rev. 1
SQS40127, Equipment Required For Safe Shutdown Per 10 CFR 50 Appendix R, Rev. 23
SQNAPPR11, Appendix R Hot Short Analysis for High/Low RCS Pressure Interfaces, Rev. 0

Drawings

1,2-15E500-1, Key Diagram Station Auxiliary Power System, Rev. 24
1,2-45E890-091-1, 10 CFR 50 Appendix R On-Site Electrical Power OPR and Spurious Cables Keys 38 & 39, Rev. 6
1,2-45N601-4, Main Steam System Schematic Diagram, Rev. 5
1,2-45N662-5, CVCS Schematic Diagram, Rev. 8
1,2-45N749-3, 480V Shutdown Board 1B1-B Single Line, Rev.45
1,2-45N749-4, 480V Shutdown Board 1B2-B Single Line, Rev. 47
1,2-45N765-1, 6900V Shutdown Auxiliary Power Schematic Diagram, Rev. 14
1,2-45N767-5, 6900V Diesel Generators Schematic Diagram, Rev. 15
1,2-45N771-1, 480V Diesel Auxiliary Power Schematic Diagram, Rev. 23
1,2-45N779-12, 480V Shutdown Auxiliary Power Schematic Diagrams, Rev. 22
1,2-45N779-19, 480V Shutdown Auxiliary Power Schematic Diagram, Rev. 22
1,2-45N779-23, 480V Shutdown Auxiliary Power Schematic Diagram, Rev. 37
1,2-45N779-26, 480V Shutdown Auxiliary Power Schematic Diagram, Rev. 23
1,2-47N779-11, 480V Shutdown Auxiliary Power Schematic Diagram, Rev. 25
1,2-47W611-1-1, Mechanical Logic Diagram Main and Reheat, Rev. 13
1,2-47W611-67-2, Mechanical Logic Diagram ERCW, Rev. 22
1,2-47W611-67-5, Mechanical Logic Diagram ERCW, Rev. 29
1-3591A18, Breaker Setting Sheet 480V Shutdown BD 1B2-B, Rev. 6

1-3591A16, Breaker Setting Sheet 480V Shutdown BD 1B1, Rev. 5
1-45E890-102-1, 10 CFR 50 Appendix R RCS Inventory Control OPR and Spurious Cables Keys 1, 2, 4, 5, 6 & 9, Rev. 2
1-47W611-62-4, Mechanical Logic Diagram CVCS, Rev. 15
1-47W611-62-3, Mechanical Logic Diagram CVCS, Rev. 9
1-47W611-63-5, Mechanical Logic Diagram Safety Injection System, Rev. 3
1-47W809-1, Flow Diagram CVCS, Rev. 72
55W2792, Communications VHF Radio In-Plant Repeaters Arrangement and Details, Rev. F
BD-K2, Appendix R Electrical Equipment Block Diagram - Key 2, Rev. 3
BD-K3, Appendix R Electrical Equipment Block Diagram - Key 3, Rev. 0
BD-K4, Appendix R Electrical Equipment Block Diagram - Key 4, Rev. 3
BD-K5, Appendix R Electrical Equipment Block Diagram - Key 5, Rev. 4
BD-K26, Appendix R Electrical Equipment Block Diagram - Key 26, Rev. 4
BD-K30, Appendix R Electrical Equipment Block Diagram - Key 30, Rev. 2
BD-K34, Appendix R Electrical Equipment Block Diagram - Key 34, Rev. 2
BD-K38&39, Appendix R Electrical Equipment Block Diagram - Key 38 & 39, Rev. 1
BD-K370, Appendix R Electrical Equipment Block Diagram - Key 370, Rev. 2
BOM, 47BM491-26, Bill of Materials for Water Spray System in FA 070, page 13 of 15
CCD No: 1,2-45N204, Turbine, Auxiliary & Control Bldgs, Units 1 & 2, Electrical Equipment, General Arrangement, Plan El 690.0, 734.0 & 732.0
CCD No: 1,2-45W816-8, Power House, Control Bay, Units 1 & 2, Conduit & Grounding, Floor El 732.0, Details - Sheet 6, Unit 2 Only
CCD No: 1,2-45W816-9, Power House, Control Bay, Units 1 & 2, Conduit & Grounding, Floor El 732.0, Details - Sheet 7, Unit 1 Only
CCD No: 1,2-45W816-9, Power House, Control Bay, Units 1 & 2, Conduit & Grounding, Floor El 732.0, Details - Sheet 7, Unit 2 Only
CCD No: 1,2-45W626-10, Additional Diesel Gen Bldg, Unit 1 & 2, Wiring Diagrams, High Press Fire Prot Sys Schematic Diagrams, SH-10
CCD No: 1,2-45W814-3, Power House, Control Bay, Units 1 & 2, Conduit & Grounding, Floor 706.0, Details - Sheet 1
CCD No: 1,2-45W814-6, Power House, Control Bay, Unit 2, Conduit & Grounding, Floor 706.0, Details - Sheet 4
CCD No: 1,2-45W826-23, Power House, Auxiliary Building, Units 1 & 2, Conduit & Grounding, Floor El. 706.0 & El 714.0, Details Sheet 9
CCD No: 1,2-45W828-6, Auxiliary Building, Units 1 & 2, Conduit & Grounding, Floor El. 734.0, Ceiling Plan
CCD No: 1,2-45W828-7, Auxiliary Building, Units 2, Conduit & Grounding, Floor El. 734.0, Ceiling Plan
CCD No: 1,2-45W828-22, Auxiliary Building, Units 1 & 2, Conduit & Grounding, Floor El. 734.0, Details - Sheet 12
CCD No: 1,2-45W828-23, Power House, Auxiliary Building, Units 1 & 2, Conduit & Grounding, Floor El. 734.0, Details - Sheet 13
CCD No: 1,2-45W829-11, Power House, Auxiliary Building Units 1 & 2, Conduit & Grounding, Floor El 749.0, Detail Sheet 7, Unit 1 Only
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CCD No: 1,2-45W1699-27, Power House, Unit 1 & 2, Wiring Diagrams, CO2 Fire Protection System Connection Diagram, SH 27
CCD No: 1,2-45W1699-50, General, Unit 1 & 2, Wiring Diagrams, Fire Protection Systems, Connection Diagram SH-50
CCD No: 1,2-45N202, Control, Auxiliary & Reactor Bldg, Units 1 & 2, Electrical Equipment, General Arrangement, Plan El 706.0, 749.0 & Sect
CCD No: 1,2-46W401-7, Auxiliary, Reactor & Control Buildings, Units 1 & 2, Architectural Plan, El. 732.0 & 734.0
CCD No: 1,2-46W401-8, Auxiliary, Reactor & Control Buildings, Units 1 & 2, Architectural Plan, El. 749.0, 759.0 & 763.0
CCD No: 1,2-46W402-2, Control Building Units 1 & 2, Architectural Plans, El. 706.0 & 732.0
CCD No: 1,2-46W402-3, Control Building, Units 1 & 2, Architectural, Plans & Details
CCD No: 1,2-46W404-6, Power House, Control Building, Architectural, Wall Sections
CCD No: 1,2-46W405-6, Power House, Auxiliary Building, Architectural, Reinforced Masonry Walls, Plans & Details
CCD No: 1-47W491-3, Auxiliary & Control Building, Unit 1, Mechanical Service Air, Water, Fire Prot & Primary Water Makeup
CCD No: 1,2-46W405-8, Power House, Auxiliary Building, Architectural, Reinforced Masonry Walls, Plans & Details
CCD No: 1,2-46W405-18, Power House, Auxiliary Building, Elevations, Reinforced Masonry Walls
CCD No: 1,2-47W920-9, Auxiliary Building, Units 1 & 2, Mechanical Heating, Ventilating and Air Conditioning
CCD No: 1-47W491-4, Auxiliary & Control Building, Unit 1, Mechanical Service Air, Water, Fire Prot & Primary Water Makeup
CCD No: 1,2-47W491-3-1, Auxiliary & Control Building, Unit 1 & 2, Mechanical Service Air, Water, Fire Prot & Primary Water Makeup
CCD No: 2-47W491-23, Power House, Control Building, Mechanical Fire Protection
CCD No: 1,2-47W491-24, Control Building, Unit 1 & 2, Mechanical Fire Protection
CCD No: 1,2-47W491-25, Control Building, Unit 1 & 2, Mechanical Fire Protection
CCD No: 1,2-47W491-26, Control Building, Unit 1, Mechanical Fire Protection
CCD No: 1,2-47W491-27, Control Building, Unit 1 & 2, Mechanical Fire Protection
CCD No: 1,2-47W491-81, Auxiliary Building, Units 1 & 2, Mechanical Fire Protection
CCD No: 1,2-47W494-4, Auxiliary Building, Units 1 & 2, Fire Prot - Compt - Fire Cells Liq Piping - Press. Ret. Bdy Plan, El. 734.0
CCD No: 1,2-47W494-5, Auxiliary Building, Units 1 & 2, Fire Prot - Compt - Fire Cells Liq Piping - Press. Ret. Bdy Plan, El. 749.0, 759.0 & 763.0
CCD No: 1,2-47W494-7, Auxiliary Building, Units 1 & 2, Fire Prot - Compt - Fire Cells Liq Piping - Press. Ret. Bdy Plan, El. 706.0 & 732.0
CCD No: 1,2-47W850-6, Auxiliary Building, Units 1 & 2, Flow Diagram Fire Protection
CCD No: 1,2-47W850-20, Auxiliary Building, Units 1 & 2, Flow Diagram Fire Protection
CCD No: 1,2-47W866-3, Power House, Auxiliary Building, Flow Diagram, Heating Vent & Air Cond, Air Flow
CCD No: 1,2-47W866-3-1, Auxiliary Building, Flow Diagram, Heating Vent & Air Cond, Air Flow
CCD No: 1,2-47W866-4, Power House, Control Building, Units 1 & 2, Flow Diagram, Heating Ventilating and Air Conditioning Air Flow
CCD No: 1,2-47W611-13-3, Power House, Unit 1 & 2, Mechanical Logic Diagram Fire Protection

CCD No: 1,2-47W611-13-6, Power House, Unit 1 & 2, Mechanical Logic Diagram Fire Protection
CCD No: 1,2-48N725, Control Building, Units 1 & 2, Structural Steel Framing, El. 732.0

Design Changes
DCN-20071-A, Provided Eight New Uninterruptible Power Systems for the Unit 1 and 2 Vital Power Systems, Rev. A, Approved 9/2/99
EDC-E21231-A, Revise Design Lighting Drawings to Provide Output for a Replacement Battery Pack, Rev. A, Approved 6/19/02

Technical Manuals and Vendor Information
Pyrotronics Model DI-2S & DI-2F Ionization Smoke Detector Data Sheets, Catalog Number 6100, Issued 08/1970
Pyrotronics Model DI-3 & DI-A3 Ionization Smoke Detector Data Sheets, Catalog Number 6119, Issued 03/1984
SQN-VM4436, Exide Model F100/F100RT Emergency Lighting Units, Fixtures and Accessories, Rev. 3

Applicable Codes and Standards
NFPA 13, Installation of Sprinkler Systems, 1975 Edition
NFPA 72E, Automatic Fire Detectors, 1974 Edition

Licensing Basis Documents
Letter - NRC to TVA, May 29, 1986, Deviation Request from Appendix R of 10CFR Part 50, L44 860606
Letter - NRC to TVA, October 1986, Deviation Request Regarding T-Cold Instrumentation in the Auxiliary Control Room, A02861008005
Letter - NRC to TVA, August 12, 1997,Issuance of Licensing Amendments for the Sequoyah Nuclear Plant, Units 1 & 2, (TAC Nos. M96996 and M96997) (TS 96-04)
NUREG-0011, Supplement 5, Safety Evaluation Report related to the Operation of Sequoyah Nuclear Plant, Units 1 and 2, Dockets 50-327 and 50-328, June 1981

Other Documents
90NLA-74767B, B49 900906 558, Control Room Vinyl Ceiling Panel Replacements, Flame Spread Documentation per ASTM E-84 Steiner Tunnel Test (FS=15)
90NJC-83878B, Item 18 - Main Control Room Carpet, Critical Radiant Flux Documentation per ASTM E-648 Flooring Radiant Panel Test, (Avg. CRF=0.55 W/cm^2)
Appendix A of Calculation #SQN-26-D054/EPM-ABB-IMPFHA, SQN Fire Hazards Analysis for Fire Areas FAA-070 and FAA-095, dated 10/31/05
Functional Evaluation FE-41251, Missing Appendix R Manual Action for FAA-095 & FAA-107, dated 11/16/05
SQN-DC-V-12.2, Detailed Design Criteria Document, Separation of Electrical Equipment and Wiring, Rev. 16
SQN-APS-003, 480V APS Class 1E Load Coordination Study Time-Current Curve #2, Rev. 12
SQN-APS-003, 480V APS Class 1E Load Coordination Study Time-Current Curve #3, Rev. 12
SQN Fire Protection Report Part III - Safe Shutdown Capabilities, Rev. 13
SQN Fire Protection Report, Revision 17, dated 03/31/2005
TVA Annunciator Response, 0-AR-M-29, Fire Detection System

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

PER 91841, Appendix R cable 1PL4915B is routed between column lines A3 and A4 inside fire area FAA-095 and could be lost due to fire damage
PER 91845, Deficiencies in safe shutdown procedures
PER 91856, Discrepancies in Safe Shutdown Analysis
PER 91857, More deficiencies in safe shutdown procedures
PER 91885, Discrepancy in safe shutdown AOP
PER 91896, Poor housekeeping in Unit 1 main steam valve vault
PER 91899, All lights out in Unit 2 main steam valve vault
PER 91987, Discrepancies in cold shutdown repair parts storage
PER 91989, More discrepancies in cold shutdown repair parts storage
PER 92119, Missing cable tray cover in cable spreading room
PER 92639, Fire Area 095 fire protection issues
PER 92664, Deficiencies in safe shutdown AOP

LIST OF ACRONYMS

AC	Alternating Current
ADAMS	Agency-Wide Documents Access and Management System
AOV	Air Operated Valve
AUO	Auxiliary Unit Operator
CFR	Code of Federal Regulations
DC	Direct Current
DCN	Design Change Notice
ELU	Emergency Lighting Unit
FPP	Fire Protection Program
ft	Foot
MCC	Motor Control Center
MCR	Main Control Room
NFPA	National Fire Protection Association
NRC	U. S. Nuclear Regulatory Commission
PARS	Publicly Available Records Systems
PER	Problem Evaluation Report
RCP	Reactor Coolant Pump
RIS	Regulatory Information Summary
RWST	Refueling Water Storage Tank
SOC	Statements of Consideration
SSA	Safe Shutdown Analysis
SSD	Safe Shutdown
URI	Unresolved Item
V	Volt