



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W., SUITE 2900  
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-327/94-06 and 50-328/94-06

Licensee: Tennessee Valley Authority  
6N 38A Lookout Place  
1101 Market Street.  
Chattanooga, TN 37402-2801

Docket Nos.: 50-327 and 50-328

License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Conducted: February 7-11, 1994

Inspector: S. Rudisail 3/5/94  
S. Rudisail Date Signed

Approved by: M. Shymlock 3-7-94  
M. Shymlock, Chief Date Signed  
Plant Systems Section  
Engineering Branch  
Division of Reactor Safety

SUMMARY

Scope:

This routine announced inspection was conducted in the areas of electrical design and maintenance. The technical adequacy of the justification for continued operation (JCO) of Unit 2 and the corrective action for Unit 1 concerning cable routed in steam generator enclosures which were exposed to temperatures exceeding design temperature ratings was reviewed. Also, two Inspector Follow-up Items and an Unresolved Item were reviewed for Unit 1 restart applicability.

Results:

In the areas inspected a violation was identified. This violation is identified as 50-327, 328/94-06-01, Inadequate Design Control for Containment Ventilation. The corrective action for Unit 1 to replace and reroute all cables within the steam generator enclosures was ongoing. The inspector considered this corrective action appropriate. The work was being accomplished in accordance with applicable design and installation requirements. The inspector found the JCO for Unit 2 adequate and the conclusions supportive of continued operation. The inspector reviewed IFI 93-35-01, PVC Jacketed Cables Exuding Plasticizer, IFI 93-35-02, BOP Fuse Control and URI 93-02-04, Grid Interface Issues. The inspector did not close any of these items. The inspector considered all actions required by the IFI's and the URI for restart of Unit 1 to be complete.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*R. Baron, Nuclear Assurance General Manager
- \*V. Bianco, Engineering
- \*C. Butcher, Electrical Engineering, Nuclear Engineering
- \*M. Burzynski, Engineering
- \*R. Collins, Electrical Engineering, Nuclear Engineering
- \*R. Driscoll, Site Quality Manager
- \*R. Fenech, Site Vice-President
- \*T. Flippo, Site Support Manager
- O. Hayes, Operations Manager, Acting
- \*B. Kimsey, Electrical Engineering, Nuclear Engineering
- L. McEachern, Maintenance, Program Coordinator
- \*S. Poage, Site Audit and Assessment Manager
- J. Proffitt, Licensing Engineer
- \*R. Shell, Site Licensing Manager
- \*R. Thompson, Compliance Licensing Manager
- \*J. Ward, Manager, Engineering and Modifications
- C. Whittenmore, Licensing Engineer
- \*K. Wittenburg, Public Relations Manager

Other licensee employees contacted during this inspection included craftsmen, engineers, technicians, and administrative personnel.

#### Other NRC Employees:

- B. Holland, Senior Resident Inspector
- \*P. Kellogg, Section Chief, Region II
- \*A. Gibson, Director, Division of Reactor Safety, Region II
- \*S. Shaeffer, Resident Inspector
- \*S. Sparks, Project Engineer, Region II

\*Attended exit interview

Acronyms and abbreviations used throughout this report are listed in the last paragraph.

### 2. Background

During performance of 1-SI-ICC-090-272.0, Instrument Maintenance it was determined that the high voltage cable 1RM447B for the Unit 1 B-train Upper Compartment HI Range Post Accident Radiation Monitor had a short. Problem Evaluation Report (PER) SQ940040PER was initiated to report this cable problem. After removal of the cable it was determined that the cable was damaged along a 45 foot section. The damage consisted of cracks in the insulation and shield and in some places the insulation on the cables was fused together. This was indicative of the cables being exposed to high temperatures. Upon investigation it was determined that these cables and other cables were routed in areas of the steam generator 1 and 4 (SG) enclosures which had temperatures which exceeded

the normal operating temperature for which the cable was designed. These operating temperatures resulted from Engineering Change Notice (ECN) L07262C which disabled the control circuitry of lower compartment cooler Essential Raw Cooling Water (ERCW) flow control valves 1-TCV-67-84, 1-TCV-67-92, 1-TCV-67-100, and 1-TCV-67-108. This left the valves fully opened resulting in the cycling of cooler fans to control lower containment temperatures. This ECN was issued because the flow control valve positioners and associated control equipment lacked environmental qualification. An ECN was also issued for Unit 2 for the same modification.

Walkdowns were performed by the licensee in Unit 1 to determine the number and purpose of cables in the SG enclosures. A limited inspection was done by the licensee to determine the condition of the cables. Simultaneous to the Unit 1 evaluations, a determination was made that cables routed in the SG enclosures would be subject to temperatures exceeding their environmental qualification temperature limit during a steam line break accident. Based on this scenario, and a determination that cables were also routed in the Unit 2 SG enclosures a JCO for Unit 2 was developed.

### 3. Justification for Continued Operation of Unit 2

The inspector reviewed the JCO for Unit 2. The conclusion of the Unit 2 JCO was based on a review of the 10 CFR 50.49 equipment in the SG enclosures, an Arrhenius evaluation to demonstrate cable life, an evaluation that the cables would be able to perform their safety function after an accident, and a determination that the failure of the cables in the SG enclosures would not prevent the safe shutdown of the reactor.

The inspector did not consider several of the conclusions of the JCO to be well supported. The licensee concluded that the Arrhenius evaluation demonstrated that the most limiting cables had a reduced life of 12.9 years and this translated to approximately September 1994 for end of cable life. The inspector did not consider that a rigorous evaluation of available temperature data had been made to support the determination of the Arrhenius evaluation. An additional statement of the supporting factors for the JCO was that two phases would have to degrade and short before the end device would become non-functional. The inspector considered that only one phase would have to degrade and short to ground thus possibly actuating the protective device and rendering the equipment unavailable. This statement by the licensee did not support the JCO with a high confidence level as concluded by the licensee.

The inspector based the acceptability of the JCO on a determination by the licensee that failure of the cables from prolonged exposure to high temperatures or sudden failure during a steam line break scenario would not result in the inability to safely shutdown and maintain the reactor.

The inspector reviewed each of the end devices, their functions and the licensee evaluation of the possible failure of the cable and its effect on safe shutdown of the plant. The inspector considered the overall conclusion of the JCO to be acceptable.

4. Corrective Action for Unit 1

The inspector reviewed the corrective actions for Unit 1 to alleviate operability concerns of cable exposed to temperatures greater than their design ratings. The licensee was replacing and re-routing all cables routed in the SG enclosures. The licensee identified 7 conduits routed in the SG enclosures which contained 11 safety related cables. These cables were being replaced by DCN No. M-10517-A. In addition non-safety related cables were being rerouted and replaced by DCN No. V-10472A. The safety related cable and function are identified as:

- |     |         |   |
|-----|---------|---|
| (1) | 1RM453A | 1-RE-90-271, Upper Inside Containment Post Accident High Range Area Radiation Monitor   |
| (2) | 1RM452A | 1-RE-90-271, Upper Inside Containment Post Accident High Range Area Radiation Monitor   |
| (3) | 1RM448B | 1-RE-90-272, Upper Inside Containment Post Accident High Range Area Radiation Monitor   |
| (4) | 1RM447B | 1-RE-90-272, Upper Inside Containment Post Accident High Range Area Radiation Monitor   |
| (5) | 1V7068B | 1-FCV-30-8, Upper Containment Exhaust isolation Valve Position Indication<br><br>1-FCV-30-50, Upper Compartment Purge Isolation Valve   |
| (6) | 1V7052B | 1-FCV-63-111, SIS Check Valve Leak Test Isolation Valve<br><br>1-FCV-63-112, SIS Check Valve Leak Test Isolation Valve<br><br>1-FCV-63-174, SIS Check Line Check Valve Isolation Test<br><br>1-FCV-30-15, Upper Compartment Purge Isolation Valve |
| (7) | 1V6980A | 1-FCV-63-21, SIS Pump Outlet to SIS Test Line<br><br>1-FCV-63-121, SIS Flow to Cold Leg Check Valve Test Line<br><br>1-FCV-63-158, RHR Return from SIS Sample Line Valve<br><br>1-FCV-63-167, SIS Pump Outlet Test Line Valve                     |

- (8) 1V3101A 1-FCV-67-296, Upper Containment Ventilation Cooler C Discharge Isolation Valve Control
- (9) 1V3097A 1-FCV-67-296, Upper Containment Ventilation Cooler C Discharge Isolation Valve Supply
- (10) 1V3091A 1-FCV-67-295, Upper Containment Ventilation Cooler A Discharge Isolation Valve Control
- (11) 1V3087A 1-FCV-67-295, Upper Containment Ventilation Cooler A Discharge Isolation Valve Supply

The inspector reviewed the DCN to ensure that the appropriate installation criteria were incorporated. The inspector reviewed the separation criteria for the cable installation work. Design Criteria SQN-DC-V-12.2, Separation of Electric Equipment and Wiring was reviewed to ensure that the requirements were being incorporated into the ongoing installation work. The inspector performed a walkdown inspection of the SG enclosures with Modifications personnel. During the walkdown the scope of the work was reviewed and both the existing installations and the proposed cable routes were reviewed. The inspector determined that the separation criteria was being met by the proposed routing of the cables outside of the SG enclosures. Modifications personnel were cognizant of the scope of the work and the requirements of the DCN. The inspector concluded that the corrective action for Unit 1 was appropriate and was being performed as required.

During a review of the corrective action the inspector attempted to determine the reason that the licensee was not aware that cables were being exposed to temperatures above the design rating. These operating temperatures resulted from Engineering Change Notice (ECN) L07262C which disabled the control circuitry of lower compartment cooler Essential Raw Cooling Water (ERCW) flow control valves 1-TCV-67-84, 1-TCV-67-92, 1-TCV-67-100, and 1-TCV-67-108. The valves were positioned fully open producing maximum cooling flow. However, to maintain lower containment temperatures above minimum TS values, during winter months, the cooler fans were cycled off and on. When the lower compartments temperatures were low the cooler fan was turned off. This caused the temperature in the associated SG 1 and 4 enclosure to exceed the cables' design rating. The licensee review of the ECN failed to recognize the effect the modification would have on temperatures in the SG enclosures and thus the effect on cables installed in the SG enclosures. This is an example of inadequate design control and is identified as Violation 94-06-01, Inadequate Design Control for Containment Ventilation.

5. Review of Inspector Follow-up Items and an Unresolved Item for Unit 1 Restart

The inspector reviewed IFI 93-35-01, PVC Jacketed Cables Exuding Plasticizer. The licensee had completed all clean up work for both Unit 1 and Unit 2. Electrical Engineering General Engineering Specification G-38, Installation, Modification, and Maintenance of Insulated Cable

Rated Up to 15000 Volts had been revised to add precaution when handling installed cables to inspect for plasticizer from PVC jacketed cables. Plant Procedure Site Standard Procedure (SSP) 6.25 Maintenance Management System Performance of Work Orders was scheduled to be revised to require all working documents for PVC jacketed cable to add precautions to observe potential plasticizer problems. This had not been completed. The licensee was scheduled to re-inspect the PVC cable in May 1994 and again in September 1994 to look for additional problems. The inspector did not close this item but considered all action necessary for Unit 1 restart complete.

The inspector reviewed the status of IF1 93-35-02, BOP Fuse Control. This item consisted of two parts. One part dealt with the incorrect installation of Bussman Indicating FLAS 5 type fuses. This item was being reviewed by the NRC Resident Inspector staff and no action was taken during this inspection.

The second part of this item consisted of BOP fuse control. A master fuse list for BOP was planned for development. The planning is scheduled for completion this year with walkdown work scheduled to begin next year. This was identified as item 91080 on the Master Issue List and identified as a post restart item. The inspector reviewed this item for Unit 1 restart applicability. A initial review of walkdown information revealed a small percentage of fuse discrepancies. Sixty fuse discrepancies out of a sample of 3000 were identified with the majority of these being the correct ampere rating for the fuse but different manufacturers or types of fuses installed than indicated on drawings or Operations Department System Walkdown Data Sheets. A review of the plant reliability study did not indicate any fuse related plant transients. The inspector did not close the IFI but considered all Unit 1 restart actions complete.

The inspector reviewed Unresolved Item 93-02-04, Plant Grid Interface Review for restart applicability. This unresolved item concerned plant grid interface problems when the 500/161 kV intertie transformer was out of service. Potential problems had been identified that indicated that there would be problems maintaining 161 kV voltage based on projected grid loading with the intertie transformer out of service. Several options had been reviewed to correct this concern such as replacement of the existing Common Station Service Transformer (CSSTs) with automatic tap changing CSSTs. This item will be further reviewed by the NRC. The inspector received from the licensee a copy of the CSST design change package, the completed grid load study, and a copy of the switchyard instruction letter which details the licensee interpretation of TS requirements. Pending resolution of this issue the licensee enters a LCO when the intertie transformer is out of service. Past inspections have noted improved communications between the dispatchers and the control room. The CSST replacements have been completed. This item was not considered a Unit 1 restart item.

## 5. Exit Meeting

The inspection scope and results were summarized on February 11, 1993 with those persons indicated in paragraph 1. Proprietary information is not included in this report. There were no dissenting comments received from the licensee. During the exit meeting, the inspector stated that the inadequate design control issue was unresolved. After further review, NRC concluded this matter to be a violation. TVA was notified of this decision by phone call of March 9, 1994 between Mr. J. Proffitt, TVA and Mr. M. Shymlock, NRC.

(Open) Violation 50-327, 328/94-06-01, Inadequate Design Control for Containment Ventilation

## 6. Acronyms and Abbreviations

BOP	Balance of Plant
CFR	Code of Federal Regulations
CSST	Common Station service Transformer
DCN	Design Change Notice
ECN	Engineering Change Notice
ERCW	Essential Raw Cooling Water
IFI	Inspector Follow-up Item
JCO	Justification for Continued Operation
kV	Kilovolts
LCO	Limiting Condition for Operation
NRC	Nuclear Regulatory Commission
PER	Problem Evaluation Report
SG	Steam Generator
SSP	Site Standard Practice
TS	Technical Specifications
URI	Unresolved Item