

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

DOCKET/REPORT NOS. 50-272/95-11
50-311/95-11FACILITY: Salem Nuclear Generating Station, Units 1 and 2
LOCATION: Hancocks Bridge, New Jersey
DATES: May 11 - 12, 1995

INSPECTOR:

Leonard S. Cheung
 Leonard Cheung, Sr. Reactor Engineer
 Electrical Section
 Division of Reactor Safety

5/25/95
 Date

APPROVED BY:

William H. Ruland
 William H. Ruland, Chief
 Electrical Section
 Division of Reactor Safety

5/25/95
 Date

Areas Inspected: Announced inspection by regional inspectors to review the status of previously identified open items and to determine the adequacy of the licensee's corrective actions to resolve these issues.

Results: The review of licensee corrective actions for the four electrical items indicated that these corrective actions were adequate. All items were closed. The four items reviewed were:

<u>Item</u>	<u>Title</u>	<u>Status</u>	<u>Discussed in Paragraph</u>
91-30-01	EQ of containment isolation valve position switches	Closed	2.1
91-80-03	(Violation) Failure to implement corrective actions for 125 Vdc system	Closed	2.2
91-80-02	(Violation) Failure to implement design control measures for EDG calculations	Closed	2.3

<u>Item</u>	<u>Title</u>	<u>Status</u>	<u>Discussed in Paragraph</u>
93-82-10	High ambient temp in switchgear/ penetration areas	Closed	2.4

DETAILS

1.0 PURPOSE AND SCOPE (2515/111)

The purpose of this inspection was to review and verify licensee corrective actions for inspection findings identified during the February 1993 electrical distribution system functional inspection (EDSF) and the April 1991 safety system function inspection (91-80). This inspection also covered a review of management oversight for resolving electrical open items.

2.0 STATUS OF PREVIOUSLY IDENTIFIED INSPECTION ITEMS

2.1 (Closed) Unresolved Item 50-272/91-30-01 and 50-311/91-30-01

This item pertained to the environmental qualification (EQ) of 28 containment isolation valve position switches (for each unit) for Regulatory Guide 1.97 application. The licensee later re-clarified the locations for some of these valve position switches to be a non-harsh environment, and provided engineering justification for the rest of the valve position switches that were located in a harsh environment. This item was updated during the February 1994 EQ inspection. The engineering justification was reviewed by the NRC during that inspection, and was determined to be acceptable. However, the exemption request for these deviations was never documented in their submittal to the NRC.

On June 27, 1994, the licensee formally documented the exemption request for these deviations in their letter, NLR-N94009, to the Office of Nuclear Reactor Regulation (NRR) of the NRC. This exemption request was reviewed by NRR and was determined to be acceptable. The results of NRR's reviews were documented in the Regulatory Guide 1.97 Safety Evaluation Report, dated April 27, 1995.

This item is closed.

2.2 (Closed) Violation 50-272/91-80-03 and 50-311/91-80-01

This violation pertained to inadequate corrective actions for underrated fuses for the 125 Vdc system. During the April 1991 safety system functional inspection (SSFI), the team identified that the fuses used for the 125 Vdc system were not capable of interrupting the calculated fault current. There were six fuses involved for each unit, and each fuse was rated at 10,000 amperes dc interrupting current. The calculated fault current was 20,408 amperes. The team also identified that this problem had been known to the licensee for years and no corrective actions were taken by the licensee. In addition, the team also identified the following deficiencies in the licensee's short circuit calculation, S-C-E000-EDC-0129, Revision 0.

1. The calculation used 120 V at the battery terminals even though the assumptions stated that the battery was considered to be in a fully-charged state. The correct terminal voltage should have been the system float voltage of 132-135 Vdc. The higher voltage results in a higher fault contribution from the battery.

2. The effects of higher-than-nominal individual cell temperatures were not considered. Higher-than-nominal temperatures increase the available fault contribution from the battery.
3. The calculation assumed an incorrect battery charger contribution during a fault condition. It assumed 220 amperes as the rated output current contrary to the actual rated output of 250 amperes, as stated on the charger nameplate. However, the calculation did conservatively assume that two chargers are connected to the system at any one time even though only one is normally connected.

The licensee did not contest this violation. In their July 12, 1991, response letter to the Notice of Violation, the licensee attributed the root cause of this violation to personnel error for not following the station procedure to correct the problem promptly. The licensee also identified the corrective actions to be taken to resolve this issue, including: 1) replacing all 12 fuses; and 2) counselling all functional engineering personnel on handling nonconformances.

During this inspection, the licensee stated that the 12 fuses were not replaced because they were not underrated. The licensee provided a letter dated August 17, 1993, from the fuse manufacturer, Cooper Bussmann, for the inspector's review. This letter indicated that the KRP-C1200 fuse (installed at Salem) had been tested by the manufacturer for 50,000 amperes interrupting current for 344 Vdc application (the ac rating for this fuse is 200,000 amperes interrupting current). The licensee explained that the dc rating of these fuses was assumed to be 10,000 amperes at the time of the SSFI, because a telecon from a contractor engineer indicated the 10,000 amperes rating. There were no other data available at that time. Since the calculated short circuit current was less than 25,000 amperes, the inspector agreed that the fuse would be capable of interrupting the fault current. The inspector reviewed the manufacturer's letter and technical manuals, conducted a walk down of the installed fuses at Unit 2, and verified that the installed fuses were as specified. The inspector also reviewed the counselling records for the functional engineering groups, and a memo (ELE-91-0635, dated October 31, 1991) entitled, "1991 RHR System Counselling," from the electrical engineering supervisor to nuclear licensing. This memo discussed the purpose and scope of the counselling. The inspector considered these parts of the corrective actions acceptable.

The inspector observed that there were no records which indicated that the three issues identified by the SSFI team in the short circuit current calculations were ever addressed before. In response to the inspector's questions during this inspection, the licensee was able to provide the following answers:

1. For the short circuit current calculation for the energy source from the battery, 2 volts per cell was the correct voltage. The licensee provided a letter from the battery manufacturer (C&D Battery) dated November 16, 1978, for the inspector's review. This letter explained the reasons of 2 volts per cell for the short circuit current

calculation. The 2 volts per cell methodology was also confirmed by IEEE Standard 946-1992. Because the battery consisted of 60 cells, the inspector agreed that 120 volts was the correct voltage for the short circuit current calculation. This issue was resolved.

2. The licensee stated that the battery cell temperature increase would not affect the short circuit current calculation. This statement was confirmed by a test report (AEI Test No. 0591-1, "Stationary Battery Short Circuit Test," dated May 16, 1991). The inspector reviewed this test report and determined that this issue was resolved.
3. The licensee stated that although the battery charger was rated for 250 amperes output current, the battery charger had a current limiting device which limited the output current within 120% of 220 amperes. This current was included in the original short circuit calculation. The inspector reviewed Calculation No. ES-4.003Q, page 44 and Station Procedure SC.MD-ST.125-0001(Q), section 5.6 and confirmed this information. The inspector also reviewed the record of Calculation No. ES-4.003(Q). The record showed that the calculation number of S-C-E000-EDC-0129 had been changed to ES-4.003(Q) on November 6, 1991. The inspector agreed that this issue was resolved.

Based on the above reviews, the inspector concluded that the corrective actions taken by the licensee were adequate. This item was closed.

2.3 (Closed) Violation 50-272/91-80-02 and 50-311/91-80-02

This violation pertained to failure to implement design control measures for emergency diesel generator (EDG) loading calculations. During the April 1991 SSFI, the team identified various deficiencies that were not addressed in the EDG loading calculations, such as: cable losses for all loads connected to EDGs were not considered; battery charger limiting conditions were not accounted for; hydrogen recombiner full load kW loading was not considered, etc. This EDG loading calculation, S-C-4kV-EDC-0650, Revision 0, was performed by a contractor, ASTA Engineering, Inc. and had not been reviewed by licensee engineering. The team determined that these deficiencies were caused by inadequacies in the licensee's design control process in that a detailed design verification was not conducted to identify and correct the deficiencies before the loading calculations were issued for use.

The licensee did not contest this violation. In their July 12, 1991, response letter to the Notice of Violation, the licensee attributed the root cause for this failure to implement design control measures to personnel error in failure to follow an established procedure. The corrective actions taken by the licensee to resolve this issue included: 1) the supervisor and the engineer involved in this incident received counselling on the importance of attention to detail; 2) the entire functional engineering staff received counselling, emphasizing the requirements for design verification; 3) the engineering department performed a line-by-line peer review and a complete, independent design verification of the EDG loading calculations; and 4) the

electrical engineering department verified that all other electrical calculations had received design verification in accordance with Station Procedure DE-AP.ZZ-0010(Q), and determined that the incident was an isolated case.

The inspector reviewed the records for counselling the functional engineering groups, including the supervisor and the engineer involved in this incident, and a memo (ELE-91-0635) from the electrical engineering supervisor to nuclear licensing. This memo discussed the objective and scope of the counselling. The inspector also reviewed the records of independent design review of the EDG load calculations. The calculation number was changed from S-C-4KV-EDC-0650 to ES-9.002 on December 31, 1991. The design review record documented various comments and resolution. These comments and resolution indicated a thorough and in-depth review. For Corrective Action (4), the licensee stated that, because this corrective action was completed before the July 12, 1991, that corrective action was not in the tracking system, therefore, there were no records for the inspector's review and verification. However, the inspector reviewed a licensee internal memorandum dated June 28, 1991, from electrical engineering to nuclear licensing. This memorandum indicated that as of June 28, 1991, all electrical calculations were verified to have received design verification in accordance with the station procedure. Therefore, this violation was an isolated case.

The inspector considers the licensee corrective actions adequate. This item is closed.

2.4 (Closed) Unresolved Item 50-272; 311/93-82-10

This pertained to high ambient temperatures in the switchgear and penetration areas. During the August 1993 electrical distribution system functional inspection (EDSFI), the team reviewed the draft calculations (S-1-CAV-MDC-0678 and S-2-CAV-MDC-0696), which were the only calculations available at that time for the ambient temperature of these areas. These calculations indicated that the maximum ambient temperature could be as high as 118°F during a postulated accident. This temperature was substantially higher than the equipment design temperature of 105°F. The licensee maintained that these calculations (performed by a contractor) were unrealistically conservative, and that the actual temperatures would be significantly lower and would be within the design commitments.

Following the EDSFI, the licensee conducted a series of heat load calculations and revised Calculation No. S-1-CAV-MDC-0678, "Unit 1 SPAVS Cooling Load Calculation, Revision 1, dated April 28, 1994." The revised calculation indicated that the highest ambient temperature, during a postulated accident, was 110.4°F in the switchgear room at elevation 84 ft. These calculations were reviewed by an NRC inspector during an EDSFI followup inspection conducted in December 1994. During that inspection, the inspector identified that the calculations for the electrical heat loads (ES-50.005 and 50.006, Revision 0) used a questionable assumption that nonsafety-related equipment did not operate during the emergency mode, and, therefore, did not contribute

to the heat load. There was no justification for this assumption, nor a controlled procedure to instruct the operators to shed nonsafety-related electrical loads during an accident. Therefore, this item remained open.

Following the December 1994 followup inspection, the licensee revised electrical heat load calculations, ES-50.005 (Revision 1) and ES-50.006, Revision 1, to include the nonsafety-related electrical heat loads and refined their total heat load calculations. The revised calculations showed that the ambient temperature for the Unit 1 switchgear room at elevation 84 ft was 110.3°F (slightly lower than the temperature of the old calculation) and that the ambient temperature for Unit 2 switchgear room at elevation 84 ft was 109.3°F. The inspector reviewed the above calculations and found them to be acceptable.

Engineering Evaluation S-1-E000-EEE-0890 was issued by the licensee to review the effect of the 115°F ambient temperature on the electrical equipment in the switchgear room. This engineering evaluation was reviewed by the NRC during the December 1994 inspection, and was determined to be technically acceptable except that the reference to Calculation ES-50.005 used Revision 1, which was preliminary. Since Revision 1 was issued for both Units 1 and 2, the inspector considered this issue resolved.

Based on the above review, the inspector determined that this item was closed.

3.0 MANAGEMENT OVERSIGHT

The inspector discussed the electrical open items with the manager of Salem electrical engineering and found the individual to be very familiar with the issues of the open items, and the corrective action for each issue.

Based on the reviews of corrective actions taken by the licensee to resolve the electrical open items, the inspector found that the quality of these corrective actions was generally good. For example, the independent design reviews of the emergency diesel generator calculations were found to be very thorough and in-depth. However, the three issues identified by the safety system functional inspection (SSFI) team for the dc system short circuit current calculations were never addressed and were not mentioned in the open item package for Violation 91-80-03. It appeared that the licensee did not read the inspection report before preparing the package for closing out the electrical item. However, the responsible engineers were found to be very knowledgeable and were able to answer the inspector's technical questions promptly and correctly.

The inspector concluded that the management oversight in providing support to resolve the technical issues of electrical open items was generally good, and the engineering personnel were very knowledgeable.

4.0 EXIT MEETING

The inspector met with the licensee personnel, denoted in the Attachment, at the conclusion of the inspection conducted on May 12, 1995, and summarized the scope of the inspection and the inspection results. No proprietary materials were reviewed during this inspection. The licensee did not dispute the inspection findings at the exit meeting.

ATTACHMENT

Persons Contacted

Public Service and Gas Company

* R. Beckwith	Station Licensing Engineer
A. Bell	Electrical Designer
* M. Bursetein	Nuclear Electrical Engineering Manager
P. Duke	Licensing Engineer
* L. Hajos	Electrical Engineering Supervisor
* C. Lambert	Manager, Nuclear Engineering Design
S. Makam	Specialist Engineering, Nuclear Mechanical
M. Quadir	Electrical Engineer

*Denotes those present at the exit meeting on May 12, 1995.