

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-272/87-38

Docket No. 50-272

License No. DPR-70

Licensee: Public Service Electric and Gas Company
P. O. Box 236
Hancocks Bridge, New Jersey 08038

Facility Name: Salem Generating Station Unit 1

Inspection At: Hancocks Bridge, New Jersey

Inspection Conducted: December 21-23, 1987

Inspectors:

K. G. Murphy, Tech. Assistant, DRS

2/26/88
date

Approved by:

P. K. Eapen, Chief STP, EB, DRS

2/26/88
date

Inspection Summary: Routine unannounced inspection of Containment Integrated Leak Rate Testing (CILRT) and Preliminary Results Evaluation (Report No. 50-272/87-38). The inspection verified that the test prerequisites and test conduct were in accordance with approved procedures. The test results indicated an acceptably low containment leak rate. The test went smoothly as a result of thorough preparation and use of experienced supervision and technicians. QA coverage was thorough. One unresolved item requires licensee attention. During the test the three operating Containment Fan Cooling Units (CFCUs) tripped ostensibly due to motor overcurrent caused by increased fan loading at high containment pressure. The licensee is verifying the root cause of these failures and is reviewing fan operation and testing to assure high confidence that these units are available during a design basis LOCA and that future fan tripping during CILRTs does not occur.

Results: No violations or deviations were identified. One unresolved item.

DETAILS

1.0 Persons Contacted

- * William Treston, CILRT, Test Director
- * George Druffner, PSE&G, R&T Lab
Robert Brandt, Chief, Inservice Testing
Steven Miltenberger, Vice President, Nuclear Operations
Mark Gross, QA
Michael Wita, QA
Jack Curham, Engineering (C.F.C. System Engineer)

United States Nuclear Regulatory Commission

Thomas Kenny, Senior Resident Inspector
Kathy Gibson, Resident Inspector

- * Indicates those present at the exit meeting on December 23, 1987.

The inspector also held discussions with technicians and engineers involved in the containment leak test.

2.0 Containment Integrated Leak Rate Testing

During the period of December 20-23, 1987, a Containment Integrated Leak Rate Test (CILRT) was performed at Salem 1, as required by 10 CFR 50, Appendix J. The test was conducted with containment isolation boundaries in an "As-Left" condition. Testing was performed in accordance with Inservice Inspection Procedure M9-ILP-CT-1, Revision 6, Issue Date 12/18/87. The Inspector reviewed the test procedure and witnessed portions of the test. The purpose of the inspection was to assure that the test was conducted in compliance with the requirements and commitments set forth in the following section, that test anomalies are identified and acted upon, and that the test results met the leak rate acceptance criteria.

2.1 Reference Documents

- Salem 1 Technical Specifications 4.6.1.2(a), (b) and (c), Type "A" Test
- 10 CFR 50, Appendix J, Primary Reactor Containment Leakage Testing for Water Coolant Power Reactors.
- Final Safety Analysis Report (FSAR)
- ANSI/ANS 56.8-1981, Containment System Leakage Testing Requirements

- USNRC I&E Information Notice No. 85-71: Containment Integrated Leak Rate Tests.

2.2 Other Documents Reviewed

- M9-ILP-CT-1, Revision 6, Reactor Containment Building Integrated Leakage Rate Test Salem Unit 1.
- Station QA Surveillance Reports Nos. 87-1785, 87-1786, and 87-1788.
- Internal Memorandum for J. Curham to W. Treston, "Containment Fan Coil Unit Operation During Type "A" Testing," dated December 10, 1987.
- Portion of "Reactor Containment Fan Cooler, Westinghouse Technical Manual Unit 1 and 2, Salem Nuclear Generating Station," PSBP No. 139970.
- Safety Evaluation Report S-2-M945-NSE-Revision 0, "Tripping of Fan Coil Unit (FCU) Motors During Type "A" Test and Inlet Vain Damper Settings. For Fan Coil Unit, Unit No. 2 Salem Nuclear Generating Station," July 1, 1983.
- Nuclear Department memorandum from J. Vargas to H. Berrick, "FCU Fan Performance/Type A Testing, SRG OPEN Item R-0104," June 26, 1984.

2.3 Administrative Control of CILRT and Procedure Review

The inspector reviewed the test procedure, the CILRT test log and the PSE&G Research Corp event log to verify that:

- Test directors were designated and their responsibilities were clearly defined.
- The procedures were adequately detailed to assure satisfactory performance.
- Test prerequisites were met.
- All required parameters were being recorded at the required frequencies.

The inspector noted that adequate attention was paid to the procedure as evidenced by keeping the step-by-step sign-offs current. Test personnel were being carefully briefed prior to each test evolution. Plant personnel not directly involved with the test were briefed on keeping "hands-off" in the areas affected by the test; this was reinforced by restricting personnel from the test areas. Control of the test by the test director was adequate.

The inspector noted several weaknesses in the test procedure itself as follows:

- a. Section 5.13 of the test procedure states that if leakage occurs "to the extent that it would interfere with the satisfactory completion of the tests, then leakage paths may be isolated and the Type A test continued." This statement is in direct opposition to 10 CFR 50, Appendix J, III.A.1(a). This disagreement was brought to this attention of the test director.
- b. Section 6.3 and Attachment 3, step 5.1.C concerning the throttling of Containment Fan Cooling Units (CFCU) and CFCU data recording appears to be insufficient as indicated in Section 2.6 of this report.

2.4 Test Witnessing

The inspector witnessed portions of the following test activities:

1. Containment pressurization and licensee walkthroughs for identifying component leakage.
2. Four hour stabilization.
3. Twenty-four hour CILRT.
4. Metered release in preparation for verification test.
5. One hour instrument verification test.
6. Start of containment depressurization.

These activities were witnessed to verify that the CILRT was conducted in accordance with the test procedure, that test personnel demonstrated adequate levels of knowledge, that no equipment anomalies were evident, and the test results were, in fact, within the requirements of 10 CFR 50, Appendix J. The inspector attended briefings with test personnel, interviewed data collection engineers and leak crew technicians, and made walkdowns with the test director and other test personnel. The inspector noted that test personnel were experienced in conducting the test with senior test personnel having conducted a number of similar tests in the past. No adverse leakage paths were identified during the walkdowns and the installation of the tygon tubing and vent bottles were as required.

The chronology of major events were as follows:

Chronology of Events

December 21, 1987 1400; noted fumes in control room from operation of air compressors

1420; commenced containment pressurization

1735; dispatched first leak inspection team

2300; Reached 40.68 PSIA at about 3 psi per hour

December 22, 1987

0030; dispatched leak inspection team

0355; #13 CFCU tripped [at about 57 psia, per
calculation by inspector]

0425; #15 CFCU tripped [at about 58 psia, per
calculation by inspector]

0530; dispatched leak inspection team

0550; began securing air compressors at 62.43
psia

0619; all compressor secured

0630; began stabilization period

0702; #14 CFCU tripped, all fan coil units out
of service

0830; dispatched leak inspection team, Ele. 100'
airlock appears to have small leak, suspect a leak
in inner ball valve per past LLRT.

1030; stabilization complete

1045; start of CILRT

December 23, 1987 1045; completion of CILRT

1453; start of verification test

1553; completion of verification test

1711; start of depressurization

Startup of the nine portable diesel powered air compressors, that were located between buildings next to the turbine building, resulted in exhaust gases being drawn into the adjacent building including the Salem 1 control room. The licensee determined that this condition was not hazardous to personnel and the condition subsided as the compressors were loaded. A minor leak into the vestibule of the airlock at Elevation 100' was the only component leak detected as a result of the walkdown by the leak crews. The only abnormal event during the pressurization phase was the tripping out of the three operating Containment Fan Cooling Units (CFCUs) which is discussed in the next section.

2.5 Tripping of Containment Fan Cooling Units (CFCUs)

Three CFCU's were in operation at the start of pressurization. At approximately 57 psia the #13 CFCU tripped followed by #15 CFCU at approximately 58 psia. The last unit, #14 CFCU, tripped about one hour after containment pressure reached the test pressure of 63 psia.

The inspector held discussions with the CFCU system engineer to determine if tripping of these units call into question their availability during design basis accidents and whether the CILRT prerequisites concerning the fans were adequate. Discussions with the engineer and subsequent review of Westinghouse design documents and PSE&G internal memoranda revealed that the licensee had experienced tripping of these fans in past CILRT tests. The licensee conducted engineering analyses to determine an appropriate solution to the problem. These memos indicate that the fans become overloaded under the test conditions and trip out due to motor overcurrent. The engineering documents reviewed did not provide a complete picture of whether the fans design bases are fully satisfied. Specifically:

1. The fact that #14 CFCU tripped after operating for one hour with a constant containment pressure of 63 psia may indicate a cause other than motor overcurrent. This should be investigated. The inspector was not provided with any firm evidence that motor overcurrent is, in fact, the sole root cause of fan tripping.
2. A complete engineering analysis that accurately predicts fan flow, motor current, component temperatures and the other parameters potentially affecting fan availability both during an CILRT and the various design basis requirements in Section 6.2.2.2 of the FSAR should be provided.
3. The above engineering analyses should provide assurance that fan surveillance testing at normal containment conditions is adequate to ensure availability during design basis accidents.
4. The tripping of the fans during the latest CILRT was apparently caused by an error in adjusting the inlet vane settings. What actions will the licensee take to assure future errors in setting the inlet vains do not occur, especially when restoring the fans to their normal operating condition? To this end it should be noted that Westinghouse report PSBP #139970 suggests that motor amp readings be taken. Accurate amp readings could provide a diverse means of verifying that fan load conditions are correct. In addition, trending amp readings during a CILRT would verify the air density versus load characteristic of the fan units.
5. Determine whether fan surveillance and CILR test procedures require modification in view of the answers to the above items.

Pending resolution of the above concerns, this item remains unresolved (50-272/87-38-01).

2.6 CILRT Leak Rate Measurements and Results

The inspector monitored the data acquisition throughout the test and reviewed the computer data reduction methods. The calibration records of the pressure, temperature, flow, and humidity instruments had been calibrated within 6 months of the test and were traceable to the National Bureau of Standards as required. All instruments were operable throughout the test with no apparent malfunctions. The computer based data acquisition and reduction activities appeared faultless with the system being thoroughly tested prior to test initiation. The data collection personnel from the Licensee's Research and Testing Laboratory were certified under the Laboratory's quality assurance program for leak testing, Level I and Level II. The licensee computed the following leak rates at the conclusion of the test:

24 HR CILRT

(Weight % per day)

	<u>Total Time Method</u>	<u>Mass Point Method</u>
Calculated (Lam)	0.041	0.039
Lam + Upper Confidence Limit	0.044	0.043
Acceptance Criteria	0.075	0.075

The inspector made independent calculations using an NRC approved computer code that showed close agreement with the licensee calculations.

3.0 QA/QC Coverage

The inspector interviewed the QC inspectors that provided coverage of the CILRT and reviewed three QC reports documenting QC findings during the test. Instrument calibration, test personnel certification, and test procedure implementation was covered along with checking 58% of the valve positions. The QC inspectors showed thorough knowledge of the purpose and requirements of the test. Well prepared QC check lists for the CILRT were used to assure coverage of important test aspects. Several valves were found to be out of position by QC, the QC inspectors followed through to find the reasons for these discrepancies and were satisfied that the test director had given permission to Operations to change the valve position and that there was no effect on the test. The inspector concluded that QC coverage was adequate.

4.0 Exit Meeting

The findings of the inspector were periodically discussed with the test director and were summarized at the exit meeting on December 23, 1987. Attendees at this exit meeting are listed in Section 1.0 of this report. At no time during this inspection was written material provided to this licensee by the inspector.