PSE&G

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

Salem Generating Station

March 6, 1991

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-70
DOCKET NO. 50-272
UNIT NO. 1
LICENSEE EVENT REPORT 91-005-00

This Licensee Event Report is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR 50.73(a)(2)(ii)(B) and 50.73(a)(2)(vii)(D). This report is required to be issued within thirty (30) days of event discovery.

Sincerely yours,

S. LaBruna
General Manager -
Salem Operations

MJP:pc

Distribution

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Salem Generating Station - Unit 1	0 5 0 0 0 2 7 2	1 OF 0 5

TITLE (4)

Cont. Fan Coil Units Do Not Meet Design Heat Removal Req'ts. Due to Equip. Failure

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
										0 5 0 0 0
0 2	0 9	9 1	9 1	0 0 5	0 0	0 3	0 6	9 1		0 5 0 0 0

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
1	1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	X 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
M. J. Pollack - LER Coordinator	6 0 9 3 3 9 - 2 0 2 2

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 2/9/91 at 1945 hours, engineering completed an analysis of thermal performance testing for Containment Fan Coil Units (CFCUs) heat removal capacity. This review concluded that 3 of the 5 CFCUs did not meet their design accident requirements as identified by the Updated Final Safety Analysis Report (UFSAR). The Nos. 12, 13 and 14 CFCUs were not capable of heat removal at a rate of 81×10^6 BTU/hr each. Also, the UFSAR accident analysis assumption that 3 remaining CFCUs (after the failure of a single Vital Bus) would be capable of removing 243×10^6 BTU/hr (at 85° F river water temperature) could not be met. Testing of the CFCUs, to verify their heat transfer capability, was conducted in accordance with NRC Generic Letter 89-13. It was conducted with the Unit at full power operation. The Unit was brought to Mode 3 on 2/9/91 in support of its ninth refueling outage. The root cause of the CFCU loss of heat removal capacity is equipment failure. The CFCU cooling coils had become partially blocked. The lack of a test program contributed to the adverse trend in CFCU heat removal capacity. CFCU testing for heat capacity has not been required nor has it been performed since installation of the CFCUs. An evaluation by Westinghouse, justifying plant operation between 1/28/91 and 2/7/91, was performed and was confirmed by PSE&G engineering. Recurring tasks have been initiated (both Salem Units) to test heat removal capacity of the CFCUs. The Salem U-2 CFCUs were recently tested for heat removal capacity. All 5 units exceeded UFSAR heat removal capacity design requirements. The Salem U-1 CFCUs will be cleaned during the current refueling outage and subsequently retested.

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as [xx]

IDENTIFICATION OF OCCURRENCE:

Containment Fan Coil Units do not meet design heat removal requirements due to equipment failure

Discovery Date: 2/09/91

Report Date: 3/06/91

This report was initiated by Incident Report No. 91-090.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 3 (Hot Standby)

DESCRIPTION OF OCCURRENCE:

On February 9, 1991 at 1945 hours, engineering completed an analysis of thermal performance testing for Containment Fan Coil Units (CFCUs) [BK] heat removal capacity. This review concluded that three (3) of the five (5) CFCUs did not meet their design accident requirements as identified by the Updated Final Safety Analysis Report (UFSAR). The Nos. 12, 13 and 14 CFCUs were not capable of heat removal at a rate of 81×10^6 BTU/hr each. Also, the UFSAR accident analysis assumption that three (3) remaining CFCUs (after the failure of a single Vital Bus) would be capable of removing 243×10^6 BTU/hr (at 85° F river water temperature) could not be met. The Analysis of Occurrence Section details the test results.

On February 9, 1991 at 1945 hours, the Nuclear Regulatory Commission was notified of the Unit operating in a condition outside of its design base in accordance with Code of Federal Regulations 10CFR 50.72(b)(1)(ii).

Testing of the CFCUs, to verify their heat transfer capability, was conducted in accordance with NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment". It was conducted with the Unit at full power operation. The Unit was brought to Mode 3 on February 9, 1991 in support of the start of its ninth refueling outage. Generic Letter 89-13 addresses the need for testing "to verify the heat transfer capability of all safety-related heat exchangers cooled by service water". A test program which addresses the concerns of the Generic Letter is in progress. This program is in conformance with the Generic Letter.

APPARENT CAUSE OF OCCURRENCE:

The root cause of the CFCU loss of heat removal capacity is equipment

APPARENT CAUSE OF OCCURRENCE: (cont'd)

failure. The CFCU cooling coils had become partially blocked limiting their heat removal capacity. Review of this concern shows that the lack of a test program contributed to the adverse trend in CFCU heat removal capacity. CFCU testing for heat capacity has not been required nor has it been performed since installation of the CFCUs. New CFCU cooling coils had been installed circa 1983. Technical Specification CFCU surveillance requirements do not include testing for heat removal capability.

ANALYSIS OF OCCURRENCE:

The CFCUs are designed to ensure the containment air temperature is maintained within limits (i.e., 120°F) during normal operation and adequate heat removal capacity is available when operated in conjunction with the Containment Spray System during post-LOCA conditions. The design is such that with all five (5) CFCUs operable, both Containment Spray Pumps, or a combination of three (3) CFCUs and one (1) Containment Spray Pump, the resulting temperature/pressure transient within Containment, after a design base accident (e.g., LOCA), will be mitigated.

There are five separate CFCUs which are broken up into three distinct groups. No. 11 CFCU is Group 1, Nos. 12 and 14 CFCUs are Group 2, and Nos. 13 and 15 CFCUs are Group 3. If either CFCU in Groups 2 or 3 become inoperable, that respective Group becomes inoperable.

The results of heat transfer performance testing of the CFCUs is listed below. These values are the heat removal capacities at design accident conditions at the Service Water temperature specified.

CFCU #	Date of Test	Test Results at 85°F	Test Results at 50°F (the current river temperature)
11	1/4/91	83.6E6 BTU/hr	99.2E6 BTU/hr
12	2/9/91	62.1E6 BTU/hr	73.7E6 BTU/hr
13	2/8/91	42.2E6 BTU/hr	50.1E6 BTU/hr
14	1/25/91	50.1E6 BTU/hr	59.3E6 BTU/hr
14	2/7/91	72.5E6 BTU/hr	86.0E6 BTU/hr
15	1/9/91	85.4E6 BTU/hr	101.1E6 BTU/hr

Based upon the group arrangements of the CFCUs, the heat removal capacity of any combination of CFCUs would not be sufficient to meet the design requirement as specified by the UFSAR, at 85°F river water temperature. This requirement includes heat removal capacity of 243E6 BTU/hr from three (3) CFCUs given the failure of a Vital Bus (which in the worst case removes two (2) CFCUs from service).

No. 14 CFCU was the first CFCU tested that did not meet the minimum required heat removal requirement of 81E6 BTU/hr. An engineering review of the test results was completed on January 28, 1991. On February 2, 1991, a safety evaluation (reference Discrepancy Report DR

ANALYSIS OF OCCURRENCE: (cont'd)

STD-91-030) was completed justifying continued operation of the Unit (without entry into the Technical Specification Action Statement for "inoperability" of a single CFCU group). This evaluation was based on the combined performance of the three (3) remaining CFCUs on the loss of "C" Vital Bus at a river temperature of 50°F meeting the design heat removal capacity requirement. It was assumed, in the safety evaluation, that the No. 12 CFCU would meet the UFSAR requirement.

On February 8, 1991 and February 9, 1991, the No. 13 CFCU and No. 12 CFCU were tested, respectively. Evaluation of the test results showed that both CFCUs did not meet design. These test results invalidated the safety evaluation assumption that No. 12 CFCU could meet its design requirement. Based upon the "group" arrangement, two groups of CFCUs (i.e., Groups 2 and 3) did not meet design. Subsequently, on February 9, 1991, Technical Specification 3.6.2.3 Action "b" was entered backdating its entry to February 8, 1991 at 2006 hours (the date and time when No. 13 CFCU was tested). It was exited on February 10, 1991 at 0930 hours with the Unit entering Mode 4 (Hot Shutdown). Technical Specification 3.6.2.3 is not applicable in Mode 4.

Technical Specification 3.6.2.3 states:

> "Three independent groups of containment cooling fans shall be OPERABLE with two fan systems to each of two groups and one fan system to the third group."

Technical Specification 3.6.2.3 Action "b" states:

> "a. With one group of the above required containment cooling fans inoperable and both containment spray systems OPERABLE, restore the inoperable group of cooling fans to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.
>
> b. With two groups of the above required containment cooling fans inoperable and both containment spray systems OPERABLE, restore at least one group of cooling fans to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore both above required groups of cooling fans to OPERABLE status within 7 days of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours."

An Engineering Evaluation (S-1-CBV-MEE-0538) has been prepared which evaluates the safety significance of operating with degraded CFCUs between January 28, 1991 and February 7, 1991. This period covers the time between when No. 14 CFCU first test evaluation (by Engineering) was complete and when the CFCU was retested after cleaning. This evaluation, which was based upon a Westinghouse analysis, considered the most limiting Containment pressure and temperature cases assuming

ANALYSIS OF OCCURRENCE: (cont'd)

the failure of a single diesel generator and failure of Auxiliary Feedwater {BA} runout protection. The evaluation concluded that there was no safety significance with the operation of the degraded CFCUs during the subject period. Therefore, the health and safety of the public was not affected.

Due to the Unit not meeting its design basis assumptions (as specified by the UFSAR), this event is reportable to the NRC in accordance with Code of Federal Regulations 10CFR 50.73(a)(2)(ii)(B). It is also reportable in accordance with 10CFR 50.73(a)(2)(vii)(D) since a single cause resulted in inoperability of three (3) CFCUs.

CORRECTIVE ACTION:

As indicated in the Analysis of Occurrence section, the No. 14 CFCU did not successfully pass its first test. Prior to continuing testing of the remaining CFCUs, cleaning of the inlet side of the water box was performed. Small amounts of debris (e.g., seaweed) was removed. The CFCU was retested on February 7, 1991, showing significant improvement in performance. Its performance exceeded the design requirement at 50° F; however, it was still below the design requirement at 85° F.

An evaluation by Westinghouse, justifying plant operation between January 28, 1991 and February 7, 1991 was performed. It was reviewed and confirmed by PSE&G engineering.

Recurring tasks have been initiated (both Salem Units) to test heat removal capacity of the CFCUs consistent with the recommendations of Generic Letter 89-13.

The Salem Unit 2 CFCUs were recently tested for heat removal capacity. All five units exceeded UFSAR heat removal capacity design requirements.

The Salem Unit 1 CFCUs will be cleaned during the current refueling outage and subsequently retested.

General Manager -
Salem Operations

MJP:pc

SORC Mtg. 91-022