



Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038-0236

Nuclear Business Unit

AUG 21 1996

LR-N96256

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

Gentlemen:

LER 272/96-015-00  
SALEM GENERATING STATION - UNIT 1  
FACILITY OPERATING LICENSE NO. DPR-70  
DOCKET NO. 50-272

This Licensee Event Report entitled "Inadequate CFCU Heat Removal Capability Due to Biofouling" is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR50.73(a)(2)(ii)(B).

Sincerely,

David F. Garchow  
General Manager -  
Salem Operations

Attachment

SORC Mtg. 96-112

JMO/tcp

C Distribution  
LER File 3.7

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PDR ADOCK 05000272  
S PDR

The power is in our hands.

Attachment A

The following represents the commitments that Public Service Electric & Gas (PSE&G) made to the Nuclear Regulatory Commission (NRC) relative to this LER (272/96-015-00). The commitments are as follows:

1. Develop a CFCU monitoring program which addresses acceptance criteria for single and multiple CFCU assessments by December 31, 1996.
2. Present the importance of operating and maintaining the service water chlorination system to Salem Chemistry Department personnel by October 30, 1996.
3. Revise procedures and training material to emphasize the importance of maintaining service water chlorination by November 30, 1996.
4. Ensure that Service Water Chlorination is placed in service prior to restoring Service Water flow to the Unit 1 and Unit 2 CFCUs.

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) SALEM GENERATING STATION UNIT 1	DOCKET NUMBER (2) 05000272	PAGE (3) 1 OF 4
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TITLE (4)  
Inadequate CFCU Heat Removal Capability Due to Biofouling

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 NAME	DOCKET NUMBER
07	22	96	96	015	00	08	21	96	Salem, Unit 2	05000311
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9) N	POWER LEVEL (10) 000	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)								
		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)		
		20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)		
		20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71		
		20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER		
		20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A		
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)					

LICENSEE CONTACT FOR THIS LER (12)

NAME Dennis V. Hassler, LER Coordinator	TELEPHONE NUMBER (include Area Code) 609-339-1989
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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 15 single-spaced typewritten lines) (16)

On July 22, 1996, an engineering review of past Containment Fan Coil Unit (CFCU) performance test data indicated that the CFCU heat transfer capability was less than the design basis during the first quarter of 1993 for both Salem Units. The individual CFCUs were tested during the first quarter of 1993 and noted to be below the acceptance criteria. No assessment of the aggregate performance of the CFCUs was performed at that time.

The cause of the CFCU degradation was the failure to effectively chlorinate the Service Water system due to a prolonged period of Service Water Chlorination system inoperability, thus allowing marine growth to agglomerate such that CFCU heat transfer capability degraded below an acceptable level. A contributing cause to the biofouling was the lack of organizational and management sensitivity to the maintenance and operation of the Service Water Chlorination system. The absence of controlled and accurate test acceptance criteria was a major cause for not recognizing the degraded CFCU conditions in a timely manner.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(B), any event or condition that resulted in the nuclear power plant being in a condition that was outside the design basis of the plant.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
SALEM GENERATING STATION UNIT 1	05000272	96	015	00	2 OF 4

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

PLANT AND SYSTEM IDENTIFICATION

Westinghouse - Pressurized Water Reactor

Essential Service Water System/Containment Fan Coil Unit {BI/CLR}\*

\* Energy Industry Identification System (EIIS) codes and component function identifier codes appear as (SS/CCC)

CONDITIONS PRIOR TO OCCURRENCE

At the time of identification, Salem Units 1 and 2 were shutdown and defueled.

DESCRIPTION OF OCCURRENCE

In 1991, PSE&G established a heat exchanger test program in response to Generic Letter 89-13, in which CFCU testing was developed and acceptance criteria identified. In 1991, upon testing of the CFCUs per Generic Letter 89-13, a failure to meet the design basis heat removal rate was reported. Corrective actions focused on cleaning of the heat exchangers.

The Service Water Pump suction chlorination system for both Units was out of service between June 24, 1991 to at least June 1993. However, both Unit 1 and Unit 2 CFCUs were tested with satisfactory heat removal results in the first quarter of 1992 and third quarter of 1992 respectively.

For Salem Unit #2, on February 5, 1993, the No. 21 CFCU failed its performance test, was declared inoperable, cleaned, retested, and restored to service. Within the next few weeks the results from No. 22 and No. 24 CFCU tests were also less than the acceptance criteria. No assessment of the overall capability of the Unit 2 CFCUs to meet their design basis heat removal was performed during that period.

Similarly for Unit #1, on March 24, 1993, the No. 11 CFCU failed its performance test, was declared inoperable, cleaned, retested, and restored to service. Within the next few weeks CFCUs No. 13 and No. 15 failed their performance tests and were restored to service by cleaning and retesting. Again, no assessment of the overall capability of the Unit 1 CFCUs to meet their design basis heat removal was performed.

On July 22, 1996, an engineering review of past CFCU performance test data was performed in the process of resolving test acceptance criteria discrepancies. The review of Unit 2 test data identified that during the period, (February 1993), a combined heat transfer rate of 209.6 E+06 BTU/HR existed. The review of Unit 1 test data identified that during the period, (March - April 1993), a combined heat transfer rate of 201.2 E+06 BTU/HR existed. Both Unit 1 and 2 test data indicated heat transfer rates less than the design basis requirement of 250.8 E+06 BTU/HR for CFCU accident performance.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

CAUSE OF OCCURRENCE

The cause of the CFCU degradation was the failure to effectively chlorinate the Service Water system due to a prolonged period of Service Water Chlorination system inoperability, thus allowing marine growth to agglomerate such that CFCU heat transfer capability degraded below an acceptable level. A contributing cause to the biofouling was the lack of organizational and management sensitivity to the maintenance and operation of the Service Water Chlorination system. The absence of controlled and accurate test acceptance criteria was a major cause for not recognizing the degraded CFCU conditions in a timely manner.

PRIOR SIMILAR OCCURRENCES

A review of LERs for the past two years identified no similar occurrences for a loss of CFCU capability and two other occurrence in which timely corrective actions were not taken to correct equipment and system problems. A third LER was identified from 1991 that addressed the same loss of CFCU capability.

LER 272/95-008 documented inadequate organizational performance as a contributing factor to a loss of switchgear and penetration area ventilation. LER 272/95-022 documented a failure to correct conditions adverse to quality in that a tear in the Auxiliary Building Ventilation system expansion joint fabric went unrepaired for twelve months. Substantial changes in organizational handling of conditions adverse to quality as well as expectations of organizational performance have been implemented since January 1994 with additional corrective actions implemented since December 1995.

LER 272/91-005 discussed the same loss of CFCU capability. Corrective actions from that LER focused on cleaning the CFCUs since that LER represented the first time that Generic Letter 89-13 testing had been performed on the CFCUs.

SAFETY CONSEQUENCES AND IMPLICATIONS

Each Salem Unit is equipped with five containment cooling fans known as containment fan coil units. They are designed to ensure the containment air temperature is maintained during normal plant operation at, or below, 120 degrees F. They also operate in conjunction with the Containment Spray (CS) system to limit the containment internal pressure rise following accident conditions. The design is such that adequate heat removal will occur with any of the following situations: all five (5) CFCUs operable, or both CS pumps, or a combination of three (3) CFCUs and one (1) CS pump. The worst case accident scenario is satisfied when the combined heat transfer of three (3) CFCUs is equal to, or exceeds, 250.8 E+06 BTU/HR.

Therefore, the availability of the second spray pump more than compensates for the CFCU heat transfer shortfall of approximately 41 E+06 BTU/HR.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

SAFETY CONSEQUENCES AND IMPLICATIONS (cont'd)

For Salem Unit 1, the safety implications were analyzed as follows. In an accident scenario, the most limiting failure from a CFCU capability perspective is a failure of the "B" vital bus. This failure still leaves the Nos. 11, 13, & 15 CFCUs and both spray pumps in operation. The "B" vital bus failure provides one more spray pump than credited in the design basis analyses. The heat removal capability of this pump is estimated at 209 E+06 BTU/HR.

For Salem Unit 2, the safety implications were analyzed as follows. Upon analysis, in taking credit for the February 1993 Service Water inlet temperature of 38 degrees F, the resultant heat transfer rate capability from Nos. 21, 22, & 24 CFCUs would have been 254.1 E+06 BTU/HR, which exceeded the design basis requirement of 250.8 E+06 BTU/HR.

Since there were no consequences for the degraded CFCU heat transfer rate, the health and safety of the public were unaffected.

CORRECTIVE ACTIONS

1. Develop a CFCU monitoring program which addresses acceptance criteria for single and multiple CFCU assessments by December 31, 1996.
2. Present the importance of operating and maintaining the service water chlorination system to Salem Chemistry Department personnel by October 30, 1996.
3. Revise procedures and training material to emphasize the importance of maintaining service water chlorination by November 30, 1996.
4. Ensure that Service Water Chlorination is placed in service prior to restoring Service Water flow to the Unit 1 and Unit 2 CFCUs.