CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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FACIL:50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co. 05000335
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SUBJECT: LER 96-001-00:on 960219,control room emergency ventilation sys inoperable due to improper sys configuration occurred. Caused by inadequate guidance & work controls for identifying.CR boundry reviewed.W/960314 ltr.

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CATEGORY 1 DOCUMENT

Florida Power & Light Company, P.O. Box 128, Fort Pierce, FL 34954-0128

March 14, 1996

L-96-71
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 96-001
Date of Event: February 19, 1996
Control Room Emergency Ventilation System Inoperable
Due to Improper System Configuration

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

W. H. Bohlke
Vice President
St. Lucie Plant

WHB/EJB

Attachment

cc: Stewart D. Ebneter, Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

220035

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
ST LUCIE UNIT 1	05000335	1 OF 10

TITLE (4)

Control Room Emergency Ventilation System Inoperable due to Improper System Configuration

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
02	19	96	96	001	00	03	14	96	N/A	N/A
									FACILITY NAME: N/A	DOCKET NUMBER: N/A

		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)					
OPERATING MODE (9)	1		20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	100		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	TELEPHONE NUMBER (Include Area Code)
Edwin J. Benken, Licensing Engineer	(407) 467 - 7156

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 February 19, 1996, with Unit 1 at 100 percent power, it was discovered that the Control Room Emergency Ventilation System was in a configuration which compromised Control Room low leakage integrity. Following maintenance, a Control Room air conditioner inlet damper and inlet plenum hatch were left open, providing a direct ventilation system flowpath from the Control Room to the adjacent HVAC equipment room. This resulted in a condition which could have prevented the Control Room Emergency Ventilation System from performing its intended function during accident conditions. Normal system alignment was restored following discovery of the condition.

This event was caused by inadequate guidance and work controls for identifying and maintaining the Control Room pressure boundary during maintenance on the Control Room Emergency Ventilation System.

Corrective Actions: 1) The Control Room boundary is being reviewed and boundary penetrations will be clearly identified. 2) Other safety significant plant buildings are being evaluated for integrity related items. 3) Other plant HVAC systems are being evaluated for generic concerns. 4) Equipment clearance instructions will be revised to provide additional guidance for work activities that affect HVAC systems and building integrity. 5) Maintenance procedures will be reviewed for changes based on HVAC operational requirements. 6) HVAC plenum access control improvements will be made.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
ST. LUCIE UNIT 1	05000335	96	-- 001	-- 00	2 OF 10

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

DESCRIPTION OF THE EVENT

On February 19, 1996, at approximately 0225, a Shift Technical Advisor (STA) was entering the Unit 1 Control Room and noticed an apparent negative pressure inside the Control Room as evidenced by an influx of air when the Control Room door was opened. The STA informed the Assistant Nuclear Plant Supervisor (ANPS) of the condition and began an investigation.

Refer to Figure 1, "St. Lucie Unit 1 Control Room HVAC Arrangement." The STA discovered that an inlet plenum access hatch to the Electrical Equipment Room supply fans, HVS-5A and HVS-5B (EIIS:VJ), was open. The hatch had been opened (at approximately 0220 hours) to perform periodic maintenance (PM) of the HVS-5B fan. The "A" side fan (HVS-5A) remained operating during this time. Concurrently, the inlet plenum hatch and inlet damper for Control Room air conditioner HVA-3C (EIIS:VI) were found to be open. The access hatch had been opened to facilitate repair of system dampers while the HVA-3C air conditioning unit was out of service for modification work. The inlet damper to HVA-3C, damper D-22 (EIIS:VI), had been replaced at approximately 1230 on February 18, 1996, and the damper was left in its fail-open position pending completion of the modification work.

The Electrical Equipment Room supply fans, HVS-5A and HVS-5B share a common inlet plenum, which is aligned to outside air. These fans supply ventilation to the Electrical Equipment Room, which is located one floor below the Control Room. The Control Room air conditioning units, HVA-3A, HVA-3B and HVA-3C (EIIS:VI), are located in the same heating, ventilation and air conditioning (HVAC) room as the Electrical Equipment Room supply fans, HVS-5A and HVS-5B. With the Electrical Equipment Room fans' inlet plenum hatch open, the operating fan (HVS-5A) suction was effectively aligned to this HVAC room.

With both the above plenum hatches open, the Electrical Equipment Room supply fan (HVS-5A) suction was aligned to the HVAC room, the Control Room air conditioning inlet plenum, and ultimately to the Unit 1 Control Room via the air handler return ducting. This condition created the negative pressure in the Control Room.

On February 19, at 0237, following the discovery of the open plenum hatches, Maintenance personnel closed the plenum hatch for HVS-5A and HVS-5B, and Control Room pressure returned to normal. At 0240, the inlet plenum hatch to Control Room Air Conditioner HVA-3C was also closed.

An engineering assessment was initiated to determine the effects on plant operation as a result of this alignment. The assessment concluded that during the time both the HVA-3C and HVS-5A & 5B plenum doors were open, the Control Room Emergency Ventilation System would not have been able to maintain a positive .125 inch water gauge (wg) pressure in the Control Room in the post-accident alignment in accordance with system design. Therefore, in accordance with 10 CFR 50.72, the event was considered to be reportable within one hour and the NRC was notified.

CAUSE OF THE EVENT

The event was caused by insufficient guidance and work controls associated with identifying and maintaining the integrity of the Control Room pressure boundary during maintenance on the Control Room Emergency Ventilation System. The pressure boundary was breached while maintenance was being performed on one of the Control Room air conditioning units, HVA-3C. Several factors contributed to the loss of this boundary. The boundary had never been clearly defined within plant processes. Control Room boundary penetrations were not labeled or otherwise identified in the field. Because of the lack of awareness regarding the Control Room pressure boundary, work control instructions were not sufficient to prevent the occurrence.

ANALYSIS OF THE EVENT

Technical Specification 3/4.7.7.1 requires that the Control Room Emergency Ventilation System (EIIS:VI) be capable of maintaining a positive pressure of greater than or equal to 1/8 inch water gauge (wg) relative to the outside atmosphere during system operation with less than or equal to 450 cubic feet per minute outside air intake. This is consistent with St. Lucie Unit 1 Updated Final Safety Analysis Report (UFSAR) design requirements.

An initial engineering assessment performed on the day the condition was discovered, February 19, 1996, concluded that the Control Room Ventilation System could not be considered operable during the time that both HVA-3C and HVS-5A & 5B plenum doors were open.

A subsequent evaluation of the event was performed which compared the dose consequences described in the UFSAR to those which would be reasonably expected with the Control Room pressure boundary breach. The worst case dose would occur with a large break Loss of Coolant Accident (LOCA). Therefore, the comparison was made assuming the large break LOCA event. The Control Room Ventilation System has two modes of operation: normal and emergency. The emergency mode of operation was assumed for dose consequences. The maintenance configuration of HVA-3C did not affect any other capabilities of this system. The following is a summary of the evaluation.

Design Bases Review

Control Room Habitability Systems (UFSAR Section 6.4.1.1)

The design bases for the Control Room habitability system includes the following:

a) Permit continuous occupancy of the control room during the first 72 hours following a LOCA. This period of habitability is based on the time it would take to change shifts under adverse meteorological conditions following a LOCA.

ANALYSIS OF THE EVENT Continued

b) Permit habitability based on outside air inleakage following a LOCA assuming a differential pressure on the exterior walls and roof of the control room resulting from wind. The calculation of the control room activity for any time after the LOCA is described in UFSAR Chapter 15. The control room dose calculations, which are also discussed in UFSAR chapter 15, take credit for iodine removal by both the Shield Building Ventilation System and the Control Room recirculation subsystem.

c) Keep direct whole body dose, when added to the whole body dose from airborne radioactivity, below the limits imposed by 10 CFR Part 50 (5 rem whole body) for the course of the accident. The Control Room Ventilation System is sized to remove airborne radioactivity at a rate sufficient to permit 30 days continuous occupancy by an individual without exceeding 30 rem thyroid dose.

d) Maintain CO_2 levels less than one percent and O_2 levels at a minimum of 17 percent at all times.

e) Maintain the ambient temperature required for personnel comfort and equipment operation during normal and accident conditions assuming a single active failure.

LOCA Control Room Dose (UFSAR Section 15.4.1.8.d.)

The dose to Control Room personnel following a LOCA was evaluated to assure compliance with 10 CFR Part 50 Appendix A, General Design Criteria (GDC) 19, which specifies that the dose received by Control Room personnel should not exceed 5 rem whole body dose or the equivalent to any part of the body. The dose was calculated considering contributions from direct radiation from the fission products in the containment and from airborne radiation resulting from leakage of fission products into the Control Room. The thyroid dose was calculated on the basis of airborne iodine activity in the Control Room considering operation of the Control Room Ventilation System described in UFSAR Section 9.4.1 in the clean up mode of operation. The UFSAR analysis calculated a 30 day thyroid dose of 30 rem and a whole body dose of 1.7 rem.

Control Room Ventilation System (UFSAR Section 9.4.1.1)

The design of the Control Room Air Conditioning System and Control Room Emergency Ventilation System includes the following:

a) Limit Control Room doses due to airborne activity to within GDC 19 limits.

b) Maintain the ambient temperature required for personnel comfort during normal conditions.

c) Permit personnel occupancy and proper functioning of instrumentation and control during all normal and LOCA conditions assuming a single active failure.

ANALYSIS OF THE EVENT Continued

Description of UFSAR Design for Ventilation System During Emergency Mode of Operation -

The main system air handling units (HVA-3A, 3B & 3C) provide approximately 19,000 cfm of flow to the Control Room envelope, assuming two air conditioning units in operation. The booster units (HVE-13A & 13B) are designed to circulate 2,000 cfm of this flow through high efficiency (HEPA) and charcoal filters. Following actuation of the system in the emergency mode, the Control Room operators adjust inlet dampers to provide a positive pressure of 0.125 inches wg with up to 450 cfm of filtered outside air make-up. The UFSAR unfiltered air inleakage value for dose analysis is 34.2 cfm. This value is based on a pressure differential created by the exposure of doors and other boundary penetrations to external wind conditions. This air inleakage plus the 450 cfm of filtered air make-up results in a 30 day Control Room dose of less than 30 rem thyroid dose. The number of doors used in the analysis is conservative. Only those doors that are directly exposed to wind would leak at the 10 cfm rate. Since there is only one door to the Control Room directly exposed to wind, the actual unfiltered inleakage (with a positive Control Room pressure of 0.125 inches wg) is 14.2 cfm.

Description of System Performance With Boundary Breach (HVA-3C Plenum Hatch Open)

When aligned in the emergency mode, the Control Room envelope will maintain a positive pressure of .125 inches wg, because it will continue to receive approximately the same amount of air flow from the main system air handlers. However, since the HVA-3C inlet and the inlet from the recirculation/make-up air loop are at a slightly lower pressure than the surrounding room, the filtered air would be bypassed with up to 450 cfm of unfiltered air from the HVAC Equipment Room through the open plenum hatch on HVA-3C.

This system lineup results in a maximum of 450 cfm Control Room air make-up from the HVAC Equipment Room in addition to any leakage directly into the Control Room from exterior doors and penetrations. The HVAC Equipment Room make-up air will be radiologically clean air until air infiltrates from the doors and via the pipe chase to the pipe tunnel. The buildup of outside air activity in the HVAC room would be slow and probably not occur until the highest activity levels had subsided. However, this evaluation conservatively assumes that outside air infiltration into the HVAC Equipment Room is immediate. The unfiltered leakage directly into the Control Room would remain at 14.2 cfm, as previously discussed.

ANALYSIS OF THE EVENT Continued

Description of System Performance With Boundary Breach (HVA-3C Plenum Hatch Open) and Access Hatch to HVS-5A & 5B Open

With the HVS-5A & HVS-5B plenum access hatch open and HVS-5A operating, a negative pressure is set up in the HVAC Equipment Room and therefore at the HVA-3C inlet. This would then create a negative pressure in the Control Room (as much as 0.167 inches wg). Make-up air to the Control Room would be shifted from the HVAC Equipment Room to the filtered air from the booster fans, HVE-13A & 13B, since this now becomes the higher pressure source. Make-up air would be regulated to less than 450 cfm by the Control Room operators post accident per procedure. The analysis shows that the unfiltered leakage directly into the Control Room for this scenario increases from 14.2 cfm to approximately 21.7 cfm, as a result of the negative Control Room Pressure.

Review of Dose Assessment Conservatisms

UFSAR LOCA dose calculations are based on the release assumptions set forth in USNRC Regulatory Guide 1.4. The assumed releases consist of 50 percent of the radioactive iodine inventory from full power operation being released from the core to the containment. Half of this, or 25 percent of the iodine inventory, is assumed to be available for leakage from the primary reactor containment.

This assumption is conservative with respect to the best estimate releases determined in severe accident studies. The investigation of accident source terms for light-water nuclear power plants, documented in NRC report NUREG-1465, concludes that at least 95 percent of the iodine entering the containment remain dissolved in water if the containment sump is maintained at a pH of 7 or greater. The containment sump pH during a LOCA in St. Lucie Unit 1 is required to be greater than 7. Only 5 percent of the iodine generated is available for leakage from the containment. This corresponds to 2.5 percent of the radioactive iodine inventory in the core. UFSAR analysis is therefore conservative by a factor of approximately 10 based on NUREG-1465 studies.

The results of the St. Lucie containment integrated leakage rate test (ILRT) performed in 1993 determined the as-found leakage to be 0.319 percent per day which is less than the Technical Specifications (TS) maximum of 0.5 percent per day. The actual leakage reported in the test results is thus less than the TS limit by a factor of 1.56.

The assumptions made in the UFSAR indicate that there is a factor of 15.6 reduction for iodine dose that occurs for the large break LOCA. The UFSAR whole body dose is conservative by the 1.56 value since noble gases are not affected by the charcoal and filter system found in the Control Room Emergency Ventilation System. Therefore, the operators would be subjected to the quantity of noble gases from outside air makeup regardless of whether it is filtered or comes directly from the outside.

ANALYSIS OF THE EVENT Continued

When NUREG 1465 source term and actual ILRT results were applied to the total make-up and unfiltered air flow into the Control Room it was found that the 1.7 rem whole body dose limit and 30 day thyroid dose limit of 30 rem described in the UFSAR would not be exceeded providing the following values were met:

a) Total Allowable Make-up and Inleakage - 755.4 cfm

b) Total Unfiltered Inleakage - 533.5 cfm

Scenario With HVA-3C Plenum Hatch Open

This scenario was assumed to last for the duration of the accident, because the maintenance activity on HVA-3C was ongoing, and had been temporarily suspended, at the time that the hatch was discovered to be open. In addition, there would be no indications expected in the Control Room that would lead to the investigation of a potential problem.

The scenario assessment showed that total make-up plus inleakage would equal approximately 464.2 cfm and would be all unfiltered. Since this value is below the allowable values previously discussed, the Control Room Emergency Ventilation System was capable of maintaining operator doses within UFSAR calculated values, when using the NUREG-1465 source terms and actual ILRT results.

Scenario With HVA-3C and HVS-5A &B Hatches Open

The time from opening the plenum hatch for the Electrical Equipment Room supply fans (HVS-5A & B) to closing the hatch was approximately 17 minutes. The reason this hatch was open was to allow mechanical maintenance personnel to perform a PM on HVS-5B. Had a design basis event occurred during this period of time, it is expected that the maintenance crew would have closed the hatch as they vacated the HVAC equipment room. However, if this did not occur, the alignment would be identified and corrected by the utility licensed operators during the implementation of the procedure used to restore make-up air to the Control Room after the accident, ONOP 1-1900030, or identified and corrected in the same manner as on February 19. Such action would isolate the suction path described previously and prevent the negative pressure buildup.

The scenario assessment, assuming the problem was not detected, showed that total make-up and inleakage would equal approximately 471.7 cfm and total unfiltered leakage would be approximately 21.7 cfm. Since both of these values are below the allowable values previously discussed, the Control Room Emergency Ventilation System was capable of maintaining operator doses within UFSAR calculated values, when utilizing the NUREG-1465 source terms and actual ILRT results.

ANALYSIS OF THE EVENT Continued

Conclusion

The evaluation concluded that if the scenarios described had gone undetected the Control Room Emergency Ventilation System could not be considered operable in accordance with its Technical Specification and design basis requirements of maintaining the Control Room at a slight positive pressure when receiving outside make-up air and filtering all make-up air. However, the safety significance of operating the plant with the HVA-3C and HVS-5A and 5B plenum hatches open, concurrent with a large break LOCA, was assessed, and the dose consequences realized by the increase in total filtered and unfiltered outside air is offset by actual ILRT leak rates and the revised source term reduction identified in NUREG - 1465. The scenarios assessed indicate that the consequences determined in the UFSAR analyses remain bounding. No other capabilities of the system were affected.

The health and safety of the public were not adversely affected by this event.

CORRECTIVE ACTIONS

1) The plenum access doors for HVA-3C and HVS-5A and HVS-5B were closed, and the Control Room Emergency Ventilation System was returned to an operable condition.

2) A list of Unit 1 and Unit 2 Control Room boundary penetrations will be developed. Penetrations which could affect the Control Room boundary will be labeled to provide for identification in the field.

3) Plant staff will complete an assessment of other safety related buildings, and provide component level information to address integrity related items.

4) Plant staff will perform an assessment of other Unit 1 and Unit 2 HVAC systems for system interaction and generic concerns related to this event.

CORRECTIVE ACTIONS Continued

5) The plant Equipment Clearance Orders will be revised as necessary to incorporate additional guidance regarding work activities that could affect system interaction between HVAC systems.

6) The plant Equipment Clearance Orders will be revised as necessary to address activities which affect building integrity.

7) Engineering will review the operational requirements of the Unit 1 Electrical Equipment room supply fans HVS-5A and HVS-5B, when performing preventative maintenance (PM). Existing PM procedures and administrative controls will be evaluated for change based on the results of the review.

8) Administrative controls for HVAC plenum keys will be improved to better control access into the plenums.

ADDITIONAL INFORMATION

Failed Components Identified

None

Previous Similar Events

None

FIGURE 1

ST. LUCIE UNIT 1 CONTROL ROOM HVAC ARRANGEMENT

(SIMPLIFIED)