

**Virginia Electric And Power Company
Surry Power Station
5570 Hog Island Road
Surry, Virginia 23883**

November 1, 2000

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555-0001

Serial No.: 00-545
SPS: BAG
Docket No.: 50-280
50-281
License No.: DPR-32
DPR-37

Dear Sirs:

Pursuant to 10CFR50.73, Virginia Electric and Power Company hereby submits the following Licensee Event Report applicable to Surry Power Station Units 1 and 2.

Report No. 50-280, 50-281/2000-003-00

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be forwarded to the Management Safety Review Committee for its review.

Very truly yours,



R. H. Blount, Site Vice President
Surry Power Station

Enclosure

Commitments contained in this letter:

1. A Category 1 Root Cause Evaluation (RCE) was initiated for this event. The conclusions from the RCE will be evaluated and the approved recommendations from the RCE necessary to prevent recurrence will be implemented through the corrective action program.

IE22

cc: United States Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-8931

Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

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 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)

SURREY POWER STATION , Unit 1

DOCKET NUMBER (2)

05000 - 280

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TITLE (4)

Both Filtered Exhaust Fans Inoperable Due to Operation Close to Trip Setpoint

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	DOCUMENT NUMBER
10	03	00	00	-- 003 --	00	11	01	00	Surry Unit 2	05000-281
									FACILITY NAME	DOCUMENT NUMBER
										05000-
OPERATING MODE (9)		N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100 %	20.2201(b)		20.2203(a)(2)(v)		X		50.73(a)(2)(i)	50.73(a)(2)(viii)
			20.2203(a)(1)		20.2203(a)(3)(i)				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
			20.2203(a)(2)(iv)		50.36(c)(2)				50.73(a)(2)(vii)	or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

NAME

R. H. Blount, Site Vice President

TELEPHONE NUMBER (Include Area Code)

(757) 365-2001

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	VF	FAN	TRANE Co.	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES		X	NO		EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
(If yes, complete EXPECTED SUBMISSION DATE).								

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On October 3 and 4, 2000, with Unit 1 operating at 100% reactor power and Unit 2 at cold shutdown for a refueling outage, two events associated with the safety-related (SR) ventilation exhaust system occurred that were determined to be reportable conditions. On October 3, 2000 both SR exhaust fans tripped during Unit 2 train B logic testing. On October 4, 2000, with one SR fan operating, a non-SR exhaust fan was secured and the operating SR exhaust fan tripped. Following this event, one SR fan was maintained operable and a 7-day clock to return both fans to service was entered. Based upon the problems identified during the repair efforts, the operability of the fans was affected since the implementation of a design change in November 1999. The trip setpoint was changed to increase operating margin, the flow controllers tuned, maintenance performed on the inlet flow control dampers, and a fan start time delay implemented. The fans were returned to service and an amended 7-day clock was exited. A root cause evaluation was initiated and approved corrective actions will be implemented. This event did not affect the health and safety of the public. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B).

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1.0 DESCRIPTION OF THE EVENT

Background

The Auxiliary Building Ventilation Exhaust System [EIS-VF] is a shared system designed to provide post-accident cooling for safety-related components and filtration to limit onsite and offsite doses within appropriate limits. The current dose analysis of record assumes that filtration provided by the ventilation system will not be needed in the initial 30 minutes of a Loss of Coolant Accident (LOCA). In addition, safety-related equipment required for post-accident mitigation can operate well in excess of 30 minutes without ventilation.

The ventilation exhaust system consists of two trains with each train having an exhaust fan 1-VS-F-58A and 1-VS-F-58B (58A and 58B) [EIS-VF,FAN], a charcoal and high efficiency particulate air filter assembly [EIS-VF,FLT], and associated dampers [EIS-VF,DMP]. During a safety injection (SI) [EIS-JE], the ventilation system is realigned from the normal ventilation alignment to an accident alignment that takes suction from the charging pump cubicles and the affected unit's Safeguards Building. Fan suction pressure switches are installed to protect the filter housing and were set to 16 inches vacuum water column (WG). Upon receipt of a SI signal from either train, both fans automatically start and run in parallel. The original system design used suction pressure to maintain total discharge design flow rate to approximately 36,000 cubic feet per minute (cfm) with parallel fan or single fan operation. In November and December 1999 (58A and 58B, respectively), a design change was implemented to change fan control from suction pressure control [EIS-VF,PIC] to discharge airflow control [EIS-VF,FIC] to eliminate flow instabilities that previously existed with the suction control system during parallel fan operation.

Technical Specification (TS) 3.22.A requires that both ventilation exhaust filter trains be operable whenever either unit's reactor coolant system temperature and pressure is greater than 350 degrees Fahrenheit and 450 psig. In accordance with TS 3.22.B, if one train is inoperable, it must be returned to operable status within 7 days or the units are required to shut down. TS 4.12.A.2 also requires the ventilation exhaust system to be tested once per 18 months to verify system operability. The test, in part, requires that the automatic start-up of the 58 exhaust fans, shutdown of non-safety-related fans, and flow path alignment be tested.

In April 2000, while conducting a test of the ventilation exhaust system, both exhaust fans automatically started as designed, but then both fans tripped. After additional testing, it was determined that the fans could not be relied upon to operate in parallel at 36,000 cfm each without the possibility of tripping both fans. The cause was attributed to a change to fan flow controls described above. The control setpoints for each fan were adjusted to 18,000 cfm to support parallel fan operation. To verify that the fans would operate in

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parallel at this new flow setting, ventilation dampers were manually re-positioned to the accident alignment and the exhaust fans were started. The event was documented in Licensee Event Report 50-280, 50-281/2000-001-00.

Event Description

In October 2000, with Unit 1 operating at 100% reactor power and Unit 2 at Cold Shutdown (CSD) for a refueling outage, two events associated with the operation of the ventilation exhaust system occurred that were determined to be reportable conditions. The first event occurred on October 3, 2000 while operators were conducting Unit 2 "J" emergency bus (train B) [EIS-EB,BU] logic testing. The second event occurred on October 4, 2000 while operators were preparing for the Unit 2 "H" emergency bus (train A) logic test. The following details are provided for each event.

Dual Fan Trip During ESF Testing:

On October 3, 2000, the Unit 2 train B logic test was being conducted. The test includes the automatic start-up of the 58 exhaust fans, shutdown of non-safety related fans, and flow path alignment as required by Technical Specification 4.12.A.2. At 1356 hours, a SI signal was simulated, automatic damper realignment initiated, and both 58 exhaust fans started. Approximately 10 seconds after the initial automatic start, both exhaust fans tripped. The fans were declared inoperable and Unit 1 entered a TS 3.0.1 action statement requiring the unit to be placed in at least Hot Shutdown (HSD) within 6 hours and in CSD within the following 30 hours. At 1410 hours, the 58B exhaust fan was placed in pull-to-lock (PTL) and the 58A exhaust fan was reset. With the auto-start signal still in effect from the logic test, the 58A exhaust fan re-started automatically, and continued to run at the design flow rate.

Following the bus undervoltage logic testing, train A of the ventilation exhaust system was verified to be operable for Unit 1 by placing the ventilation dampers in the Unit 1 accident alignment and running the 58A exhaust fan at the design flow rate. At 1620 hours, with the 58A exhaust fan operating and the ventilation in the Unit 1 accident alignment, the Unit 1 6-hour action statement to HSD was exited and a 7-day TS action statement to return 58B fan to operable status was entered.

Operable Fan Trip During Ventilation Realignment:

On October 4, 2000, Unit 1 remained in a 7-day TS action statement with the 58A exhaust fan providing ventilation to the Auxiliary Building Central area (charging pump cubicles) and Unit 1 Safeguards Building. Two charging pump dampers were opened and maintained open (most restrictive emergency ventilation alignment) to prepare for the Unit 2 train A logic test. The non-safety related 1-VS-F-59 (59) exhaust fan was providing filtered ventilation for outage activities in Unit 2 containment and was discharging to a common vent stack. At 1625 hours, the 59 exhaust fan was secured for the logic test. At

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1627 hours, the 58A fan tripped, therefore, both exhaust fans were considered inoperable and Unit 1 again entered a 6-hour action statement to HSD. The 58B exhaust fan was started in the Unit 1 accident alignment with three charging pump dampers open and verified to be operable. At 1745 hours, Unit 1 exited the 6-hour HSD action statement and reverted to the original 7-day action statement started on October 3, 2000 at 1356 hours.

A recovery team was formed to resolve the problems and allow the fans to be returned to operable status. The team recognized that the testing following the April 2000 recovery effort had not actually performed a complete system dynamic functional test since dampers were already in the filtered line up when the 58 exhaust fans were manually started. This was considered acceptable at the time based upon the original design of the system that provided a short time delay between damper reposition and fan start. The recovery team focused on damper alignment and fan start timing as the source of the problem. It was determined that the time delay between suction damper opening and fan start was not sufficient, resulting in fan tripping on low suction pressure. A time delay relay was installed in both fans' start circuitry to allow the suction path dampers to complete their full travel prior to fan start. Following implementation of this modification and installation of monitoring equipment, a functional test was performed on each fan individually and then concurrently in the most restrictive emergency ventilation alignment, with no damper pre-positioning. In this restrictive alignment, one fan continued to indicate unstable operation.

Repair efforts subsequently improved the unstable operation. However, during subsequent testing, both exhaust fans continued to operate near their suction pressure trip setpoint and therefore, the 7-day action statement remained in effect to return both fans to service. On October 10, 2000, enforcement discretion was requested and the request verbally granted to extend the allowed outage time of TS 3.22.B, Auxiliary Ventilation Exhaust Filter Trains, for an additional 10 days. During this period, at least one auxiliary ventilation exhaust filter train was maintained operable.

Repair, maintenance, and modifications efforts focused on the low margin to setpoint on the fan suction pressure switches. Following pressure switch replacement, suction pressure switch setpoint increase, maintenance on the flow control dampers, and successful functional testing, the Auxiliary Ventilation System was declared operable. The 7-day action statement entered on October 3, 2000 and amended on October 10, 2000 was exited on October 19, 2000 at 1303 hours.

A condition prohibited by TSs existed for Unit 1 on October 3, 2000 when both exhaust fans tripped during emergency bus logic testing. On October 4, 2000 a condition prohibited by TSs also existed for Unit 1 when one exhaust fan was inoperable in PTL and the other exhaust fan tripped when the non-safety related 59 exhaust fan was secured. The conditions found during the October 2000 events are assumed to have existed for Unit 1 and Unit 2 since the implementation of the fan flow control design

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change in November 1999 and continued to be inoperable following recovery efforts in April 2000. These conditions are being reported pursuant to 10 CFR 50.73(a)(2)(i)(B), any operation or condition prohibited by TSs.

2.0 SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

The accidents that are most sensitive to the operation of the exhaust fans are the LOCA and the Fuel Handling Accident (FHA). For the LOCA accident, the Auxiliary Building Ventilation Exhaust Filter System provides ventilation (cooling) to the safety-related equipment and filters the Auxiliary Building ventilation central exhaust and the Safeguards Building exhaust to maintain control room operator and offsite doses within the appropriate limits. The system also mitigates a FHA by filtering the exhaust air from the Fuel Building and/or the Containment (refueling operation).

The investigation of the dual fan and single fan trip on October 3 and 4, 2000, respectively, recognized that the Auxiliary Building Ventilation Exhaust System was operating too close to the suction pressure trip setpoint. During a SI signal to either unit, both 58 exhaust fans would automatically start, but may trip as dampers re-aligned. Single fan operation in the emergency alignment was demonstrated after the flow control design change in 1999, and then again during April and October 2000. However, during post modification testing following the fan start time delay installation, a single exhaust fan operating at design flow rates tripped. The preliminary cause was determined to be operation too close to the suction pressure trip setpoint and controller settings that resulted in system instabilities while in the most restrictive emergency ventilation alignment.

The current dose analysis of record for a LOCA does not credit the immediate operation of the Auxiliary Building Ventilation Exhaust Filter System. Filtration of Emergency Core Cooling System (ECCS) leakage is assumed to begin 30 minutes post-accident. If the exhaust fans tripped following a SI, reasonable operator actions can be taken from the control room to reset and re-start one filtered exhaust fan. Station emergency operating procedures direct the operator to ensure that at least one fan is running. The operator actions would be completed within a sufficient time (assume 30 minutes) for the ventilation exhaust filtration system to fulfill its safety function.

If a fan tripped after the first 30 minutes following a SI, the safety-related equipment in the Safeguards and in the Charging Pump cubicles can operate without the cooling until ventilation can be restored. However, the consequences of not having ventilation (assume 30 minutes), will increase the calculated onsite and offsite doses from releases resulting from both the FHA and LOCA accident. Considering the conditions found during these events, the calculated control room dose and off-site dose would remain within the regulatory limits for both the FHA and the LOCA accident.

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The auxiliary ventilation exhaust fans are explicitly included in the Surry Power Station probabilistic risk assessment (PRA) model and have been determined to be low risk significant components. The at-power risk analysis addressed a LOCA with only one filter exhaust fan operable and resulted in a slight (<1%) Core Damage Frequency (CDF) increase above the baseline value. The Large Early Release Frequency (LERF) was also evaluated and the results indicate that, within the limits of roundoff error, there is no increase in LERF. The time available in the PRA model for operators to perform the required action of re-starting one fan is long, compared to the time required for the operators to perform that action. Therefore the impact of operation with one or both fans requiring manual start is minimal and can also be estimated at less than 1%. The combined risk with one fan unavailable and the other requiring a manual start can be estimated at less than 2%.

In conclusion, since there have been no accidents that required the operation of the ventilation system, the PRA risk assessment for these events was minimal, and since a review concluded that the calculated doses from FHA and LOCA accident releases would have remained within the regulatory limits, these conditions did not result in any safety consequences and the health and safety of the public was not affected.

3.0 CAUSE

A category 1 root cause evaluation (RCE) has been initiated to determine the cause of the dual exhaust fan and the 58A exhaust fan trip in October 2000, and the cause of the failure of the April 2000 recovery efforts to prevent a recurrence of ventilation problems.

The preliminary root cause of the dual fan trip on October 3, 2000 and the 58A fan trip on October 4, 2000 was operation of the ventilation system too close to suction pressure trip setpoint. With the trip setpoint at 16 inches vacuum WG, operating vacuum was measured at values very close to the setpoint while at design flow. The 1999 design change did not change the operating vacuum; however, the change did increase the sensitivity of the system to small system perturbations, such as damper alignment, filter loading, and fan start/stops.

In addition, the lack of a complete functional test after the fan flow control design change and during the recovery efforts in April 2000, prevented identification of system and component interactions that caused ventilation system instabilities.

4.0 IMMEDIATE CORRECTIVE ACTION(S)

With Unit 1 in a 6-hour TS action statement to place the unit in HSD, the ventilation was aligned to the Unit 1 accident alignment and a 58 exhaust fan started and verified to run at the design flow rate. The 6-hour TS action statement was exited.

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Due to the concern with automatic alignment and fan operation, the ventilation was maintained in Unit 1 accident alignment with one exhaust fan running. One 58 exhaust fan was maintained in PTL and a 7-day TS action statement for Unit 1 was entered.

5.0 ADDITIONAL CORRECTIVE ACTIONS

A Cat 1 RCE was initiated to determine the cause of the fan trips, as well as determining what the previous recovery effort in April 2000 had missed.

A recovery team composed of Station and Corporate Engineering and Operations was formed to return the fans to operable status. The team recognized that testing following the April 2000 recovery effort had not actually performed a complete system functional test. They assumed the actuation start delay that was part of the original system design would allow for damper re-alignment prior to the fans starting. The October 2000 recovery team determined that the original system time delay was not sufficient and resulted in fan tripping on low suction pressure. Based upon this, a design change was implemented to install fan start time delays in the 58 exhaust fan auto start circuit to provide time for all affected dampers to re-align before the 58 fans actually started.

Following implementation of the time delay design change, a complete functional test for each fan individually and then concurrently in the SI alignment, was performed with no damper pre-positioning. During testing, one fan continued to indicate unstable operation. The recovery effort then focused on the flow controllers, the material condition of the flow control dampers and their actuators, suction pressure switches, and the margin to trip setpoint. The flow controllers were tuned and the gain adjusted to provide optimal performance. The inlet flow control dampers and their actuators were inspected, lubricated and adjusted for optimal performance. Additional margin was provided to the suction pressure trip by increasing the setpoint to 18 inches WG. In addition the suction pressure switches were replaced to enhance repeatability.

As part of normal test requirements, train A logic test, originally scheduled on October 4, 2000, was performed on October 27, 2000. A SI signal was simulated, automatic damper realignment initiated, and both 58 exhaust fans started and continued to run. The fans demonstrated stable operation and the test was completed with no additional fan concerns identified.

6.0 ACTIONS TO PREVENT RECURRENCE

A Category 1 Root Cause Evaluation (RCE) was initiated for this event. The conclusions from the RCE will be evaluated and the approved recommendations from the RCE necessary to prevent recurrence will be implemented through the corrective action program.

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7.0 SIMILAR EVENTS

LER 2-92-006-00, Auxiliary Building Vent Exhaust Filter System Train Rendered Inoperable When Fan Tripped Due to Filters Being Near the End of Their Service Life.

With Train A out of service, the 58B exhaust fan tripped because the containment doors were opened during purging and excessive vacuum due to the train B filters operating near the end of their service life. The filters were replaced and procedures revised to replace the filters at a lower vacuum.

LER 2-94-001-00, Both Auxiliary Ventilation Exhaust Filter Trains Inoperable.

The 58A vent exhaust fan tripped with redundant fan out of service for testing. The ventilation exhaust filter was aligned for containment purge and adjusted for maximum flow. System perturbations were believed to have caused flow anomalies that tripped the operating fan on low suction pressure. An Engineering evaluation was initiated to determine if a change to the fan control system was needed.

LER 1-00-001-00, Filtered Exhaust Fan Failure Results In Technical Specifications Violation.

Both exhaust fans automatically started as designed, but then tripped while conducting a test of the ventilation exhaust system. The preliminary cause was attributed to a change to fan flow controls implemented in late 1999. The control setpoints were adjusted to support parallel fan operation.

LER 1-00-001-01, Filtered Exhaust Fan Failure Results In Technical Specifications Violation.

On June 21, 2000 a condition existed in which one fan was in pull-to-lock and the other fans tripped causing both filter exhaust fans to be considered inoperable. This condition resulted from a soiled supply filter and the system operating configuration, which was permitted by procedural changes implemented to address the April 2000 ventilation transients.

8.0 MANUFACTURER/MODEL NUMBER

Not Applicable

9.0 ADDITIONAL INFORMATION

None