



September 2, 2008

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

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)  
DOCKET NO. 50-395  
OPERATING LICENSE NO. NPF-12  
LICENSEE EVENT REPORT (LER 2008-002-01)  
CONTROL ROOM NORMAL AND EMERGENCY AIR HANDLING  
SYSTEMS INOPERABLE DUE TO PRESSURE BOUNDARY BREACH

Attached is Licensee Event Report (LER) No. 2008-002-01, for the Virgil C. Summer Nuclear Station (VCSNS). The revised report describes the sequence of actions that led to South Carolina Electric & Gas Company (SCE&G) determining that the allowed outage time for Technical Specification Limiting Condition for Operation 3.7.6.a.2 had been exceeded. This report is submitted in accordance with 10CFR50.73(a)(2)(i)(B). Revisions are identified by vertical bars in the right side margin of the attached.

Should you have any questions, please call Mr. Bruce Thompson at (803) 931-5042.

Very truly yours,

Jeffrey B. Archie

GR/JBA/dr  
Attachment

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DMS (RC-08-0107)

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# LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NE0B-10202; (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.

<b>1. FACILITY NAME</b> Virgil C. Summer Nuclear Station	<b>2. DOCKET NUMBER</b> <b>05000 395</b>	<b>3. PAGE</b> <b>1 OF 4</b>
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**4. TITLE**  
Control Room Normal and Emergency Air Handling Systems Inoperable Due to Pressure Boundary Breach

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	11	2008	2008	2	1	09	02	2008		<b>05000</b>
									FACILITY NAME	DOCKET NUMBER
										<b>05000</b>

<b>9. OPERATING MODE</b> Mode 1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply)			
<b>10. POWER LEVEL</b> 100%	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME Virgil C. Summer Nuclear Station	TELEPHONE NUMBER (Include Area Code) (803) 931-5042
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	VI	AHU	A089	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="radio"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="radio"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR

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

On March 11, 2008 following maintenance on an outside air intake valve, Surveillance Test Procedure STP-454.002 was performed to restore the "A" train of the Control Room Normal and Emergency Air Handling (CR Ventilation) System to service. The test results were unsatisfactory.

Investigation into the test failure determined that a control room pressure boundary (CRPB) breach occurred during normal preventive maintenance performed February 26, 2008 on Instrument and Control (I&C) Area Air Handling Unit XAH0048. The identified breach was sufficient to allow a quantity of air out-leakage that reduced CRPB pressure below Technical Specifications (TS) minimum and resulted in increased outside air flow that exceeded the maximum allowed by TS. Repairs were made to the air handling unit and the surveillance test was successfully completed on March 14, 2008.

The effect of the leakage at XAH0048 on the "B" Train of CR Ventilation could not be readily determined. Therefore, both trains of CR Ventilation were assumed to be inoperable from February 26 to March 14, 2008. Since this condition affected both trains of CR Ventilation and existed for greater than 24 hours, TS Limiting Condition for Operation (LCO) 3.7.6.a.2 was violated.

A root cause analysis determined that the root causes of this event were: 1) adequate maintenance retests were not procedurally addressed, and 2) Air Handling Unit XAH0048 was located within the CRPB, but not purchased to meet the CRPB design requirements. The corrective actions to prevent recurrence include: 1) revise procedures to verify CRPB restoration requirements and to provide additional guidance for CRPB envelope testing, and 2) perform a design change to either relocate or upgrade Air Handling Unit XAH0048.

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**NARRATIVE**

**PLANT IDENTIFICATION**

Westinghouse - Pressurized Water Reactor

**EQUIPMENT IDENTIFICATION**

XAH0048 - Instrument and Control Area Air Handling Unit

**IDENTIFICATION OF EVENT**

On March 11, 2008, following maintenance on an outside air intake valve, Surveillance Test Procedure STP-454.002 was performed to restore the "A" train of the Control Room Normal and Emergency Air Handling (CR Ventilation) System to service. This test required demonstrating that the CR Ventilation System maintained a positive pressure in the Control Room Pressure Boundary (CRPB) while limiting the outside air (OA) intake flow. This test is required to meet Technical Specifications (TS) Surveillance Requirement (SR) 4.7.6.e.3. The test results were unsatisfactory.

Investigation into this event determined that a boundary breach occurred on February 26, 2008, during normal preventive maintenance performed on Instrument and Control (I&C) Area Air Handling Unit XAH0048. The identified breach was sufficient to reduce CRPB pressure below TS minimum and resulted in increased OA flow that exceeded the maximum allowed by TS. This breach condition was considered to have existed from February 26, 2008 until the breach was identified and repaired with return to service on March 14, 2008. On March 19, 2008 a past operability review concluded that the effect of the leakage at XAH0048 on the "B" train of CR Ventilation could not be readily determined. Therefore, both trains of CR Ventilation were assumed to be inoperable from February 26 to March 14, 2008. Since this condition affected both trains of CR Ventilation and existed for greater than 24 hours, TS Limiting Condition for Operation (LCO) 3.7.6.a.2 was violated.

**EVENT DATE**

March 11, 2008

Condition Reports CR-08-00944 and CR-08-00972 were initiated to address this event.

**REPORT DATE**

Initial - May 12, 2008

Revision 1 - September 2, 2008

**CONDITIONS PRIOR TO EVENT**

Mode 1, 100% Power

**DESCRIPTION OF EVENT**

Following unsatisfactory test results during performance of STP-454.002, the "A" train of the CR Ventilation System was declared inoperable and an investigation was initiated to determine the reason for the test failure. This investigation of the CRPB identified a breach in the suction plenum of Air Handling Unit XAH0048. XAH0048 is physically located within the CRPB and comprises a physical portion of the CRPB, but has no functional interface with the CRPB. This air handling unit cools and recirculates air to the I&C maintenance shop located outside of the CRPB. Repairs were made to XAH0048 and the surveillance test was successfully completed on March 14, 2008. On March 19, 2008 a past operability review concluded that the effect of the leakage at XAH0048 on the "B" train of CR Ventilation could not be readily determined. In addition, the review conservatively determined that the "B" train CR Ventilation would probably have exceeded the TS maximum limit of 1,000 SCFM outside air flow. The "B" train CR ventilation may very well have maintained the control room differential pressure above 0.125 inch w.g., but it would have been reduced from its normally expected value and could have challenged the TS requirement of greater than 0.125 inch w.g. Therefore, both trains of CR Ventilation were assumed to be inoperable from February 26 to March 14, 2008.

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**NARRATIVE**

**DESCRIPTION OF EVENT (Continued)**

The root cause team determined that on February 26, 2008 maintenance had been performed on XAH0048. During this maintenance, duct tape had been removed to allow removal of screws which held a panel cover in place. Following maintenance the duct tape was not restored. Although the post-maintenance test verified that the CRPB had been restored, it only required that the differential pressure be determined with the CR Ventilation System operating in the normal mode. The CRPB differential pressure is normally higher with the CR Ventilation System in the normal mode than in the emergency mode. The breach condition was considered to have existed from February 26, 2008 until the breach was identified and repaired with return to service on March 14, 2008. Since this condition affected both trains of CR Ventilation and existed for greater than 24 hours, TS Limiting Condition for Operation (LCO) 3.7.6.a.2 was violated.

**CAUSE OF EVENT**

Investigation into the test failure determined that a control room pressure boundary (CRPB) breach occurred during normal preventive maintenance performed February 26, 2008 on Instrument and Control (I&C) Area Air Handling Unit XAH0048. The identified breach was sufficient to allow a quantity of air out-leakage that reduced CRPB pressure below TS minimum and resulted in increased outside air flow that exceeded the maximum allowed. Since this condition affected both trains of CR Ventilation and existed for greater than 24 hours, TS Limiting Condition for Operation (LCO) 3.7.6.a.2 was violated.

A root cause analysis was completed for this event. The root causes include: 1) procedures did not include the requirements to verify outside air intake flow following maintenance, and 2) Air Handling Unit XAH0048 was purchased for location outside of the CRPB, but was located inside the CRPB and did not adequately meet the design requirements for this location.

**ANALYSIS OF EVENT**

The CRPB is designed and maintained to provide a habitable environment such that occupants within the CRPB can control the reactor safely under normal conditions and maintain it in a safe condition following a radiological event, hazardous chemical release, or a smoke challenge.

The VCSNS Control Room Normal and Emergency Air Handling System consists of two independent, redundant trains that recirculate air in the normal and emergency mode and additionally provide filtration of the air in the emergency mode. It also serves to maintain a positive pressure within the CRPB of greater than 0.125 inch w.g. with a maximum of 1000 SCFM per train of outside air during system operation. Pressurization of the CRPB minimizes infiltration of unfiltered air through the CRPB from all the surrounding areas adjacent to the CRPB.

The subject breach in the suction plenum of Air Handling Unit XAH0048, resulted in the following conditions when the Control Room Normal and Emergency Air Handling System is operating in the emergency mode:

- The Control Room differential pressure (dp) decreased below the TS limit of 0.125 in w.g., with a measured dp of ~0.1 inch w.g. for Train "A" and a projected dp of greater than 0.1 inch w.g. for Train "B". This dp loss was attributed to the out-leakage of air due to the breach of XAH0048.
- To compensate for the out-leakage, OA intake flow increased above the TS limit of 1000 SCFM, with a measured value of ~1054 SCFM for Train "A" and a projected value of < 1100 SCFM for Train "B".

Both conditions are adverse as control room personnel could possibly be exposed to a larger dose during a radiological event or to more hazardous conditions during a chemical release.

Outside Air Intake Flow - An increase in outside air intake flow of ~100 SCFM (i.e., to 1100 SCFM) is judged to have a small adverse impact on both radiological and chemical event consequences. The impact on control room doses is small because the outside air is filtered before entering the control room in the emergency mode. Significance can be quantified by examining the limiting event for control room doses which, for VCSNS, is the postulated Loss-of-Coolant Accident (LOCA). Current design basis analyses for this accident are performed in accordance with Regulatory Guide 1.4. Thyroid, as opposed to whole body, doses are

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**NARRATIVE**

**ANALYSIS OF EVENT (Continued)**

limiting. Existing studies indicate that an increase in the outside air flow of ~100 SCFM would increase the 30-day thyroid dose by ~0.85 Rem. This is equivalent to ~4.7 SCFM of unfiltered inleakage into the CRPB. Dose impacts on other non-LOCA events would be significantly less because of the smaller source terms. Hazardous chemical assessments consider a chlorine cylinder release and failure of the Ammonium Hydroxide Tank in accordance with the guidance of Revision 0 and Revision 1 of Regulatory Guide 1.78, respectively. Current analyses are based on the TS limit for outside air flow (1000 SCFM), but have inherent margins to accommodate potential increases in CRPB inleakage in excess of 700 SCFM before the applicable toxicity limit is approached.

Control Room Differential Pressure - A baseline ASTM E741 integrated test was performed in March 2005 to measure leakage into the CRPB. Filtered outside air was found to be within the current TS limits of 1000 SCFM per train and the maximum unfiltered CRPB inleakage recorded was 41 SCFM. This as-found condition was less than the current analysis limit of 55 SCFM, which is based on thyroid doses being less than or equal to 30 Rem during a postulated LOCA. A decrease in the Control Room differential pressure to ~ 0.1 inch w.g. is adverse since it creates the potential for unfiltered inleakage to increase above the previously measured maximum of 41 SCFM. This is of concern primarily from a LOCA dose standpoint since, based on current methods, margins are small (~ 15 SCFM). Increases in unfiltered inleakage (if any) are expected to be small since a positive pressure would have been maintained in the Control Room.

Inleakage margins are small because of the conservatism inherent to the current licensing basis methods. Substantial increases in the margin (i.e., hundreds of SCFM's) could be made available by crediting the higher thyroid dose limits within Regulatory Guide 1.195 or Alternate Source Term methods. Even though the exact impact on unfiltered inleakage cannot be quantified, these inherent conservatisms provide reasonable assurance that the CR Normal and Emergency Air Handling System would have been able to accomplish its safety function.

**CORRECTIVE ACTIONS**

Repairs were made to the Air Handling Unit XAH0048 and the surveillance test was successfully completed on March 14, 2008.

An engineering evaluation determined that Air Handling Unit XAH0048 is capable of maintaining its portion of the CRPB during all required design basis events and transients.

The corrective actions from the root cause analysis to prevent recurrence include: 1) revise Station Administrative Procedure SAP-603 to provide specific details for restoration of the CRPB, 2) revise General Test Procedure GTP-214 to reference SAP-603 and to provide guidance for CRPB envelope testing after maintenance, and 3) process a design change per Engineering Change Request ECR-70441 to remove Air Handling Unit XAH0048 from the CRPB or to upgrade it.

Engineering Change Request ECR-70441 will make a determination whether to upgrade the documentation for XAH0048 and retain it within the CRPB or simplify the CRPB design by relocating it outside the CRPB.

**PRIOR OCCURRENCES**

There is no historical evidence of a prior occurrence.