



November 14, 2016

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

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS), UNIT 1  
DOCKET NO. 50-395  
OPERATING LICENSE NO. NPF-12  
LICENSEE EVENT REPORT (LER 2016-004-00)  
STEAM PROPAGATION BARRIER DEGRADED DUE TO MISSING  
ORIFICES

Attached is Licensee Event Report (LER) 2016-004-00, for the Virgil C. Summer Nuclear Station. This report describes an event that was identified based on an Extent of Condition Review for LER 2016-003-00 Steam Propagation Door (DRIB/107) Discovered Propped Open. The station identified orifices that were not installed in the correct drain lines as specified in a design change package. The station has conducted a preliminary evaluation of the rooms if a High Energy Line Break (HELB) event occurred. This report is submitted in accordance with 10CFR50.73(a)(2)(v)(D) and will be supplemented when results are finalized.

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

Very truly yours,

George A. Lippard

WHK/GAL/rp  
Attachment

c:	K. B. Marsh	S. A. Williams	Marsh USA, Inc.
	S. A. Byrne	NRC Resident	Maintenance Rule Engineer
	J. B. Archie	Inspector	NSRC
	N. S. Carns	L. W. Harris	RTS (CR-16-04716 & CR-16-04801)
	J. H. Hamilton	Paulette Ledbetter	File (818.07)
	S. M. Shealy	J. C. Mellette	PRSF (RC-16-0158)
	W. M. Cherry	ICES Coordinator	
	C. Haney	K. M. Sutton	
		INPO Records Center	



**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

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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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-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> VC SUMMER - UNIT 1	<b>2. DOCKET NUMBER</b> 05000                      395	<b>3. PAGE</b> 1 <b>OF</b> 4
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**4. TITLE**  
STEAM PROPAGATION BARRIER DEGRADED DUE TO MISSING ORIFICES

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
10	14	2016	2016	004	00	11	14	2016	FACILITY NAME	DOCKET NUMBER
										05000
										05000

9. OPERATING MODE		11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)					
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)					
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)					
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)					
100	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)					
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)					
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)					
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)					
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)					
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER      Specify in Abstract below or in NRC Form 366A						

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT Bruce Thompson	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
X	KM	CHU	N418	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH 02	DAY 16	YEAR 2017
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**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

License Event Report (LER)-2016-003 documented a steam propagation door (DRIB/107) to the Chiller Room for XHX0001C-VU propped open on September 13, 2016 without compensatory actions during routine operator rounds.

As part of the extent of condition, the station discovered an additional degradation to the steam propagation barriers. Steam propagation barriers (orifices) were not installed as designed between the Chiller rooms and Chilled Water (VU) pump room floor drains; therefore, in the as-found configuration, there was no separation between the rooms. When any chiller room door is open, even with administrative contingencies in place, the other chiller and pump rooms were not protected from a High Energy Line Break (HELB). The station has conducted a preliminary evaluation of the rooms if a HELB event occurred. This LER will be supplemented when results are finalized. This event is reportable under 10CFR50.73(a)(2)(v)(D) as any event or condition that could have prevented the fulfillment of a safety function.



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

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		<b>YEAR</b> 2016	<b>SEQUENTIAL NUMBER</b> 004	<b>REV NO.</b> 00

**NARRATIVE**

**1.0 EVENT DESCRIPTION**

LER-2016-003 documented a steam propagation door (DRIB/107) to the Chiller Room for XHX0001C-VU propped open on September 13, 2016. The door was discovered during operator rounds and was determined not to have all compensatory measures in place.

As part of the extent of condition, the station discovered an additional degradation to the steam propagation barrier. Steam propagation barriers (orifices) were not installed as designed between XHX0001A-VU Chiller room and Chilled Water (VU) pump room and between the XHX0001B-VU and XHX0001C-VU Chiller room floor drains. In the as-found configuration, there was no separation between XHX0001B-VU & XHX0001C-VU chiller rooms nor XHX0001A-VU chiller and chilled water pump rooms via the floor drain system. The station has conducted a preliminary evaluation of the rooms if a High Energy Line Break (HELB) event occurred. This License Event Report will be supplemented when results are finalized. This event is reportable under 10CFR50.73(a)(2)(v)(D) as any event or condition that could have prevented the fulfillment of a safety function.

**2.0 EVENT ANALYSIS**

In preparation for replacement of all three VU chillers, Engineering Change Request (ECR) 50585 (Base) was issued to implement, amongst other things, chiller room separation. The separation scope was intended to fully isolate each chiller room from each other to allow online chiller replacement with one set of chiller room doors propped open for an extended period of time. The intent of the design was with a door propped open during a HELB in the Intermediate Building (IB), only the chiller room with the open doors would be impacted. One potential steam path between the chiller rooms was through the floor drain system. The ECR was to modify existing orifices in the floor drains between the IB 412 foot elevation and the chiller rooms, as well as install additional flow limiting orifices between chiller rooms. The floor drain orifices between the chiller rooms in the XHX0001A-VU and XHX0001B-VU were incorrectly installed. These orifices were installed under ECR-50585 (Base) in preparation for replacement of all three VU Chillers. The base ECR was issued in 2006. The work order steps for orifice installation were planned between August 2007 and September 2008. The orifices were installed between November 2008 and January 2009. The installed configuration did not provide the required separation. High Energy Line Breaks are discussed in Final Safety Analysis Report (FSAR) 3.11.2.2.2.2 and 15.4.2. The VU System has two trains and is designed to provide safety related cooling to various areas and equipment as discussed in FSAR 9.4.7.2.4. The open pathway could have affected the functionality of both trains of VU.

The station conducted a Root Cause Analysis (RCA-16-04801) on the condition, where the flow limiting orifices were installed in the wrong location. The following root causes and contributing causes were identified:

Root Cause (RC01): The planning supervisor assigned ECR 50585 to a maintenance planner with no previous modifications planning experience. This individual did not have the level of experience/competency necessary to successfully plan the work. There were no means of ensuring/verifying competency for maintenance planners prior to task assignment related to planning plant modifications. This resulted in less than adequate reviews and verifications of the work package, as well as insufficient information regarding the locations of the orifice plates in the sumps.



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**NARRATIVE**

Root Cause (RC02): The work order steps for installing the orifice plates were classified as non-nuclear safety related work. When QC reviewed the work order, they determined that no QC was necessary based on the work order safety classification. However, the ECR classified this work as Quality Related. This resulted in the orifice installation being performed without QC verification. No guidance existed at the time the work orders were planned that would have instructed QC inspectors to review ECR packages for safety classification during the QC work order routing reviews.

Potential Root Cause (RC03): The potential exists that the information (ECR section) included in the work package was not sufficient to provide adequate work instruction. If the ECR instructions were not included in the work package, the information available to the workers for the orifice plate installation locations was inadequate. The detailed drawing, included in the work package, was incorrect for the Chiller orifice plate location. Due to this occurring over seven years previous, the workers could not recall what led up to or contributed to the orifice plates being located in the wrong location. Neither the planner nor the workers could recall whether or not the ECR section was included in the work package.

Potential Root Cause (RC04): The potential exists that the workers failed to follow work (ECR) instructions if they had been included in the work package. The ECR written instructions provided sufficient detail for the orifice plates to be installed in the correct locations. If the ECR was included in the work package, the workers would have had adequate work instructions, but failed to follow it. The Work Order instructions available to the workers did not include the room numbers. Due to this occurring over seven years previous, the workers could not recall what led up to or contributed to the orifice plates being located in the wrong location. Neither the planner nor the workers could recall whether or not the ECR section was included in the work package.

Contributing Cause (CC1): The interface review comments were provided but were not resolved in a manner to aid in determining proper installation locations per the drawings. There were two comments made during the ECR interface review that would have clarified the orifice plate installation locations. A promissory resolution was given to an incorrect drawing and the second comment on the clarity of the orifice plate locations was dismissed with no resolution. There was no formal tracking in place for the resolution of interface review comments. As a result, the information provided in the ECR lacked clarity.

Contributing Cause (CC2): No guidance existed at the time the work orders were planned that would have directed the planner to base safety classification on ECR information. This resulted in the planner basing the non-nuclear safety classification on the CMMS system listing for floor drains instead of the quality related classification of the ECR.

The root cause analysis determined that the causes associated with this event did not reflect current performance. Corrective actions to address the causes in RCA-16-04801 are addressed in CR-16-04801.

The VU System provides cooling to safety related areas (Technical Specification (TS), Table 3.7-7) as an attendant cooling system and supports the comfort requirements for the Control Room Emergency Filtration Systems (CREFS). The VU System is needed to ensure that equipment located within these areas can withstand the environmental effects of a postulated FSAR Chapter 15 event. With a nonfunctional chiller unit, its associated VU train will become nonfunctional, thereby affecting room temperatures and the reliability of the train s associated equipment. The most limiting area for temperature limits has been identified as the charging pump rooms. Per TS 3/4.5.2, one charging pump has to be operable per train of Emergency Core Cooling System (ECCS) during Mode 1-3.



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**NARRATIVE**

TS 3/4.7.9, "Area Temperature Monitoring" and associated Table 3.7-7 describe the area temperature limits during normal operation due to cooling provided by the VU System. If the chiller cooling a Chilled Water loop is not running, room temperatures will rise over time. If the temperature in a given area exceeds the limit shown in TS Table 3.7-7 for eight hours, a Special Report detailing the basis for continued operability must be submitted to the NRC within three days. In addition, if the Technical Specifications limit for a given area is exceeded by thirty degrees for four hours, the equipment in the associated area must be declared inoperable.

TS 3/4.7.6, "Control Room Emergency Filtration Systems (CREFS)" states that two CREFS trains shall be operable. The surveillance requirements under TS 3/4.7.6 require each CREFS train to be demonstrated operable through verification that the control room air temperature is less than or equal to 85 degrees Fahrenheit.

A thermal hydraulic model was developed using the GOTHIC computer code (version 8.1) to calculate the environmental conditions that could have existed at IB 412 foot elevation during a postulated HELB event. The GOTHIC computer program is a general purpose analysis tool that solves the conservation equations for mass, energy, and momentum for multi-component, multi-phase flow, and it has been used extensively for compartment transient analysis in nuclear power plants. The preliminary analysis demonstrates that the event and the postulated effect on the rooms are not expected to experience a significant temperature rise or be at a significant risk of condensation. As a result, for the spectrum of HELB events, which are consistent with the design basis evaluation of steam line breaks outside of containment, there is reasonable assurance that the risk significant equipment in the Mild Area (i.e., Chiller, Chiller Pump, Battery and Battery Charger rooms) would have been able to perform their required functions had such an event occurred.

The station is currently evaluating breaks smaller than the design basis break sizes. This LER will be supplemented when results are finalized.

**3.0 SAFETY SIGNIFICANCE**

The safety significance of this event will be provided in a supplemental report to this LER.

**4.0 PREVIOUS OCCURRENCE**

No previous occurrence within the last three years.

**5.0 CORRECTIVE ACTIONS**

Immediate action taken: On September 14, 2016, stopped all associated VU chiller work and ensured all steam propagation doors were closed. Station Order 16-05 was issued that directs that no work can be performed in the chiller rooms that would require the door(s) to be propped open. The Station Order was in place until the orifice installations in the sumps was corrected.