



February 9, 2017  
RC-17-0015

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

Dear Sir / Madam:

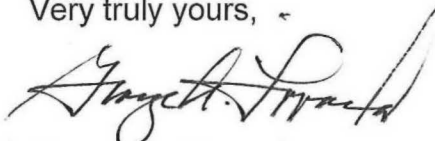
Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS), UNIT 1  
DOCKET NO. 50-395  
OPERATING LICENSE NO. NPF-12  
LICENSEE EVENT REPORT (LER 2016-003-01)  
STEAM PROPAGATION DOOR DISCOVERED PROPPED OPEN

Reference: G. A. Lippard, SCE&G, letter to NRC, "Licensee Event Report (LER 2016-003-00), Steam Propagation Door Discovered Propped Open," dated November 14, 2016.  
ADAMS Accession ML16319A400

Attached is a supplemental Licensee Event Report (LER) 2016-003-01, for the Virgil C. Summer Nuclear Station (VCSNS), for LER 2016-003-00, as referenced. This report describes a condition and results from an event, discovered during routine operator rounds, where a steam propagation door to the Safety Related Chiller Room C (DRIB/107) was discovered propped open without all required compensatory actions. The propped open door could have rendered both trains of Chilled Water nonfunctional if a High Energy Line Break (HELB) event occurred. This event had the potential to render both trains of High Head Safety Injection inoperable due to the loss of Chilled Water cooling to safety related room coolers. This report is submitted in accordance with 10CFR50.72(b)(3)(v) and 10CFR50.73(a)(2)(v)(D).

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

Very truly yours, \*



George A. Lippard

WHK/GAL/wm

cc:

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NSRC  
PRSF (RC-17-0015)  
RTS (CR-16-04703)  
File (818.07)



## LICENSEE EVENT REPORT (LER)

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

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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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 [Infocollections.Resource@nrc.gov](mailto:Infocollections.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-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.

## 1. FACILITY NAME

VC SUMMER - UNIT 1

## 2. DOCKET NUMBER

05000

## 3. PAGE

1 OF 4

## 4. TITLE

STEAM PROPAGATION DOOR DISCOVERED PROPPED OPEN

## 5. EVENT DATE

MONTH	DAY	YEAR
10	13	2016

## 6. LER NUMBER

YEAR	SEQUENTIAL NUMBER	REV NO.
2016	003	01

## 7. REPORT DATE

MONTH	DAY	YEAR
02	09	2017

## 8. OTHER FACILITIES INVOLVED

FACILITY NAME	DOCKET NUMBER
	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)

## 10. POWER LEVEL

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 checked="" type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A

## 12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT  
Bruce ThompsonTELEPHONE NUMBER (Include Area Code)  
(803) 931-5042

## 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
A	KM	CHU	Y018	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On September 13, 2016 at 20:30 a steam propagation door (DRIB/107) to Chiller Room C was discovered propped open without all required compensatory actions during routine operator rounds. The door was determined to be open for approximately 3 hours and 22 minutes. The propped open door could have rendered both trains of Chilled Water nonfunctional if a High Energy Line Break (HELB) event occurred. This could have subsequently rendered both trains of High Head Safety Injection inoperable due to the loss of chilled water cooling to safety related room coolers. Technical Specification 3.0.3 was entered until the door was secured at 20:42. The cause of the event was due to a human performance error. Station Shift Test Specialist authorized the door to be propped open without verifying programmatic contingencies were established. This condition is reportable under 10CFR50.72(b)(3)(v) and 10CFR50.73(a)(2)(v)(D) as any event or condition that at the time of discovery could have prevented the fulfillment of a safety function. An 8 hour event notification (EN 52240) was made.

VCSNS has supplemented the previous License Event Report with the Final Results from an Engineering Technical Report. The report concludes that a HELB event postulated to occur during the times when the non-conforming HELB barrier configuration existed would not have impacted the operability of equipment in the Battery/Battery Charger Rooms or the functionality of equipment in the Chiller Pump Room and at least one of the three Chiller Rooms.



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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
VC SUMMER - UNIT 1	05000- 395	YEAR 2016	SEQUENTIAL NUMBER 003	REV NO. 01

**NARRATIVE****1.0 EVENT DESCRIPTION**

On September 13, 2016 at 20:30 a steam propagation door (DRIB/107) to Chiller Room C was discovered propped open without all required compensatory actions during routine operator rounds. The door was determined to be open for approximately 3 hours and 22 minutes. The propped open door could have rendered both trains of Chilled Water (VU) nonfunctional if a High Energy Line Break (HELB) event occurred. This could have subsequently rendered both trains of High Head Safety Injection inoperable due to the loss of chilled water cooling to safety related room coolers. Technical Specification 3.0.3 was entered until the door was secured at 20:42.

**2.0 EVENT ANALYSIS**

The Fire Protection Procedure (FPP-025 Enclosure 6.3) provides the compensatory actions for propping open DRIB/107. Door DRIB/107 may be opened during all Modes provided XHX0001C-VU is declared nonfunctional and train separation has been established via closure of HELB dampers. Closure of the HELB dampers isolates the room from the common ventilation ductwork supplying the other rooms. This contingency is controlled by the station's procedure for controlling fire barriers and the Lock-Out/Tag-Out (LOTO) process. DRIB/107 is a steam propagation door that leads to one of three chiller units that provide chilled water to the VU System. 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. Allowing the steam propagation door to Chiller Room C to be propped open without closing the room's HELB dampers would have provided a pathway for a steam environment to the other chiller rooms if a HELB event occurred. High Energy Line Breaks are discussed in FSAR 3.11.2.2.2.2 and 15.4.2. The open pathway could have affected the functionality of both trains of VU. In addition, the ventilation for the chiller rooms shares common supply and exhaust ductwork with the Safety Related Battery and Charger Room Ventilation system, thereby providing a potential pathway for a steam environment to also affect the functionality of both trains of vital DC power systems.

The apparent cause of this event was a human performance error. Compensatory measures associated with propping open DRIB/107 had been in place during the previous night shift and were cleared prior to the end of the night shift. There was inadequate communication between Work Control and the Shift Test Specialist that the LOTO for a HELB contingency had been cleared. The Shift Test Specialist assumed the HELB contingencies were still in place when a subsequent request to prop open the door was made.

The VU System provides cooling to safety related areas (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 Modes 1-3.

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.



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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 30 days. Additionally, if the Technical Specification limit for a given area is exceeded by thirty degrees for four hours, the equipment in the associated area must be declared inoperable.

TS 3/4.8.2 "D.C. SOURCES", the D.C power sources and associated distribution systems during operation ensures that sufficient power will be available to supply the safety related equipment required for 1) the safe shutdown of the facility and 2) the mitigation and control of accident conditions within the facility. The minimum specified independent and redundant D.C. power sources and distribution systems satisfy the requirements of General Design Criterion 17 of Appendix "A" to 10 CFR 50.

VCSNS contracted an engineering firm to conduct an assessment of the impact on equipment affected by this condition. Specifically, this evaluation considers DRIB/107 being propped open while the associated room's ventilation system HELB dampers remained open. HELB dampers are installed to prevent steam propagation from the Intermediate Building (IB) Harsh Area into the Chiller Rooms, Chilled Water Pump Room, Battery Rooms, and the Battery Charger Rooms (Mild Areas) during postulated HELB events when the affected chiller room door is propped open. The evaluation also considers the nonconforming condition of the Chiller Room and Chilled Water Pump Room drain system that was discovered under the extent of condition review. Specifically, steam propagation barriers (orifices) in the floor drainage system were installed incorrectly between the Chiller Rooms and the Chilled Water Pump Room. While this condition existed, Chiller Rooms B and C were connected by an 8-inch drain line, as were Chiller Room A and the Chilled Water Pump Room. The drainage system nonconformance condition will be reported in LER-2016-004.

A thermal hydraulic model was developed using the GOTHIC computer code (version 8.1) to calculate the environmental conditions that could have existed at the Intermediate Building (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 initial analysis indicated that during a postulated HELB event, the environmental result for the additional rooms connected by the drain line were not expected to significantly rise in temperature and humidity. And as a result, there would have been 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.

However, further analyses were initiated to ensure smaller break sizes (<4" Nominal Pipe Size (NPS)) would not potentially lead to more steam propagation than the EQ design basis cases. The station performed analyses which postulated these types of breaks. For small breaks, the mass and energy release rates are low and the IB rooftop blowout panels do not actuate. Although temperatures within the IB rise, IB pressure remains low, so that propagation of air/steam from the IB is small. As a result, entry of air/steam from the IB into Chiller Room C does not lead to significant changes in the Battery, Battery Charger, Chiller, and Chilled Water Pump room conditions.



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**NARRATIVE**

For intermediate breaks, the mass and energy release rates could be high enough to result in degraded conditions at an open Chiller Room door, but low enough to not actuate the IB rooftop blowout panels. As a result, intermediate breaks have the potential to produce the largest changes in Battery/Battery Charger and Chiller Area room environmental conditions. However, for this worst case, the Battery/Battery Charger Area room temperatures remain in their normal operational band and relative humidity remains at normal values. Chiller Room A temperature remains in the normal operational band and relative humidity remains at normal values. The Chiller Pump Room temperature remains in the normal operational band and relative humidity remains at normal values because it is not connected via floor drains to the Chiller Room with the propped open door. The environmental conditions in Chiller Room B, however, would degrade to the point where Chiller B would fail due to high temperature resulting in one of the two trains of Chilled Water being inoperable during the time the door to Chiller Room C was propped open. Chiller Room A and the Chilled Water Pump Rooms would not have been affected by the postulated event.

**3.0 SAFETY SIGNIFICANCE**

A HELB event postulated to occur during the times when the non-conforming HELB barrier configuration existed would not have impacted the functionality of equipment in the Battery/Battery Charger Rooms (which would have remained within Technical Specification 3.7.9 limits) or the functionality of equipment in Chiller Room A and the Chilled Water Pump Rooms. There is no change to the result in the PRA model, and the condition is determined to be not risk significant.

**4.0 PREVIOUS OCCURRENCE**

No previous occurrence within the last three years.

**5.0 CORRECTIVE ACTIONS**

To mitigate the events and preclude reoccurrence VCSNS conducted the following activities:

1. The door was closed as the immediate action and VCSNS issued Special Order 16-05 as an interim action to suspend propping open chiller room doors. This Special Order has since been cancelled as the proper plant configuration (drain orifices) has been restored to its normal configuration.
2. The station conducted a walkdown of the steam barriers associated with the event. Based on the walkdown the station evaluated the extent of condition of identified nonconformances addressed in LER 2016-004-00 (orifice) and LER 2016-005-00 (ductwork). A detailed analysis was completed to address safety significance.
3. Procedures have been reviewed and updated to minimize reoccurrence under the Corrective Action Program.
4. The station initiated an assessment of the potential impacts due to steam propagation. The resulting technical report documents the evaluation of the potential impact on equipment functionality of recently identified non-conforming HELB barrier configurations at VCSNS.