

V. C. Summer Nuclear Station
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April 2, 2020

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

Serial No. 19-516A
VCS-LIC/HK R0
Docket No. 50-395
License No. NPF-12

DOMINION ENERGY SOUTH CAROLINA (DESC)
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
SUPPLEMENTAL LICENSEE EVENT REPORT 2019-003-01
COMPLETION OF A TECHNICAL SPECIFICATION REQUIRED PLANT SHUTDOWN

Dominion Energy South Carolina hereby submits Supplemental Licensee Event Report (LER) 2019-003-01, for VCSNS. This report provides details concerning the completion of a Technical Specification Required Plant Shutdown, including the results of the Failure Mode Analysis and Root Cause Analysis. This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(A).

Should you have any questions, please call Mr. Michael Moore at (803) 345-4752.

Sincerely,

A handwritten signature in blue ink, appearing to read "George A. Lippard".

George A. Lippard
Site Vice President
V.C. Summer Nuclear Station

Enclosures

Commitments contained in this letter: None

cc:

G. J. Lindamood – Santee Cooper
L. Dudes – NRC Region II
S. A. Williams – NRC Project Mgr.
NRC Resident Inspector
J. N. Bassett – INPO
Marsh USA, Inc.



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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to 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.

1. Facility Name V. C. Summer Nuclear Station, Unit 1	2. Docket Number 05000 395	3. Page 1 OF 4
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4. Title
Completion of a Technical Specification Required Plant Shutdown

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
11	07	2019	2019	003	01	04	02	2020	Facility Name	05000
									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	<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)
100	<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 checked="" type="checkbox"/> 50.73(a)(2)(i)(A)	<input 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 Michael Moore, Manager Nuclear Licensing	Telephone Number (Include Area Code) (803) 345-4752
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13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
X	BK	FAN	J127	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)
 On November 5, 2019, at 1041, while operating in Mode 1 at 100% reactor power, the Virgil C. Summer Nuclear Station entered Technical Specification (TS) Limiting Condition for Operation (LCO) action statement 3.6.2.3.a as a result of having one group of Reactor Building Cooling Units (RBCU) inoperable. TS 3.6.2.3.a requires the inoperable group to be restored to operable status within seven days or be in at least hot standby within the next six hours and in cold shutdown within the following thirty hours.

Due to ongoing efforts to identify an existing Reactor Coolant System (RCS) leak, the station conservatively shutdown to further investigate both the unidentified RCS leakage and the cause of the RBCU trips. The plant entered Mode 3 on November 7, 2019, at 0528, completing the plant shutdown. At the time of shutdown it was not evident that the failure could not be corrected within the LCO allowed outage time. Therefore, a notification was not submitted in accordance with 10 CFR 50.72(b)(2)(i). This Licensee Event Report (LER) is being provided per the requirements of 10 CFR 50.73(a)(2)(i)(A) because the RBCU condition was not restored within the seven day LCO allowed outage time.



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

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1. FACILITY NAME		2. DOCKET NUMBER		3. LER NUMBER		
V. C. Summer Nuclear Station, Unit 1		05000-		YEAR	SEQUENTIAL NUMBER	REV NO.
		395		2019	003	01

NARRATIVE

1.0 DESCRIPTION OF THE EVENT

On October 30, 2019, Reactor Building Cooling Unit (RBCU) fan XFN0064A tripped in fast (normal) speed due to high vibrations. RBCU fan XFN0065A was started in fast (normal) speed and its vibrations were consistent with recent historical trend data. On the morning of October 31, 2019, RBCU fan XFN0064A was restarted in slow (emergency) speed and secured due to unacceptable vibration readings.

At 1041 on November 5, 2019, RBCU fan XFN0065A tripped. Subsequently, the station entered LCO action statement 3.6.2.3.a. due to the loss of one group of RBCUs.

In addition to the RBCU Fan vibration issue described above, the station was also investigating an unidentified RCS leakage issue. Therefore, the conservative decision was made to shut down the unit to further investigate the unidentified RCS leakage and RBCU fan vibration. The inoperable RBCU XAA0001A was restored to operable status on November 17, 2019, satisfying TS 3.6.2.3.

Following shutdown, investigations determined that RBCU fan XFN0065A failed resulting in the loss of three fan blades. The failed blades left the fan casing and damaged the XAA0002A RBCU cooling coil (XCE0009A) and plenum wall. The damaged cooling coil was isolated by removing RBCU XAA0002A from service. RBCU XAA0001A fan XFN0064A was found to have one failed blade, which left its fan casing but caused no additional damage.

2.0 SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

TS 3.6.2.3 requires that "Two independent groups of reactor building cooling units shall be OPERABLE with at least one of two cooling units OPERABLE in slow speed in each group."

The OPERABILITY of the reactor building cooling system ensures that the reactor building air temperature will be maintained within limits during normal operation, and adequate heat removal capacity is available when operated in conjunction with the reactor building spray systems during post-Loss of Coolant Accident (LOCA) conditions. The reactor building cooling system and the reactor building spray system provide post-accident cooling of the reactor building atmosphere.

The Reactor Building Cooling System consists of two full capacity cooling systems that are completely independent except for common ductwork. Each Reactor Building Cooling System train (A and B) has the capability to supply 100% of the cooling load required in the reactor building during accident conditions. Each train is comprised of two RBCUs to meet single failure criteria.

The normal operating configuration is for three RBCUs to be operating at high speed with the fourth in standby. One RBCU is required to be operating at slow speed during worst case design basis analysis emergency operation. During this event two of the four RBCUs were rendered inoperable (XAA0001A and XAA0002A). The containment cooling design basis function remained intact with two operable RBCUs (XAA0001B and XAA0002B).



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3.0 CAUSE OF THE EVENT

A Failure Mode Analysis and Root Cause Analysis were performed to determine the causal factors for the RBCU fan blade failures. The results of these analyses determined that the Direct Cause of RBCU fan blade failures on XFN0064A and XFN0065A were due to High Cycle Fatigue (HCF) cracking and fracture.

The Root Cause (RC) is that preventative maintenance for the RBCU fans is less than adequate for HCF. The Contributing Cause (CC) of the RBCU fan failure was determined to be operating the RBCU fans in a configuration that induces operating conditions in the region of lower stability on the performance curve which increases loads on the fan blades.

4.0 IMMEDIATE CORRECTIVE ACTIONS

The damaged XAA0002A RBCU cooling coil was isolated by closing and removing power from the inlet and outlet SW System valves. All RBCU fan blades for the three operational fans were replaced and the fan assemblies were balanced. The damaged blades have been sent to a materials analysis laboratory for failure analysis to support development of corrective actions to prevent recurrence.

5.0 ADDITIONAL CORRECTIVE ACTIONS

A temporary repair was made by crimping and soldering the end of the ruptured XAA0002A RBCU cooling coils. The RBCU was removed from service and the inlet and outlet isolation valves, XVG03108B-SW and XVG03109B-SW, were closed. Power was removed from the valves to prevent inadvertent operation.

A repair plan is being developed to determine the most prudent method to restore the cooling coil function and the XAA0002A RBCU fan (XFN0065A). Repairs are scheduled for the upcoming 2020 spring outage.

Corrective actions included the replacement of the RBCU fan blades with those that were received from an offsite source and were inspected by Non-Destructive Examination (NDE) Penetrant Testing (PT).

6.0 ACTIONS TO PREVENT RECURRENCE

Actions to prevent recurrence are under development. The FMA and RCA have determined the causes and specific corrective actions have been developed.

Actions developed as a result of the RC causal factors include revising maintenance and engineering procedures so that they address non-destructive testing and inspection of fan blades. CC causal factor corrective actions include revising surveillance test procedures and system operation procedures to prevent RBCU fan configuration alignments that leads to operating conditions in the region of lower stability on the fan's performance curve.



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NARRATIVE

7.0 SIMILAR EVENTS

None

8.0 MANUFACTURER/MODEL NUMBER

The RBCU fans (XFN0064A and XFN0065A) are Joy Axivane Containment Cooling Fans and were procured by the vendor American Air Filter Co. Inc. and manufactured by Joy Mfg. Co.

9.0 ADDITIONAL INFORMATION

None