



George A. Lippard
Vice President, Nuclear Operations
803.345.4810

December 12, 2017

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 2017-003-01)
Failed Lightning Arrester on Main Transformer Causes Reactor Trip

Reference: G. A. Lippard, SCE&G, letter to NRC Document Control Desk, "Licensee Event Report (LER 2017-003-00), Failed Lightning Arrester on Main Transformer Causes Reactor Trip," dated October 26, 2017 (ML17299A951) (RC-17-0143).

Attached is a supplemental Licensee Event Report (LER) 2017-003-01, for the Virgil C. Summer Nuclear Station (VCSNS), for LER 2017-003-00, as referenced. This report describes the Reactor Trip which was a result of a failed lightning arrester on the main transformer. This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A).

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

Very truly yours,

George A. Lippard

WHK/GAL/rlp
Attachment

cc:

K. B. Marsh
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J. B. Archie
N. S. Carns
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NSRC
RTS (CR-17-04597)
File (818.07)
PRSF (RC-17-0174)



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, 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 395

3. PAGE

1 OF 3

4. TITLE

FAILED LIGHTNING ARRESTER ON MAIN TRANSFORMER CAUSES REACTOR TRIP

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		
08	28	2017	2017	003	01	12	12	2017	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 checked="" 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)	
			<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 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 S. MooreTELEPHONE NUMBER (Include Area Code)
(803) 345-4752

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	FC	LAR	N/A	N					

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 August 28, 2017, at 0837, VCSNS Unit 1 automatically tripped due to a turbine trip. The turbine trip was caused by the Main Generator Differential Lockout due to a fault on the center phase, 230 kV lightning arrester, on the Main Transformer (XTF-1).

The plant trip response was normal. All control rods fully inserted. Balance of Plant (BOP) buses automatically transferred to their alternate power source, Emergency Auxiliary Transformers (XTF-31/32). Both Motor Driven (MD) Emergency Feedwater (EF) pumps and the Turbine Driven EF Pump started as designed.

The cause of this event was the failure of the center phase lightning arrester on XTF-1. The failed arrester, along with the other two lightning arresters that were in service on XTF-1 during the reactor trip, was replaced. The lightning arresters were sent to an independent lab, NEETRAC – Georgia Tech, for testing and evaluation.

The examination results indicate that the most probable cause of the arrester failure was an internal flashover of the metal oxide varistor blocks. The cause of the internal flashover is likely moisture ingress from the upper end seal.

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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
VC SUMMER - UNIT 1	05000-	2017	003	01

NARRATIVE**1.0 EVENT DESCRIPTION**

On August 28, 2017, at 0837, VCSNS Unit 1 automatically tripped due to a turbine trip. The turbine trip was caused by the Main Generator Differential Lockout due to a fault on the center phase lightning arrester on XTF-1.

Plant trip responses were normal. All control rods fully inserted, BOP buses automatically transferred to their alternate power source XTF-31/32, and all EF pumps started as required.

2.0 EVENT ANALYSIS

In the normal alignment, power produced at VCSNS is transmitted offsite through XTF-1 via the 230 kV system and also feeds normal onsite loads through the Auxiliary Transformer (XTF-2). An alternate source of power for the service power system is available immediately, upon loss of XTF-2, via the 230 kV system and XTF-31 and XTF-32.

The engineered safety features power system originates offsite from three independent sources: two credited, 230kV source via XTF-31 and 115kV source via the Engineered Safety Feature Transformers (XTF-4 or XTF-5), and one alternate 13.8kV source via Engineered Safety Feature Transformer (XTF-5052). In the event of a loss of all offsite power, emergency power for the engineered safety features is available from two onsite diesel generators. The AC electrical power sources provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to engineered safety systems so that the fuel cladding, reactor coolant system (RCS), and containment design limits are not exceeded. This event had no impact on the Class 1E electric system.

Each phase of XTF-1 has an associated lightning arrester (LA) connected to the 230 kV line between the transformer high voltage bushing and the first transmission line tower out from the transformer yard. The LAs are designed to protect the transformer and its components against impulse and lightning surges on the transmission line.

In this event, examination results indicate that the center phase LA failed as a result of moisture ingress past the end seal of its upper housing. With moisture being present, the upper housing block structure flashed over immediately placing the lower housing in an overvoltage condition, which resulted in a flashover of its metal oxide varistors. This LA failure grounded the center phase of XTF-1, which caused the XTF-1 Overall Differential Backup Lockout Relays to actuate and initiated the trip of the Main Generator Field Supply Breaker, resulting in a turbine trip and ultimately an automatic reactor trip.

3.0 SAFETY SIGNIFICANCE

A PRA sensitivity study was performed as a result of this reactor trip. PRA model 8b was used with baseline testing and maintenance values. This event was modeled with "reactor trip" set to 1/yr and the results were compared with the baseline values.

The resulting change in Core Damage Frequency (CDF) is 1.08E-07/yr and the resulting change in Large Early Release Frequency (LERF) is 5.47E-09/yr. The baseline CDF and LERF for the model (version 8b) used for this study are 3.3208E-06/yr and 1.0439E-07/yr, respectively. These changes constitute a 3.24% increase in CDF and a 5.24% increase in LERF.

The changes in CDF and LERF described herein are not considered significant.



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 2017	SEQUENTIAL NUMBER 003	REV NO. 01

NARRATIVE

4.0 PREVIOUS OCCURRENCE

No previous occurrence within the last three years.

5.0 CORRECTIVE ACTIONS

All three LAs on XTF-1 were replaced, under Work Order 1713128, in an effort to avoid the possibility of a common cause or mode failure occurring on either of the two remaining LAs.

During repair efforts, collateral damage to the Center Phase High Voltage Bushing was identified. To ensure proper operation of XTF-1, the Center Phase High Voltage Bushing was also replaced under Work Order 1713128.

The failed LA, along with the other two LAs that were in service on XTF-1 during the reactor trip, were sent to an independent lab, NEETRAC – Georgia Tech, for testing and evaluation to determine the cause of the failure. The results of this examination were discussed in section 2.0 Event Analysis of this report.