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August 3, 2018

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) 2017-001-01
C Main Feedwater Failure to Trip Results in Loss of Emergency Feedwater Auto Start Actuation Signal

Attached is revised Licensee Event Report (LER) 2017-001-01, for VCSNS, Unit 1. This revised report provides updated and corrected details regarding the 'C' Main Feedwater Pump's (MFP) failure to trip.

This revision was driven by a review of LER 2017-001-00 that determined that clarification was required regarding MFP oil sampling. This review was captured in CR-18-00485.

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

Very truly yours,

George A. Lippard

WHK/GAL/bb

Attachment

c:

J. E. Addison	C. Haney	ICES Coordinator	RTS (CR-18-00485,
W. K. Kissam	S. A. Williams	K. M. Sutton	CR-17-01611)
J. B. Archie	NRC Resident Inspector	INPO Records Center	File (818.07)
J. H. Hamilton	L. W. Harris	Marsh USA, Inc.	PRSF (RC-18-0088)
G. J. Lindamood	Paulette Ledbetter	Maintenance Rule Engineer	
W. M. Cherry	J. C. Mellette	NSRC	

NRC FORM 366
(04-2018)

U.S. NUCLEAR REGULATORY COMMISSION

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 http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. Facility Name	2. Docket Number	3. Page
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4. Title

C MAIN FEEDWATER PUMP FAILURE TO TRIP RESULTS IN LOSS OF EMERGENCY FEEDWATER AUTOSTART ACTUATION SIGNAL

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
04	07	2017	2017	001	01	08	03	2018		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	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. Power Level	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☑ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Michael S. Moore, Manager Nuclear Licensing	(803) 345-4752

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
B	JK	P	G080	No					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ Yes (If yes, complete 15. Expected Submission Date) ☑ No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On June 16, 2017, the station completed a past operability review and determined that an Emergency Feedwater Auto Start Actuation Signal was inoperable from November 12, 2016 until April 7, 2017. Technical Specification (TS) 3.3.2 Limiting Conditions for Operation (LCO) was entered due to having less than the minimum number of channels operable for Motor Driven Emergency Feedwater Pump (MDEFWP) actuation per TS Table 3.3-3 Functional Unit 6.g.

This event was a result of TPP0022C, MAIN FEEDWATER PUMP TURBINE C, remote trip actuating device not operating as designed. The remote trip actuating device not operating as designed was a result of oil contamination due to a gland seal steam leak near the Low Pressure (LP) bearing.

This condition is reportable under 10CFR50.73(a)(2)(i)(B), an operation or condition which was prohibited by the plant's Technical Specifications.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. FACILITY NAME	2. DOCKET NUMBER		3. LER NUMBER		
			YEAR	SEQUENTIAL NUMBER	REV NO.
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NARRATIVE

1.0 EVENT DESCRIPTION

On June 16, 2017, the station completed a past operability review and determined that an Emergency Feedwater Auto Start Actuation Signal was inoperable from November 12, 2016 until April 7, 2017. Technical Specification (TS) 3.3.2 Limiting Conditions for Operation (LCO) was entered due to there being less than the minimum number of channels operable for Motor Driven Emergency Feedwater Pump (MDEFWP) actuation per TS Table 3.3-3 Functional Unit 6.g.

MAIN FEEDWATER PUMP TURBINE C (TPP0022C) failed to trip when given a trip signal from the Main Control Board (MCB), Digital Control System (DCS), and the local trip pull handle. Indications did not change when an attempt to trip was made from the MCB. The attempt to trip from DCS resulted in the DCS indicating "tripped" with no change in the 'C' MFP. Indications did not change when attempting to trip 'C' MFP locally. 'C' MFP was tripped by using an alternative method of starting the Emergency Lube Oil Pump and removing power from the Main and Auxiliary Lube Oil Pumps. There was no impact to the station as a result of this condition.

There were no issues with the feedwater isolation signal nor were there any issues with securing 'A' and 'B' MFPs during the RF23 downpower.

2.0 EVENT ANALYSIS

As described in Virgil C. Summer Nuclear Station's Final Safety Analysis Report (FSAR) Section 10.4.7.2, the Feedwater System is designed to pump feedwater from the deaerator storage tank through 2 stages of high pressure heaters to the steam generators during normal operation, startup, and before shutdown. To perform this function, three 50% capacity, non-safety, variable speed, turbine driven feedwater pumps are included in the system. In the event of a loss of one feedwater pump, a power reduction may be necessary to prevent reactor trip, but the MFP turbines can be operated at runout capacity temporarily. There are no further specific criteria described for the MFP turbines in Section 10.4.7.2 of the FSAR.

FSAR Section 7.3.2.3 lists the automatic initiations of a MDEFWP. One of the five methods that provides an automatic MDEFWP initiation is a trip of all three MFPs.

TS 3/4.3.2 states that the Engineered Safety Feature Actuation System (ESFAS) instrumentation channels and interlocks shown in Table 3.3-3 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3-4 and with RESPONSE TIMES as shown in Table 3.3-5.

Action Statement 3.3.2.c states that with an ESFAS instrument channel or interlock inoperable take the ACTION shown in Table 3.3-3.

Table 3.3-3 Functional Unit 6.g states that Emergency Feedwater ESFAS instrumentation requires the Trip of MFPs to start Motor-Driven Pumps. In Modes 1 and 2 there must be three total channels (one per pump) of this trip present or Action 19 must be taken.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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Action 19 states that with the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within one hour.

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to two hours for surveillance testing of other channels per Specification 4.3.2.1.

When the electronic and manual trips were attempted on April 7, 2017, no indication was received that the MFP turbine had tripped (i.e. stop valve closure, speed reduction, local indicator lights). Because the trip system would not actuate, one of three channels for MFP trip under TS 3/4.3.2 was inoperable.

LCO for TS 3.3.2 was entered at 21:15 on April 7, 2017, requiring the operable channel be placed in the trip condition within an hour. At 22:09, 'C' MFP was secured and LCO for TS 3.3.2 was exited. Therefore, Action 19 under TS 3.3.2 was satisfied as 'C' MFP was able to be placed in the tripped condition by securing the Lube Oil Pumps that supplied high pressure oil to the stop valves ultimately satisfying Emergency Feedwater ESFAS instrumentation requirements.

An evaluation found that contaminants in the 'C' MFP oil system accumulated in the low flow sections of the oil system such as in the Secondary Operating Cylinder (SOC) and the SV-12 solenoid valve. These contaminants impeded actuation of the SV-12 solenoid valve. The bound condition would not allow the steam inlet valves to close resulting in the inoperable ESFAS.

The past adverse condition leading to the Emergency Feedwater ESFAS instrumentation channel being inoperable was the inability of the 'C' MFP to trip as a result of the remote trip actuating device, SV-12 solenoid valve, being bound by contaminants in the oil system.

The first indication that there were contaminants in the oil system of the 'C' MFP was manifested by speed control issues, as documented in CR-16-05720 and CR-17-01268. The SOC actuation, which controls the speed of TPP0022C, was impeded by the contaminants in the oil system.

Since the SOC was not functioning properly due to the oil contaminants, it is likely that the SV-12 solenoid valve was also adversely affected as they share the same oil system. Additionally, since the SV-12 solenoid valve was not called into service from November 12, 2016 to April 7, 2017, it is conservatively assumed that the TPP0022C trip system was inoperable for that period of time.

3.0 SAFETY SIGNIFICANCE

This event has no impact on the Probabilistic Risk Analysis (PRA) model. The PRA model includes start signals for Emergency Feedwater from: Low Steam Generator Level, Manual, Load Sequencer, and Anticipated Transient Without SCRAM Mitigation System Actuation Circuitry (AMSAC). Loss of Feedwater is not modeled as a separate actuation.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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NARRATIVE

4.0 PREVIOUS OCCURRENCE

No previous occurrence within the last three years.

5.0 CORRECTIVE ACTIONS

MAIN FEEDWATER PUMP TURBINE C was tripped by starting the Emergency Lube Oil Pump and removing power from the Main and Auxiliary Lube Oil Pumps.

MAIN FEEDWATER PUMP TURBINE C was repaired under Work Orders (WOs) 1704018, 1616104, 1514836, and 1603349.

The WOs inspected the SV-12 Stem and Cylinder for damage, and replaced parts as appropriate. The front standard trip assembly and other components were also inspected and cleaned as required.