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June 8, 2015

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 2015-002-00)
LOW OIL LEVEL TRIP RENDERS CHILLER NON-FUNCTIONAL AND "A" TRAIN OF CHARGING SYSTEM INOPERABLE

Attached is Licensee Event Report (LER) 2015-002-00, for the Virgil C. Summer Nuclear Station (VCSNS). This report describes a condition that rendered the "A" Chiller non-functional. This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B).

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

Very truly yours,

Shawn Zalanchi for

Thomas D. Gatlin

WLT/TDG/ts
Attachment

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PRSF (RC-15-0085)

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NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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 internet 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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

LOW OIL LEVEL TRIP RENDERS CHILLER NON-FUNCTIONAL AND "A" TRAIN OF CHARGING SYSTEM INOPERABLE

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
										05000
4	9	2015	2015	002	00	6	8	2015	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)(i)(C)	☐ 50.73(a)(2)(vii)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
	☐ 20.2203(a)(2)(vi)	☑ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Bruce Thompson, Manager Nuclear Licensing	(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
B	KM	CHU	N418	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)*

A past operability review determined that HVAC System Mechanical Water Chiller (XHX0001A) had been non-functional during the month of July 2013 due to a vulnerability with component operation resulting in a low oil level condition. The event impacts the operability requirements of the Chilled Water (VU) System and the area room coolers the system supports per TS 3/4.7.9, "Area Temperature Monitoring."

On September 25, 2013, XHX0001A tripped on low oil level following surveillance testing. The "Circuit 2 Low Oil Level" fault occurred due to the compressor oil level dropping below the low oil level indicator switch set point for 60 seconds which initiates shutdown of the component. The cause was low superheat, causing liquid floodback to the compressor and a low evaporator heat load that was insufficient to promote proper oil return in the evaporator. The chiller unit was intermittently operated as the only chiller on the "A" VU train in July 2013. Due to this vulnerable condition the non-functional chiller impacted the operability of the "A" train components served by the "A" train VU system.

On April 9, 2015, the station determined this event was reportable and is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B).

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NARRATIVE

EVENT DESCRIPTION

A past operability review determined that HVAC System Mechanical Water Chiller (XHX0001A) had been non-functional during the month of July 2013 due to a vulnerability with component operation resulting in a low oil level condition. On September 25, 2013 XHX0001A had tripped on low oil level following surveillance testing. The "Circuit 2 Low Oil Level" fault occurred due to the compressor oil level dropping below the low oil level indicator switch (ILI-19039A-VU) set point for 60 seconds which initiates an alarm and chiller unit shutdown. Data collected from the event indicates XHX0001A was started when the chilled water at the inlet of the component was 60 degrees Fahrenheit and the alarm came after Compressor 2 shut off as the "lag" circuit. The lag circuit shutdown occurs when the chilled water outlet temperature is below 43.5 degrees Fahrenheit and combined compressor amps are below 250 amps for greater than 120 seconds. After the lag circuit permissive was satisfied, Circuit 2 was signaled to shut off and the "Circuit 2 Low Oil Level" fault was received resulting in shutdown of the chiller.

EVENT ANALYSIS

XHX0001A was installed on August 5, 2011 and is one of three chiller units that provide chilled water to the VU System. XHX0001A is a different design than XHX0001B and XHX0001C. XHX0001A is a 280-ton three tier chiller skid that has 2 equal capacity circuits that are independently controlled via a Triconex Programmable Logic Controller. 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. XHX0001C is used as a swing component that is powered from either train of Safeguards Power.

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 equipment located within these areas can withstand the environmental effects of a postulated FSAR chapter 15 event. With a non-functional chiller unit, the VU system will become inoperable therefore affecting room temperatures and the reliability of associated equipment within the safety related area. 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).

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.

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 past basis for continued operability must be submitted to the NRC. 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.

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NARRATIVE

LER 2013-003-00 dated August 21, 2013 [ML13235A311] reported that XHX0001A had been inoperable/non functional since installation through June 2013 due to skid mounted molded case circuit breaker trip setpoint being set too low. That LER discussed the safety significance of the nonfunctional chiller during that time period.

Investigation after the September 25, 2013 event found that XHX0001A has been also vulnerable to the low oil level condition since original installation on August 5, 2011 and was therefore non-functional since installation. The past operability review determined that from July 5 through July 27, 2013, XHX0001A was intermittently operating as the only chiller on "A" train while being vulnerable to the low oil level condition during the following timeframes:

Placed In Service	Removed From Service	Total Time
07/05/2013 at 18:30	07/07/2013 at 17:03	46.6 hours
07/11/2013 at 02:27	07/20/2013 at 02:12	215.8 hours
07/20/2013 at 03:06	07/27/2013 at 09:54	174.8 hours

The second and third listed timeframes represent times where "A" VU train was unavailable for greater than 72 hours which exceeds the TS 3/4.5.2 action requirements for XHX0001A.

The September 25, 2013 trip was attributed to low superheat causing liquid floodback to the compressor and a low evaporator heat load that was insufficient to promote proper oil return in the evaporator.

The plant was operating at 100 percent power at the time of the event.

SAFETY SIGNIFICANCE

The safety significance of this event was minimal. The VU system function of cooling plant areas and equipment is not modeled in the Probabilistic Risk Analysis (PRA) model. The VU backup function to supply alternate cooling to Charging pump gear box is also not credited in the PRA model.

The Final Safety Analysis Report (FSAR) 9.4.7.2.4 describes the Safety Class Chilled Water System. This section states that continuous operation of one of the three chillers and chilled water pumps is required during normal and emergency periods to provide 45 degrees Fahrenheit water to the chilled water coils. Use of three chillers and three chilled water pumps permits one unit to undergo extended maintenance. When all three chillers and pump sets are available, one is designated as a spare and its breaker(s) is racked out. All chillers may also be started locally.

During the periods of time in July 2013 when XHX0001A was the only operating chiller on "A" VU train, XHX0001B was operable and aligned to "B" VU train.

If the XHX0001A tripped, XHX0001C would have been aligned to the "A" VU train per Annunciator Response Procedure before the temperatures became excessive.

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NARRATIVE

PREVIOUS OCCURRENCE

XHX0001A tripped on Circuit 2 Low Oil Level on January 11, 2013, under similar circumstances. Troubleshooting identified that the hot gas bypass valve on Circuit 2 was leaking by. The valve leak-by influenced Circuit 2 suction pressure and superheat values which resulted in excess liquid refrigerant being admitted to the compressor. The hot gas bypass valve was repaired and XHX0001A was returned to service. In retrospect, this trip may have been as a result of low superheat causing liquid floodback to the compressor and low evaporator heat load to promote proper oil return in the evaporator.

LER 2013-003-00 dated August 21, 2013 [ML13235A311] reported that XHX0001A had been inoperable since installation through June 2013 due to skid mounted molded case circuit breaker trip setpoint being set too low.

CORRECTIVE ACTIONS

To resolve the liquid floodback failure mechanisms the suction piping on Circuit 2 of XHX0001A was buffed to allow the thermal expansion valves (TXV) sensing bulb to be installed flush with the suction piping per the manufacturers' installation recommendations, software changes to prevent the lagging circuit from starting if the lead compressor has enough capacity to cool down the VU loop were implemented, XHX0001A TXVs were adjusted to ensure optimal superheat, and the initial 20% open position for the Service Water Motor Operated Valves was revised to 15% initial position in order to enhance compressor discharge pressure control.

The corrective actions for the below minimum heat load failure mechanism include implementing software changes to improve chiller operation, modifying hot gas bypass function during dual circuit operation, reducing hot gas delay time from 30 seconds to 5 seconds, limiting minimum compressor unloading to 140 amps, and revising the logic permissive for securing the lag compressor to reduce the time the lag compressor runs at minimum loads during transients when two compressors are required.