Entergy

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J. E. Pollock
Site Vice President

NL-11-125

December 1, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop O-P1-17
Washington, D.C. 20555-0001

SUBJECT: Licensee Event Report # 2011-003-00, "Technical Specification (TS) Violation for Entry into TS 3.0.3 for 3 Inoperable Fan Cooler Unit Trains and Failure to Correct Condition within 1 hour and Actions Taken for Plant Shutdown"
Indian Point Unit No. 2
Docket No. 50-247
DPR-26

Dear Sir or Madam:

Pursuant to 10 CFR 50.73(a)(1), Entergy Nuclear Operations Inc. (ENO) hereby provides Licensee Event Report (LER) 2011-003-00. The attached LER identifies an event where there was a Technical Specification (TS) violation for entry into TS 3.0.3 for three inoperable Fan Cooler Unit trains and failure to correct condition within one hour and actions initiated to shutdown the plant, which is reportable under 10 CFR 50.73(a)(2)(i)(B). This condition was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2011-04894.

There are no new commitments identified in this letter. Should you have any questions regarding this submittal, please contact Mr. Robert Walpole, Manager, Licensing at (914) 734-6710.

Sincerely,

JEP/cbr

cc: Mr. William Dean, Regional Administrator, NRC Region I
NRC Resident Inspector's Office, Indian Point 2
Mr. Paul Eddy, New York State Public Service Commission
LEREvents@inpo.org

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NRR

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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)

1. FACILITY NAME:	2. DOCKET NUMBER	3. PAGE
INDIAN POINT 2	05000-247	1 OF 4

4. TITLE: Technical Specification (TS) Violation for Entry Into TS 3.0.3 for 3 Inoperable Fan Cooler Unit Trains and Failure to Correct within 1 Hour and Actions Taken for 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
10	03	2011	2011-	003 -	00	12	01	2011		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 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)
☐ 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)
☐ 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

NAME	TELEPHONE NUMBER *(Include Area Code)*
Tom Beasley, System Engineer	(914) 254-7644

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	BK	FCU	M086	Y	X	BI	P	S450	Y

14. SUPPLEMENTAL REPORT EXPECTED

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

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

16. ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced type written lines)*

On October 3, 2011, during performance of the quarterly surveillance test of the Containment Fan Cooler Unit (FCU) cooling water flow, all five FCUs failed to meet minimum flow requirements with the essential service water (SW) header (1/2/3 header) supplied by the 22 and 23 SW pumps. Operations entered Technical Specification (TS) 3.0.3 per TS 3.6.6.F for 3 trains of FCUs inoperable. In accordance with TS 3.0.3 operations initiated actions to place the plant in Mode 3 within 7 hours. Operations initiated turbine load reduction by approximately 5 MW and swap of the essential SW supply to the 4/5/6 header. Upon completion of the essential header swap, operations re-performed the quarterly surveillance test on the 4/5/6 header with satisfactory results. Based on successful completion of the test, Operations exited the TS 3.0.3 action statement and commenced power ascension to 100% power. The direct cause was excessive accumulation of silt in the SW Bay that resulted in degraded inlet flow to the SW pumps. The root cause was ineffective barriers established to monitor and remove silt accumulations that would affect SW pump Net Positive Suction Head (NPSH) margin failed to include predictive elements that account for changing environmental conditions. Corrective actions included sonar mapping and de-silting of the SW Bay. The sonar mapping frequency will be increased and the SW System Monitoring Plan will be revised to include alert and action levels for silt buildup. A comprehensive silt monitoring and mitigation plan will be developed to include predictive trending and monitoring methods. The event had no significant effect on public health and safety.

Note: The Energy Industry Identification System Codes are identified within the brackets {}.

DESCRIPTION OF EVENT

On October 3, 2011, while at 100% steady state reactor power, during performance of surveillance test 2-PT-Q016 (Containment Fan Cooler Unit Cooling Water Flow Test), at approximately 3:45 hours, all five Containment Fan Cooler Units (FCUs) {BK} failed to meet minimum flow requirements with the essential service water (SW) {BI} header (1/2/3 header) supplied by the 22 and 23 SW pumps (SWP). Operations entered Technical Specification (TS) 3.0.3 per TS 3.6.6.F for 3 trains of FCUs inoperable. In accordance with TS 3.0.3, at approximately 4:38 hours, Operations initiated actions to place the plant in Mode 3 within 7 hours. At approximately 4:43 hours, Operations initiated turbine {TA} load reduction by approximately 5 MW and swap of the essential SW supply to the 4/5/6 header. Upon completion of the essential header swap, operations re-performed the quarterly surveillance test on the 4/5/6 header with satisfactory results. Based on successful completion of the test, Operations exited the TS 3.0.3 action statement at approximately 5:32 hours, and commenced power ascension to 100% power at approximately 5:54 hours. The condition was recorded in the Indian Point Energy Center (IPEC) Corrective Action Program (CAP) as Condition Report CR-IP2-2011-04894. During the event, an attempt to start the 21 SWP failed and the 21 SWP was determined to be inoperable due to a faulty breaker inertia latch. This condition was recorded in CR-IP2-2011-04893 (See LER-2011-002 that reported this event).

A troubleshooting plan and Kepner-Tregoe (K-T) analysis was initiated to investigate the issues associated with the failed surveillance test. Testing of the 21, 22, 23 SW pumps was performed to determine if their capability was satisfactory. Sonar mapping of the SW Bay {MK} was performed on October 4, 2011. The results of sonar mapping indicated that silt levels had increased in the bay since the last sonar survey in February 2011. Silt had accumulated to levels similar to levels that had challenged SW pump performance in 2007. The sonar data validated the results of the K-T analysis which identified silt accumulation in the SW Bay as the cause of the lower essential SW pressure and failure of the surveillance test. Accumulations of silt and sediment/debris impacted pump inlet flow and impacted pump performance.

The SW System (SWS) is designed to supply cooling water from the Hudson River to various heat loads in both the primary and secondary portions of the plant. The design ensures a continuous flow of cooling water to those systems and components necessary for plant safety during normal operation and under abnormal or accident conditions. The SWS consists of two separate, 100% capacity, safety related cooling water headers. Each header is supplied by 3 pumps to include pump strainers, with SWS heat loads designated as either essential or non-essential. The essential SWS heat loads are those which must be supplied with cooling water immediately in the event of a Loss of Cooling Accident (LOCA) and/or Loss of Offsite Power (LOOP). The FCUs consists of a motor, fan, cooling coils, dampers, duct distribution system and instrumentation and controls. SW is supplied to the cooling coils to perform the heat removal function. The FCUs were supplied by Marlo Ind. Inc. {M086}. The SWPs are vertical motor driven pumps initially manufactured by the Johnston Pump Company {J105} which was subsequently purchased by Sulzer {S450}.

An extent of condition review determined that silt accumulation that affected the unit 2 SWS pump performance is unique to the unit 2 SW Bay. The unit 3 SW pump design utilizing shorter columns allows for a much higher level of silt in the bay before any negative pump/system performance issues are encountered. An assessment of the Circulating Water pump (CWP) bays {NN} determined that the CWPs are not susceptible to challenges with NPSH margin from the mechanism present at the SW pumps. Their higher flow rates preclude silt accumulations and the pump design and inlet geometry differ from the unit 2 SWPs and SWP bay design.

Cause of Event

The direct cause was excessive accumulation of silt in the SW Bay that resulted in degraded inlet flow to the SW pumps. The root cause was ineffective barriers established to monitor and remove silt accumulations that would affect SW pump Net Positive Suction Head (NPSH) margin failed to include predictive elements that account for changing environmental conditions. Established barriers focused on monitoring and removal of the silt before accumulations impacted pump performance and were independent of the mechanism of silt migration or accumulation. The established barriers failed to incorporate predictive elements that would have enhanced the monitoring plans by accounting for external influences and changing river conditions such as heavy precipitation with significant run-off into the river. External influences can directly impart a time-based, non-linear influence on silt accumulation rate in the SWP intake bays.

Corrective Actions

The following corrective actions have been or will be performed under Entergy's Corrective Action Program to address the cause and prevent recurrence:

- Sonar mapping and de-silting of the SW Bay was performed to identify and remove silt accumulation impeding SW pump performance.
- The sonar mapping frequency will be increased from a 2-year to 3-month Preventive Maintenance (PM) frequency.
- The SW System Monitoring Plan will be revised to include alert and action levels for silt buildup.
- A comprehensive silt monitoring and mitigation plan will be developed to include predictive trending and monitoring methods and integrated into the IPEC SEP-SW-001, Generic Letter 89-13 Program Document and the PM Program.
- Predictive trending and monitoring methods will be developed to provide early indication of influences from natural events.

Event Analysis

The event is reportable under 10CFR50.73(a)(2)(i)(B). The licensee shall report any operation or condition which was prohibited by the plant's TS. On October 3, 2011, during a quarterly surveillance test, all five FCUs were considered inoperable at 3:45 hours, due to the failure of all five FCUs to meet minimum flow requirements. TS 3.6.6 Condition F was entered for 3 trains of FCUs inoperable which requires immediate entry into TS 3.0.3 [Limiting Condition for Operation (LCO) Applicability]. TS 3.0.3 requires that the unit be placed in a Mode or other specified condition in which the LCO is not applicable. Action shall be initiated within one hour, to place the unit in Mode 3 within 7 hours, Mode 4 within 13 hours, and Mode 5 within 37 hours. Subsequently, at 4:38 hours, Operations initiated actions to place the unit in Mode 3 within 7 hours. At 4:43 hours, Operations initiated turbine load reduction by approximately 5 MW and swap of the essential SW supply to the 4/5/6 header following failure of the 21 SWP to start (See LER-2011-002 reporting that event). After swap of the essential header and successful completion of the SW flow test, Operations exited the TS 3.0.3 action statement at approximately 5:32 hours. In accordance with reporting guidelines of NUREG-1022, Section 3.2.2, guideline for entry into TS 3.0.3, "Entry into TS 3.0.3 is not necessarily reportable however, it should be considered reportable if the condition is not corrected within 1-hour such that it is necessary to initiate actions to shutdown/cooldown." The condition was entered at 3:45 hours and not corrected until 5:32 hours (greater than 1 hour) and actions were initiated to shutdown the plant and plant load was reduced to comply with the TS.

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

There was no safety system functional failure reportable under 10CFR50.73(a)(2)(v). Monitored SW header pressure was within normal range until September 29, 2011, when there was a drop in pressure that alarmed in the control room. Operations rotated pumps and the pressure returned to normal but subsequently degraded until tested on October 3, 2011. Engineering judgment concluded there was a non-linear buildup of silt that resulted in reduced SW pressure and flow. The minimum required safeguards components were available to perform the function during the time the 5 FCUs were declared inoperable as both containment spray pumps (CSPs) were available. Considering the CSPs as a subsystem of the Containment Heat Removal System then both CSPs can be credited because in accordance with reporting guidance in NUREG-1022, an additional random single failure need not be assumed in that system during the condition. A review of SW header pressure determined that the 1/2/3 SW header pressure had been within normal range until September 29, 2011, when the Control Room received a low SW pressure alarm at 20.02 hours. A graph of SW header pressure showed a significant dip in pressure that started earlier in the day. The indicated pressure drop exceeded the low indicated pressure associated later with inadequate SW FCU flow from the scheduled functional test (2-PT-Q016) of the FCUs on October 3, 2011. TS 3.6.6 has a Surveillance Requirement (SR) 3.6.6.3 that requires each FCU cooling water flow rate to be equal or greater than 1600 gpm. The alarm for low SW pressure on September 29, 2011, is indicative that the TS SR was not likely met and required entry into the appropriate TS condition. Because there was a failure to enter the applicable TS condition for the low header pressure condition, this was a TS prohibited condition reportable under 10CFR50.73(a)(2)(i)(B).

Past Similar Events

A review was performed of the past three years of Licensee Event Reports (LERs) for events that involved a TS prohibited condition (e.g., TS 3.0.3 violation) due to a SW flow inadequacy. No LERs were identified.

Safety Significance

This event had no significant effect on the health and safety of the public. There were no actual safety consequences for the event because there were no accidents or transients requiring the CSS or FCUs. During the declared inoperability of the three trains of FCUs (October 3, 2011 at 3:45 hours through 5:32 hours), both CSPs were available.

The Containment Spray System and Containment Fan Cooler System are Engineered Safety Feature (ESF) systems are designed to ensure that the heat removal capability required during the post accident period can be attained. The CSS and the Containment FCU System provide redundant methods to limit and maintain post accident conditions to less than the containment design values (5 FCUs/3 FCUs & 1 CSP/2 CSPs). The configuration with one CS train and two FCU trains is the configuration available following the loss of any safeguards power train (e.g., diesel failure). Accident analysis assumptions regarding containment air cooling and iodine removal are met by one CS train and any two FCU trains (i.e., at least three FCUs). The Containment FCU System consisting of five 20 percent capacity FCUs and the CSS consisting of two 50% trains are divided into trains based on the safeguards power train which supports them. During the period of the declared inoperable FCU trains, there was minimum safeguards capability available. A Westinghouse calculation demonstrates that adequate heat removal can be provided at lower river water temperatures. The required TS surveillance SW flow rate through the FCUs is based on a LOCA at worst case river water temperature (95 degrees F) however, during this event the river water temperature was significantly lower than 95 degrees F, being measured at approximately 65 degrees F. The as-found test values of SW flow exceed the calculation value indicating acceptable cooling for a postulated DBA during the event.