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NL-15-124

October 9, 2015

U.S. Nuclear Regulatory Commission
Document Control Desk
11545 Rockville Pike, TWFN-2 F1
Rockville, MD 20852-2738

SUBJECT: Licensee Event Report # 2015-001-00, "Technical Specification (TS) Prohibited Condition Due to an Inoperable Containment Caused by a Service Water Pipe Leak with a Flaw Size that Results in Exceeding the Allowed Leakage Rate for Containment"
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) 2015-001-00. The attached LER identifies an event where there was a Technical Specification (TS) Prohibited Condition due to not meeting Containment integrity as a result of a Containment Fan Cooler Unit motor cooler service water return pipe defect whose leakage could result in post-LOCA air leakage out of containment in excess of that allowed by Technical Specification 3.6.1 (Containment) which requires leakage rates to comply with 10 CFR 50, Appendix J. This condition 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-IP2-2015-3550.

IE22
NRR

There are no new commitments identified in this letter. Should you have any questions regarding this submittal, please contact Mr. Robert Walpole, Manager, Regulatory Assurance at (914) 254-6710.

Sincerely,

LC/cbr

Attachment: LER-2015-001

cc: Mr. Daniel H. Dorman, Regional Administrator, NRC Region I
NRC Resident Inspector's Office
Ms. Bridget Frymire, New York State Public Service Commission

NRC FORM 366 (01-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES: 1/31/2017

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-I0202, (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 5

4. TITLE: Technical Specification (TS) Prohibited Condition Due to an Inoperable Containment Caused by a Service Water Pipe Leak with a Flaw Size that Results in Exceeding the Allowed Leakage Rate for Containment

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
08	11	2015	2015-	001 -	00	10	9	2015	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)*
Dennis Pennino, Engineer, Engineering Systems	(914) 254-7216

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	BI	PSP	U080	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 August 11, 2015, during operator investigations inside the reactor containment building, a through wall leak was discovered on the 24 Fan Cooler Unit (FCU) motor cooler service water (SW) return line. The leak was in a 2 inch copper-nickel pipe near a welded joint upstream of containment penetration SS. The leak was located within the ASME Section XI Code ISI Class 3 boundary and estimated to be approximately 2 gpm. Since the pipe flaw was through wall and was located within the ASME Section XI boundary, it exceeded the flaw allowable limits provided per IWD-3000. The weld leak was evaluated and determined to meet the structural requirements of ASME Code Case N-513-3. The condition was determined to have no impact on SW cooling safety function or adverse impact on piping structural integrity. The pipe is part of a closed loop system inside containment and is required to meet containment integrity. An engineering evaluation was performed to determine the potential air leakage out of containment based on the observed SW leakage into containment. This evaluation concluded that the leaking defect could result in post-LOCA air leakage out of containment in excess of that allowed by Technical Specification 3.6.1 (Containment) which requires leakage rates to comply with 10 CFR 50, Appendix J. The apparent cause was corrosion. The immediate corrective action was to install an engineered clamp over the pipe defect. The clamp is being monitored daily and UT monitoring will be performed every 90 days until the pipe is repaired. The pipe will be repaired or replaced in accordance with the requirements of ASME Section XI Code by the next refueling outage in 2016. The event had no significant effect on public health and safety.

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

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

DESCRIPTION OF EVENT

On August 11, 2015, at approximately 16:45 hours, during operator investigations inside the reactor containment building {NH}, a through wall leak was discovered on the 24 Fan Cooler Unit (FCU) {FCU} motor cooler service water (SW) {BI} return line. The leak was in a 2 inch 90-10 Copper-Nickel pipe {PSP}, line #495-SWN-NF near a welded joint upstream of containment penetration SS at approximately elevation 76 feet. The condition was recorded in the Indian Point Energy Center (IPEC) Corrective Action Program (CAP) in Condition Report CR-IP2-2015-03550. Non-destructive examination (NDE) by ultrasonic testing (UT) technique was performed to characterize the flaw and the results were evaluated using the structural margins provided in ASME Code Case N-513-3.

The leak was located within the ASME Section XI Code Class 3 boundary and estimated to be approximately 2 gpm. Since the pipe flaw was through wall and was located within the ASME Section XI boundary, it exceeded the flaw allowable limits provided in IWD-3000. The leaking defect was subsequently determined to be within the structural limits of the ASME Code Case N-513-3 and the condition was determined to have no adverse impact on SW cooling safety function or on the structural integrity of the system. There was no visual indication of weld or base metal degradation at the affected pipe section, and there was no evidence of leakage at any other location on this weld or elsewhere on the piping adjacent to it. The leakage, if not contained by the installed engineering clamp, would have eventually drained into the containment sump. The impact of the isolation of the pipe flaw was evaluated for in-leakage into containment and the leak was not expected to exceed the limit in Technical specification (TS) 5.5.14. The pipe is considered a closed loop system inside containment and as such required to meet containment integrity. An engineering evaluation was performed to determine the potential air leakage out of containment based on the observed SW leakage into containment. This evaluation concluded that the leaking defect could result in post-LOCA air leakage out of containment in excess of that allowed by Technical Specification (TS) Surveillance Requirement (SR) 3.6.1.1 (Containment) which requires leakage rates to comply with 10 CFR 50, Appendix J.

The leak in 2 inch line #495-SWN-NF at the affected location is downstream of 24 FCU motor cooler which can be supplied with SW via either 18 inch line #408 (4-5-6 SW Header) or 18 inch line #409 (1-2-3 SW Header). At the time of discovery, the SW System (SWS) was aligned with the 4-5-6 SW Header as the Essential Header for Modes 1-4 Operations per Technical Specification (TS) 3.7.8 (Service Water System). The 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, safety related cooling water headers. Each header is supplied by 3 pumps each having its own strainer, 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 Design Basis Accident (DBA). The essential SWS heat loads can be cooled by any two of the three SW pumps on the essential header. Either of the two SWS headers can be aligned to supply the essential heat loads or the non-essential SWS heat loads. The design pressure and temperature of the SWS is 150 psig and 160 degrees F. The function of line #495 is to return the SW that was used to cool the 24 FCU fan motor out of containment and discharge it to the discharge canal.

Each FCU consists of a motor, fan, cooling coils, dampers, duct distribution system and instrumentation and controls. Each FCU fan motor is equipped with a cooler supplied by SW. SW is supplied to the cooling coils to perform the heat removal function. During normal operation, SW is supplied to all five FCUs and one or more FCUs may be operated for containment cooling to limit the ambient containment temperature to less than the limit specified in TS 3.6.5 (Containment Air Temperature).

An extent of condition (EOC) review determined other FCU motor cooler SW copper-nickel piping could be susceptible to similar degradation. EOC inspections are required by ASME Code Case N-513-3 for at least 5 similar and susceptible locations. The results of the inspections found all 5 selected locations in the FCU motor cooler return lines to be structurally acceptable. There is no evidence of additional leakage at any other location in the degraded 2 inch #495 line or at any other location in the other four FCU motor cooler return lines. The FCU motor cooler tubing is 6 percent molybdenum stainless steel which has a higher resistance to corrosion.

Cause of Event

The apparent cause of the through-wall leakage at the weld area was corrosion. The sensitized heat affected zone (HAZ) surrounding a weld is typically more susceptible to corrosion than the pipe base metal. Corrosion of the copper-nickel piping resulted in a through wall pipe defect and leakage of SW into the reactor containment. The leak was estimated to be approximately 2 gpm. Based on the UT wall thickness measurements the leak occurred at a degraded area approximately 0.5 inch long in both the axial and circumferential directions. Based on the Code Case N-513-3 evaluation, the allowable flaw length in the axial and circumferential direction was calculated to be 1.47 inches and 1.10 inches respectively. Using a calculated corrosion rate based on measured conditions, the predicted flaw length by the next refueling outage in the spring of 2016 is predicted to be within the allowable flaw lengths. Based on these results, the affected piping is structurally acceptable consistent with the requirements of ASME code Case N-513-3.

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:

- A leak-limiting engineered clamp was applied to the pipe flaw.
- The clamp is being monitored daily by operator rounds and a special operator log for any signs of increased leakage.
- UT monitoring will be performed every 90 days until the pipe is repaired.
- The pipe will be repaired or replaced in accordance with the requirements of ASME Section XI Code during or prior to the next refueling outage in 2016.

Event Analysis

The event is reportable under 10 CFR 50.73(a)(2)(i)(B). The licensee shall report any operation or condition which was prohibited by the plant's TS. This condition meets the reporting criteria because TS 3.6.1 Containment Operability was not met.

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

Because the FCUs are utilized to maintain normal containment temperature within accident analysis input limits and for accident mitigation, SW flow is not isolated following a DBA. SW piping supply and discharge for the FCUs is considered to be a closed system in containment or an extension of the containment boundary.

Consequently, defects discovered within this piping may adversely affect containment integrity, and the ability to control release of radioactive materials. Both containment isolation valves in the affected FCU SW piping were operable but the line was not isolated.

Initial operability determined the leak was within the Code Case limits, that the inventory loss was not significant with no impact on other safety related structures, systems and components. The SW pipe flaw leakage was evaluated for containment in-leakage for potential flooding and out leakage for containment integrity per TS 5.5.14 and 10 CFR 50, Appendix J. TS 5.5.14.e requires that SW in-leakage into containment be limited to less than 0.36 gpm per FCU. Prior isolation valve testing provided measured leakage that was less than the TS limit. Containment out leakage is required to be in accordance with TS Surveillance Requirement (SR) 3.6.1.1 whose leakage rate requirements comply with 10 CFR 50, Appendix J, Option B. An evaluation was performed to estimate the air leakage out of containment under accident conditions. Based on the results of this evaluation, it was concluded that the defect could result in post-accident containment air out leakage in excess of 10 CFR 50, Appendix J limits. Since TS 3.6.1 requires the containment to be operable in Modes 1-4 and TS SR 3.6.1.1 requires leakage rate requirements comply with 10 CFR 50, Appendix J, Option B and the calculated equivalent containment air out leakage exceeded TS allowable, TS 3.6.1 was considered not met. The application of an engineered clamp on the pipe flaw will ensure that both the SW leakage into containment and post-accident air leakage out of containment will remain within the applicable TS limits. The affected pipe section is structurally acceptable based on the requirements of ASME Code Case N-513-3 and therefore the pipe is considered operable.

There was no safety system functional failure reportable under 10 CFR 50.73(a)(2)(v). A designated essential header was available and the leak would not have prevented the performance of the SW cooling function for affected heat loads or resulted in unanalyzed flooding of the containment.

Past Similar Events

A review was performed of the past three years of Licensee Event Reports (LERs) for events reporting a TS violation due to inoperable SW piping caused by leaks and one LER was identified. LER-2013-004 reported pin hole leaks in Code Class 3 SW piping elbows for series 300 stainless steel. The pin hole leaks were due to pitting corrosion. The cause of the event reported in LER-2013-004 was not the same as this event as the piping material was different (copper-nickel vs stainless steel).

Safety Significance

This event had no effect on the health and safety of the public. There were no actual safety consequences for the event because there were no accidents or events during the degraded condition.

There were no significant potential safety consequences of this event. The leakage from the affected SW pipe was within the capability of the SW system to provide adequate SW flow to SW loads. The degraded piping was on the discharge of the FCU motor therefore any failure would not prevent the SW cooling function.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Indian Point Unit 2	05000-247	2015	- 001	- 00	5 OF 5

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

Current analysis for SW pipe failures are postulated to be limited to small through-wall leakage flaws as SW is defined as a moderate energy fluid system. The SW leak would eventually drain to the containment sump. The containment sumps have pumps with sufficient capacity to remove excessive leakage. The impact of the pipe flaw was evaluated for containment free volume in-leakage per the limits of TRM 3.4.D. The leak did not and is not expected to exceed the TRM 3.4.D limit. The pipe leak was just upstream of outboard containment isolation valve SWN-71-4A.

An evaluation of the leak concluded that it did not result in any structural, flooding, or spraying condition that would adversely impact the capability of SSCs to perform their safety function.