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Anthony J. Vitale  
Site Vice President

NL-17-008

February 28, 2017

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

SUBJECT: Licensee Event Report # 2016-010-01 "Safety System Functional Failure  
Due to an Inoperable Containment Caused by a Through Wall Defect in a  
Service Water Supply Pipe Elbow to the 24 Fan Cooler Unit"  
Indian Point Unit No. 2  
Docket No. 50-247  
DPR-26

Reference: 1. LER-2016-010-00 (NL-16-140) dated December 21, 2016

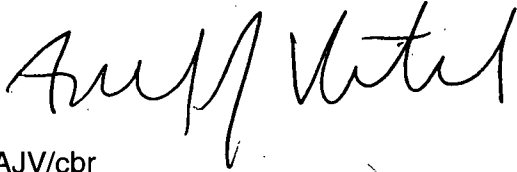
Dear Sir or Madam:

Pursuant to 10 CFR 50.73(a)(1), Entergy Nuclear Operations Inc. (ENO) hereby provides Licensee Event Report (LER) 2016-010-01. The attached LER is a revision to an LER submitted by Reference 1, that identifies an event where there was a safety system functional failure due to an inoperable Containment as a result of a through wall defect in a Service Water (SW) supply pipe elbow to the 24 Containment Fan Cooler Unit. This condition is reportable under 10 CFR 50.73(a)(2)(v). This condition was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2016-06934 and CR-IP2-2016-07271. At the time of submittal, only the likely cause was initially provided as the root cause evaluation (RCE) was not complete. After completion of the RCE the specific cause was identified and additional corrective actions were planned, necessitating a revision to the original LER.

JEZZ  
NRR

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) 254-6710.

Sincerely,

A handwritten signature in black ink, appearing to read "Andrew V. Vitek". The signature is written in a cursive style with a large initial "A".

AJV/cbr

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



U.S. NUCLEAR REGULATORY  
COMMISSION

LICENSEE EVENT REPORT (LER)  
(See Page 2 for required number of  
digits/characters for each block)

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018

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 Infocollections.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.

<b>1. FACILITY NAME</b> Indian Point 2	<b>2. DOCKET NUMBER</b> 05000-247	<b>3. PAGE</b> 1 OF 5
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**4. TITLE:** Safety System Functional Failure Due to an Inoperable Containment Caused by a Through Wall Defect in a Service Water Supply Pipe Elbow to the 24 Fan Cooler Unit

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
11	21	2016	2016	010	01	2	28	2017	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> <i>(Check all that apply)</i>			
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 type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
100%	<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 checked="" 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 checked="" 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	


<b>12. LICENSEE CONTACT FOR THIS LER</b>	
LICENSEE CONTACT Dennis Pennino, Engineer, Engineering Systems	TELEPHONE NUMBER (Include Area Code) (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	MANU-FACTURER	REPORTABLE TO EPIX
X	BI	PSF	U080	Yes					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR

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

On November 21, 2016, as a result of investigating an increased level rise in the Waste Hold-Up Tank (WHUT), Operators identified a corresponding rise in containment sump level. A containment entry was made to investigate the source of the sump level rise and determined the source was a through wall leak in a Service Water (SW) supply pipe elbow to the 24 Fan Cooler Unit (FCU). The leak constituted a breach of a closed system within containment. Technical Specification (TS) 3.6.1 (Containment) was entered and containment declared inoperable. TS 3.6.6 (Containment Spray and Fan Cooler System) was entered when the 24 FCU was secured and SW to the 24 FCU was isolated. Inspections identified a through wall leak on a SW supply pipe elbow to one of the 24 FCU water boxes. The leak is on a 3 inch carbon steel epoxy-lined elbow. The pipe fitting is in an ASME ISI Code Class 3, nuclear safety related piping system. The direct cause was failure of the interior coating allowing brackish river water to corrode the carbon steel fitting. The root cause was the maintenance coating procedure requirements for post-coating inspections were inadequate. Key corrective actions included removal of the defective elbow and weld repair, recoating and re-installation. Maintenance procedure 0-SYS-409-GEN will be revised to mandate detailed inspections and/or testing of surface preparation and applied coatings to ensure proper coverage and adhesion. The event had no effect on public health and safety.

NRC FORM 366A (11-2015)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB: NO. 3150-0104	EXPIRES: 10/31/2018
 <b>LICENSEE EVENT REPORT (LER) CONTINUATION SHEET</b>		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.	

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Indian Point 2	05000-247	YEAR	SEQUENTIAL NUMBER	REV NO.
		2016	- 010	- 01

**NARRATIVE**

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

**DESCRIPTION OF EVENT**

On November 21, 2016, while at 100 percent reactor power, Operations investigated an increase in level rise in the Waste Holdup Tank (WHUT) {WD} and identified a corresponding rise in Containment {NH} sump level. At 16:50 hours, Entered Technical Requirements Manual (TRM) 3.4.D (Containment Free Volume Leakage) Condition A (Total leakage into the containment free volume greater than 10 gpm). At 16:55 hours, entered procedure 2-AOP-Flood-1 (Flooding) due to calculated leakage into containment of approximately 15 gpm. At 17:30 hours, a Containment entry was made to investigate the source of the sump level rise. The Control Room was notified at 17:38 hours, the investigation by operations identified the source of the leak was a through wall defect in a Service Water {BI} supply pipe elbow {PSF} to the 24 Fan Cooler Unit {FCU}. Entered Technical Specification (TS) 3.6.1 (Containment), Condition A (Containment Inoperable) due to the possibility of a loss of containment {NH} integrity. The 24 FCU was isolated and removed from service at approximately 17:38 hours. Entered TS 3.6.6 (Containment Spray System and Containment Fan Cooler System), Condition C (One Containment FCU Train Inoperable). After completing isolation of the 24 FCU SW, TS 3.6.1 was exited. As SW is credited as a containment boundary the defect in the SW pipe was determined to be a loss of safety function requiring an 8-hour non-emergency notification to the NRC. A non-emergency notification was made to the NRC for a safety system functional failure under 10CFR50.72(b)(3)(v) by Event Notification number 52388 at 21:22 hours. The leak was recorded in Indian Point Energy Center (IPEC) corrective action program (CAP) as CR-IP2-2016-06934 and CR-IP2-2016-07271.

The SW System (SWS) {BI} 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 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 leak was a defect in a pipe fitting that is within the ASME Section XI Code ISI Class 3 boundary. The pipe fitting leak is in a moderate energy ASME ISI Code Class 3, nuclear safety related piping system. Because the defect in the elbow was through wall and was located within the ASME Section XI boundary, it exceeded the flaw allowable limits provided per IWD-3000. Since the through wall defect was located in a welded fitting (elbow), the ASME Code Case N-513-3 could not be applied because it excludes socket welds and pipe fittings.

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

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**NARRATIVE**

The pipe elbow for the SW supply to the 24 FCU is epoxy coated carbon steel located on approximately the 76 foot elevation in containment. The through wall flaw was next to weld of the elbow to SW supply pipe.

The Containment Fan Cooler system consists of five 20 percent capacity FCUs located inside containment. These FCUs are used for both normal and post-accident cooling of the containment atmosphere. Each FCU consists of a motor, fan, cooling coils, dampers, duct distribution system and instrumentation and controls. SW is supplied to the cooling coils of each FCU 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. It is necessary to limit the ambient containment air temperature during normal operation to less than the limit specified in TS 3.6.5 (Containment Air Temperature).

An extent of condition review included a best effort visual inspection of all FCUs. There was no evidence of additional leakage at any other place in the 24 FCU supply or return line or at any other location in the other four FCU lines 3 inch SW supply or return lines. The potential exists for a similar condition of lining degradation on the remaining spool pieces in the 24 FCU that were previously Enecon repaired. Unit 3 is not applicable to this condition as the piping material is not similar. Unit 3 utilizes 3 inch Schedule 40, 904L alloy stainless steel piping and does not have interior epoxy lining.


**CAUSE OF EVENT**

The direct cause was failure of the interior Enecon (epoxy) coating allowing brackish river water to corrode the carbon steel pipe fitting. The pipe elbow with the flaw resulted in containment out leakage in excess of 10CFR50, Appendix J limits. The root cause was maintenance coating procedure (0-SYS-409-GEN) requirements for post-coating inspections were inadequate. A defect or holiday in the applied coating remained undetected which eventually resulted in a coating functional failure. The coating failure in turn allowed corrosion to initiate and propagate through-wall by allowing brackish river water to contact the interior of the carbon steel pipe fitting (elbow).

**CORRECTIVE ACTIONS**

The following corrective actions have been or will be performed under the Corrective Action Program (CAP) to address the causes of this event:

- The defective elbow was removed, code weld repaired, recoated on the interior and reinstalled.
- Maintenance procedure 0-SYS-409-GEN will be revised to include a mandate for detailed inspections and/or testing of the surface preparation and applied coatings to ensure proper coverage and adhesion. Requirements will be added to document the specific components coated and extent of the coatings applied to each component. A requirement will be included that any changes in the scope of the components coated are to be documented and concurred with by engineering.

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**NARRATIVE**

- The IPEC Site Specific Curricula for GL 89-13 Program Inspections (Qualification Card) will be updated to include specific requirements for coating and lining inspections for FCU piping.
- A detailed visual inspection will be performed of all 3 inch FCU SW piping elbow coatings during the FCUs scheduled Preventive Maintenance.
- Procedure SEP-SW-IPC-001 will be revised to include a requirement in the GL 89-13 Program to conduct and document a 100 percent internal lining visual inspection of all 3 inch FCU piping spool pieces, when removed during future FCU cooling coil PMs.

**EVENT ANALYSIS**

The event is reportable under 10 CFR 50.73(a)(2)(v)(C). The licensee shall report any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to (C) Control the release of radioactive material. This condition meets the reporting criteria because TS 3.6.1 Containment Operability was not met. The pipe flaw leakage was determined to be greater than the 10 CFR 50, Appendix J allowable leak rate. TS 3.6.1 (Containment) requires the containment to be operable in Modes 1-4. TS Surveillance Requirement (SR) 3.6.1.1 requires visual examinations and leakage rate testing in accordance with the containment Leakage Rate Testing Program specified in TS 5.5.15. SR 3.6.1.1 leakage rate requirements comply with 10 CFR 50, Appendix J, Option B. As SW is required in an accident, the SW to the FCU would not be isolated in DBA and the piping credited as a closed system inside containment for containment integrity.

Consequently, defects discovered within the FCU SW piping may adversely affect containment integrity and the ability to control releases of radioactive material. The condition also meets the reporting criteria of 10 CFR 50.73(a)(2)(i)(B). The licensee shall report any operation or condition which was prohibited by the plant's TS. During the previous period of operation for an unknown period of time the SW pipe contained a through wall leak that did not meet code requirements. This previously unrecognized condition required entry into TS 3.7.8 and corrective actions implemented to return the pipe to operable. Failure to comply with the TS LCO and perform required actions is a TS prohibited condition.

**PAST SIMILAR EVENTS**

A review of the past three years of Licensee Event Reports (LERs) for events that involved containment integrity due to flawed piping credited as a closed system inside containment identified two LERs. LER-2015-001-01 reported a Technical Specification prohibited condition and a Safety System Functional Failure (SSFF) due to a through wall leak on the 24 FCU motor cooler SW return line that results in exceeding the allowable leakage rate for containment. This LER is similar as the SW pipe defect was in piping credited as a closed system for containment integrity. However, the pipe material (copper-nickel) and function (motor cooler return) are different. The direct cause was similar (pitting corrosion) but the apparent cause was different (length of time to replace the copper-nickel piping) as this LER concerns epoxy coated carbon steel. LER-2015-004 reported a SSFF due to an inoperable containment caused by a flaw on an elbow on the 24 FCU SW motor cooler return line.

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(11-2015)

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### NARRATIVE

#### SAFETY SIGNIFICANCE

This condition 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. 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 and instrumentation to alert operators to a degraded condition.

The containment consists of the concrete reactor building, its steel liner, and the penetrations through the structure. The containment building is designed to contain radioactive material that might be released from the reactor following a design basis accident (DBA). The containment building steel liner and its penetrations establish the leakage limiting boundary of the containment.

Maintaining the containment operable limits the leakage of fission product radioactivity from the containment to the environment. The DBA analysis assumes that the containment is operable such that, for the DBAs involving release of fission product radioactivity, release to the environment is controlled by the rate of containment leakage.

The containment was designed with an allowable leakage rate of 0.1 percent of containment air weight per day. Containment isolation valves form a part of the containment pressure boundary. Two barriers in series are provided for each penetration so that no single credible failure or malfunction of an active component can result in a loss of isolation or leakage that exceeds limits assumed in the safety analysis. One of these barriers may be a closed system such as the SW piping for the FCUs. The only time containment integrity can be affected is post accident when the FCUs safety function is being performed and SW pressure for the FCU cooling piping and coils may fall below peak accident pressure. Mitigation of radiation release by the degraded SW pipe pathway can be by use of radiation monitors R-46 and R-53 which monitor containment fan cooling water for radiation indicative of a leak from the containment atmosphere into the cooling water. If radiation is detected, each FCU heat exchanger can be individually sampled to determine the leaking unit. The SW for the 24 FCU can be isolated to prevent radioactive effluent releases. During the time the FCU SW piping was degraded there was no leakage out of containment.