Entergy

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Site Vice President

NL-16-045

May 2, 2016

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

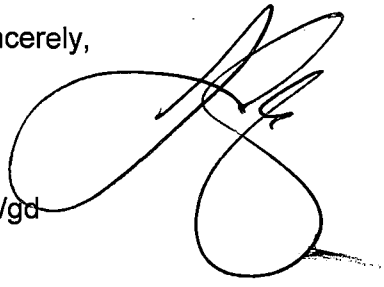
SUBJECT: Licensee Event Report # 2016-001-00, "Technical Specification Prohibited Condition Caused by a Main Steam Safety Valve Outside Its Required As-Found Lift Setpoint Range"
Indian Point Unit No. 2
Docket No. 50-247
DPR-26

Dear Sir or Madam:

Pursuant to 10 CFR 50.73(a)(1), Entergy Nuclear Operations Inc. (ENO) hereby provides Licensee Event Report (LER) 2016-001-00. The enclosed LER identifies an event where there was a Technical Specification prohibited condition for an inoperable Main Steam Safety Valve (MSSV), 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-IP2-2016-01204.

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/gd

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

IE22
NRR

NRC FORM 366 (01-2014) 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 Records and FOIA/Privacy Service 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-l0202, (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 Prohibited Condition Caused by One Main Steam Safety Valve Outside Its As-Found Lift Set Point Test Acceptance Criteria

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
3	4	2016	2016	001 -	00	5	2	2016		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

79%

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)*
Anthony De Donato, Code Programs	(914) 254-6683

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	SB	RV	C710	Yes					

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 March 4, 2016, during the performance of surveillance procedure 2-PT-R006, Main Steam Safety Valve (MSSV) MS-45B failed to lift within the Technical Specification (TS) as-found required range of +/- 3% of the setpoint pressure. Valve MS-45B lifted at 1125 psig, 29 psig outside its acceptance range of 1034 to 1096 psig and 5.7% above its 1065 psig setpoint. The valve was declared inoperable, then subsequently restored to operability upon two successful lifts within the required setpoint range without the need for adjustment. Nine other MSSVs that were tested lifted within the as-found required setpoint range. The apparent cause for the failure was internal friction due to spindle rod wear, which causes the spindle rod to bind against internal components. Corrective actions were modification of MS-45B and twelve other MSSVs, and the replacement of their spindle rods. The event had no effect on public health and safety.

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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 March 4, 2016 at 1116 hours, while at approximately 79 percent power, during surveillance testing of the Main Steam Safety Valves (MSSV) in accordance with procedure 2-PT-R006, MSSV MS-45B on Steam Generator (SG) 22 failed to lift within the Technical Specification (TS) as-found required range of +/- 3% of the required setpoint pressure. Valve MS-45B lifted at 1125 psig, 29 psig outside its setpoint range of 1034 to 1096 psig and 5.7% above its 1065 psig setpoint. Consequently, MS-45B was declared inoperable and Technical Specification (TS) 3.7.1 (Main Steam Safety Valves) Condition A was entered. Two immediate subsequent tests were performed without any adjustments required and the valve lifted at 1038 psig and 1037 psig. With the valve lifting within the required setpoint range, the valve was restored to operability, allowing exit from the TS 3.7.1 Action Statement at 1126 hours. During the surveillance test, nine (9) other MSSVs that were tested passed their as-found test criteria and were left within the +/- 1% set point criteria. The failure of MS-45B was recorded in the Indian Point Energy Center (IPEC) Corrective Action Program (CAP) as Condition Report CR-IP2-2016-01204.

During the performance of the 6-year Internal Inspection Preventive Maintenance (PM) activity on MS-45B completed on March 31, 2016 during refueling outage 2R22, numerous dimensions, clearances, and tolerances were verified and internal components were inspected for wear/damage. The valve spindle rod was found to have areas of wear along its length and around the circumference in the form of small steps, which is attributed to system vibration during power operation. All other inspection criteria were satisfactory.

There are five code safety valves (MSSVs) and one atmospheric dump valve (ADV) {RV} on each main steam (MS) line outside the Reactor Containment {NH} and upstream of the MS isolation valves {ISV}. The MSSVs consist of four 6-inch by 10-inch and one 6-inch by 8-inch valve per SG on each of four MS lines for a total of 20 valves. The five valves on each steam line are nominally set to open at 1065, 1080, 1095, 1110, and 1120 psig. The MSSVs are ASME Code relief valves, manufactured by Crosby-Ashton {C710}. Valve MS-45B is a 6-inch by 8-inch Model HA-65W Safety Valve.

CAUSE OF EVENT

The apparent cause for the failure was internal friction due to spindle rod wear, which causes the spindle rod to bind against internal components. High vibrations of the spindle rod caused friction between the rod, spring washer, and adjusting bolt. The vibration of the spindle rod while in contact with the spring washer and adjusting bolt resulted in severe wear in the form of steps on the spindle rod. The resulting frictional force occurs on the first lift and then does not repeat.

The vendor's solution to the problem is to install sacrificial bronze wear sleeves along the inner diameter of the spindle rod contact points (inner diameters of the adjusting bolt, upper spring washer, and lower spring washer). The spring washers and adjusting bolt are machined to accept the bronze wear sleeves, which act as a sacrificial metal, preventing spindle wear and step formation. One sleeve is installed in each of the spring washers and two sleeves are installed in the adjusting bolt.

An extent of condition (EOC) was performed to determine where potential conditions with similar valves, design, systems, and environments could occur. The review determined that the EOC found in the failure of MS-45B is restricted to the other 19 MSSVs at Unit 2 and the 20 MSSVs at Unit 3 due to the exclusive valve design. All MSSVs are exposed to high vibrations during their operating cycle during which wear can occur. Previous failures of MSSVs have included wear due to spring skewing and setpoint drift. Spring skewing can occur in any of the MSSVs and cause side loading frictional forces which prevent the valve from lifting. Setpoint drift can occur due to age of the components and the operating cycle it is exposed to (e.g., changes in temperature, pressure and vibrations).

PAST SIMILAR EVENTS

A review was performed of Licensee Event Reports (LERs) for any events reporting TS prohibited conditions due to MSSV test failures. LER 2010-002 reported two MSSV failures, one due to valve spring skew and the other due to setpoint drift. LER 2012-005 reported one MSSV outside the required as-found lift setpoint range due to spring skew/spindle wear.

The MSSVs at Unit 2 are the same as those at Unit 3, and LERs have reported MSSV test failures at Unit 3. LER-2011-004 reported two MSSVs outside the required as-found lift setpoint ranges due to spindle wear and spring skew. LER-2013-001 reported two MSSVs outside the required as-found lift setpoint ranges due to galling around the circumference of the spindle rod as a result of vibration for one valve, and internal friction caused by foreign material between the guide bearing and spindle for the other valve. LER 2015-002 reported three MSSVs outside the required as-found lift setpoint ranges due to internal friction from spindle rod vibration.

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CORRECTIVE ACTIONS

A modification was initiated in 2011 to install bronze wear sleeves in the upper and lower spring washers and the adjusting bolt as a solution to valve spring skew and spindle wear for the IPEC MSSVs. This modification was completed for 7 of the 20 Unit 2 MSSVs in the 2014 refueling outage (2R21). Valve MS-45B and the 12 other MSSVs that were not modified in 2R21 were modified in the 2016 refueling outage (2R22). New spindles were also installed in these 13 MSSVs in 2R22. All 20 MSSVs have been modified with the bronze wear sleeves.

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 TS. TS 3.7.1 (Main Steam Safety Valves) requires the MSSVs to be operable in accordance with TS Tables 3.7.1-1 and 3.7.1-2. The applicable accident/transient analyses require five MSSVs per SG to provide overpressure protection for design basis transients occurring at 102% reactor thermal power. The MSSVs also provide a heat sink for the Reactor Coolant System if the Main Condenser is unavailable and the ADVs cannot relieve steam line pressure.

Operability of the MSSVs is defined as the ability to open within the setpoint range, relieve SG overpressure, and reseat when pressure has been reduced, and is determined by periodic surveillance testing. TS Surveillance Requirement (SR) 3.7.1.1 requires that each MSSV be verified to lift at its required setpoint per Table 3.7.1-2 in accordance with the Inservice Testing Program (IST). On March 4, 2016, MSSV valve MS-45B was found outside its required setpoint range, therefore, it failed its as-found testing criteria and was declared inoperable. The valve was disassembled and inspected and determined to have conditions preventing proper operation. The apparent cause determined that failure was due to internal friction caused by spindle rod wear from vibration during the operating cycle. Spindle wear is not normal drift, therefore, the valve may have been inoperable during past operation. As it is not possible to determine when the valve would not have lifted within its required setpoint range, the valve was concluded to be inoperable for greater than the TS allowed completion time. An evaluation of applicable accident/transient analyses was performed to determine the impact of one MSSV with a higher opening setpoint. The evaluation concluded the condition would not have resulted in a loss of safety function. Therefore, this condition is not reportable under 10CFR50.73(a)(2)(v) as a safety system functional failure.

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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 transients requiring the MSSVs.

There was no significant potential safety impact of the condition under reasonable and credible alternate conditions. Had an accident or transient occurred during the condition of the out of tolerance MSSV, the condition would not have significantly affected accident mitigation capability and the MSSVs overpressure function would have been adequate. The design basis of the MSSVs is to limit the secondary system pressure to 110% of design pressure when passing 100% of design steam flow. Each MS line has an ADV capable of releasing steam to the atmosphere. The ADVs have the capability to relieve approximately 10% of total steam.

The MSSV design basis is sufficient to cope with any anticipated operational occurrence or accident considered in the Design Basis Accident and transient analysis. The events that challenge the relieving capacity of the MSSVs, and thus Reactor Coolant System pressure, are those characterized as decreased heat removal events, whose evaluations are presented in UFSAR Chapter 14. Of these, the full power loss of external electrical load without steam dump is the limiting event.

The limiting UFSAR Chapter 14 transients which do not credit the ADVs and which are impacted by the higher MSSV setpoint were evaluated and it was concluded that the acceptance criteria for the transients would have been met with the out of tolerance MSSV.