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NL-16-048

May 6, 2016

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

SUBJECT: Licensee Event Report # 2016-003-00, "Technical Specification (TS) Prohibited Condition Due to an Inoperable 21 Main Boiler Feedwater Pump Discharge Valve for Greater Than the TS Allowed Outage Time"
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) 2016-003-00. The attached LER identifies an event where there was a Technical Specification (TS) Prohibited Condition due to an inoperable Main Boiler Feedwater Pump (MBFP) discharge valve BFD-2-21 as a result of the failure of BFD-2-21 to close on demand. Technical Specification 3.7.3 (Main Feedwater Isolation) requires two MBFP discharge valves to be operable and TS Condition C has an Allowed Outage Time of 72 hours to close or isolate the MBFP discharge valve. The valve was determined to have been inoperable since December 5, 2015, due to a failed torque switch. This condition is reportable under 10 CFR 50.73(a)(2)(i)(B) as the TS Condition C Completion Time was not met. This condition was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2016-1236.

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,

JF/cbr

Attachment: LER-2016-003

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 4

4. TITLE: Technical Specification (TS) Prohibited Condition Due to an Inoperable 21 Main Boiler Feedwater Pump Discharge Valve for Greater Than the TS Allowed Outage Time

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
03	07	2016	2016-	003 -	00	05	06	2016		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

3

10. POWER LEVEL

0%

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)*
Tat Chan, Supervisor, Engineering Systems	(914) 254-6973

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
E	SJ	33	L200	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 March 7, 2016, during a refueling outage the control switch for the 21 Main Boiler Feedwater Pump (MBFP) was positioned to trip and the 21 MBFP tripped as designed but the MBFP discharge valve BFD-2-21 failed to fully close. MBFP discharge valve BFD-2-21 was declared inoperable and Technical Specification (TS) 3.7.3 (Main Feedwater Isolation) Condition C (One or both MBFP discharge valves inoperable) was entered. Troubleshooting on the valve determined the close torque switch contact finger was out of position within the contact holder. This misalignment allowed the contact finger to move out of the proper position causing Motor Operated Valve (MOV) BFD-2-21 to fail to close. Direct cause was valve BFD-2-21 close torque switch was out of position. The apparent cause was the MOV preventive maintenance procedure lacked the level of detail and direction to provide the appropriate guidance to recognize the susceptibility associated with the orientation of the close torque switch contact finger bracket opening and spreading of the "U" shape bracket. Corrective actions included replacement of the defective torque switch, inspection and testing. A case study from this event will be developed and included in the continual ESP training. The adequacy of the guidance on work instruction on the arrangement/alignment of the contact "U" shape brackets will be evaluated and the necessary guidance provided. The event had no significant effect on public health and safety.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Indian Point Unit 2	05000-247	2016	- 003	- 00	2 OF 4

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 7, 2016, at approximately 00:10 hours, during plant shutdown for refueling outage cycle 22, while in Mode 3 (Hot Standby), the control switch {33} for the 21 Main Boiler Feedwater Pump (MBFP) {SJ} was positioned to trip and the 21 MBFP tripped as designed but the MBFP discharge valve BFD-2-21 {ISV} failed to close. Operations observed a duel light indication for BFD-2-21 valve position on Control Room Panel FAF identifying the valve failed to fully close. MBFP discharge valve BFD-2-21 was declared inoperable and Technical Specification (TS) 3.7.3 (Main Feedwater Isolation) Condition C (One or both MBFP discharge valves inoperable) was entered. TS 3.7.3 Required Action C.1 is to close or isolate the MBFP discharge valves within 72 hours, and C.2 verify MBFP discharge valves are closed or isolated once per 7 days. At 3:15 hours, valve BFD-2-21 was manually closed and de-energized then cracked open 20 hand wheel turns off its seat to eliminate thermal binding concerns. The condition was recorded in the Indian Point Energy Center (IPEC) Corrective Action Program (CAP) in Condition Report CR-IP2-2016-01236.

On March 7, 2016, troubleshooting commenced at approximately 19:47 hours, to determine the cause of the valve BFD-2-21 failure to close. On March 9, 2016, during troubleshooting of valve BFD-2-21, when the limit switch compartment cover was removed the close torque switch contact finger was found slipped out of position within the contact holder. Inspection of the failed torque switch identified that the "U" shaped contact holder was slightly bent or spread open and the tabs at each end of the holder were not parallel with each other. Engineering concluded this misalignment would allow the contact finger to have free play within the contact holder. Excessive free play within the contact holder contributed to the contact finger moving out of the proper position. In addition, the orientation and arrangement of BFD-2-21 actuator/torque switch is such that the opening in the contact holder is angled slightly downward. This orientation would make it easier for the contact finger to slip out of the gap. On March 9, 2016, the torque switch was replaced and the valve stroke tested satisfactory. Discussions were held with the original torque switch manufacturer (Limitorque) (OEM) and they recommended that during installation of the new torque switch specific additional inspections be performed and the Indian Point MOV preventive maintenance (PM) procedure be enhanced. Limitorque also recommended an enhancement which could provide a heavier duty compression spring (located under the contact finger) which would aid in preventing recurrence of this type failure. After a major PM on the valve, inspections and diagnostic testing were performed to monitor torque switch operation and proper torque switch contact holder assembly.

The closed circuit for motor operated valve (MOV) BFD-2-21 is supervised by limit switch 8. Limit switch 8 (LS8) is set to open and de-energize the motor after the valve disc contacts the valve seat (closed position). The closed torque switch is in series with the close LS8 and provides mechanical overload protection. The closed torque switch is set high enough so that normal operation of BFD-2-21 will not cause its contacts to open. The closed torque switch is bypassed using Limit Switch 9 (LM9) for the first two seconds of the closing stroke. This ensures full motor capability is available to start the valve close which will initiate the trip signals to the MBFPs. After two seconds the close torque switch bypass is out of the circuit and the valve will continue to close until either LS8 or the close torque switch contacts opens.

The MBFP discharge valve BFD-2-21 is a motor operated gate valve with a torque switch, model number SMB-3 (actuator) manufactured by Limitorque {L200} (Flowserve), part number 11501-042 (Torque switch) {33}.

The main FW system consists of two steam turbine driven feedwater pumps which supply the necessary FW requirements during normal operation by discharging through three parallel high pressure FW heaters into the steam generators (SG). Flow into the SGs is controlled by regulating the FW pump speed and individual SG level control valves. FW discharge from the FW pumps is through check valves and motor operated gate valves into a common header.

An extent of condition (EOC) review determined the unique conditions of the alignment, orientation of the torque switch contact finger and spreading of the "U" shape bracket would be applicable to the 22 MBFP discharge valve (BFD-2-22). Valve BFD-2-22 was inspected and stroked properly and closed with no issues. A corrective action was initiated to evaluate the remaining population of MOVs for a similar condition.

Cause of Event

Direct cause of the failure to close of MBFP discharge valve BFD-2-21 was the valve's close torque switch contact finger was out of position. The apparent cause was the MOV preventive maintenance procedure lacked the level of detail and direction due to an unrecognized susceptibility associated with the orientation of the close torque switch contact finger bracket opening and spreading of the "U" shape bracket. The downward arrangement makes it easier for the torque switch contact finger to move out with spreading of the "U" shape contact holder. The closed torque switch contact finger was misaligned in the retaining bracket.

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:

- The defective torque switch was replaced and BFD-2-21 and BFD-2-22 were inspected and tested.
- MBFP 22 discharge valve BFD-2-22 was inspected and a Work Order implemented to validate BFD-2-22 was acceptable.
- The remaining population of motor operated valves (MOVs) will be evaluated for a similar condition.
- A case study from this event will be developed and included in the continual ESP training.
- The adequacy of the guidance on work instruction on the arrangement/alignment of the contact "U" shape brackets will be evaluated and the necessary guidance provided to either the fleet procedure (EN-MA-141) or the Work Program (Asset Suite).

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 3.7.3 (Main Feedwater System) requires the two MBFP discharge valves and the trip function to be operable. TS 3.7.3 Condition C (One or both MBFP discharge valves inoperable) required action C.1 is to close or isolate MBFP discharge valve within 72 hours and C.2 verify MBFP discharge valve is closed or isolated once per 7 days. As a result of discovering on March 7, 2016, that MBFP discharge valve BFD-2-21 would not close and that would not have closed upon demand due to a failed torque switch, TS 3.7.3 Condition C was not met. Valve BFD-2-21 was last demonstrated operable on December 5, 2015, when there was a reactor trip and no reported issue with valve closure.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Indian Point Unit 2	05000-247	2016	- 003	- 00	4 OF 4

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

There was no safety system functional failure reportable under 10 CFR 50.73(a)(2)(v). The MBFP discharge valve BFD-2-22 for the 22 MBFP was operable and isolation of Main FW from the 21 MBFP could have been accomplished in accordance with TS Basis 3.7.3.a by closure of the Main FW Regulating Valves (MFRVs), trip of the MBFPs, and the closure of all four Low Flow Main FW Bypass Valves (FBVs).

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 MBFPs. No LERs were identified.

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.

Isolation of the main FW system is necessary to mitigate accident and transient conditions [Main Steam Line Breaks (SLB), SG Tube Ruptures, and Excessive Heat Removal Due to FW System Malfunction]. Main FW must be isolated to prevent excessive reactor coolant system cooldown, containment overpressure, and steam line overfill. Main FW isolation is initiated by either an Engineered Safety Feature Actuation System (ESFAS) safety injection (SI) signal or a high steam generator water level signal. Main FW isolation to all four SGs is provided by either 1) Closure of all four main FW regulating valves (MFRVs) and all four Low Flow Main FW Bypass Valves (FBVs), or 2) Closure of both MBFP discharge valves which initiates closure of all eight FW Isolation Valves (MFIVs), and the trip of both MBFPs. Either of these combinations is capable of achieving main FW isolation to all four SGs within the time limits assumed in the accident analysis. If all eight valves referenced in item 1 close, main FW isolation to all four SGs is completed within time limits that satisfy accident analysis assumptions. To establish redundancy for main FW isolation safety function, the SI ESFAS or High SG Level signal also provides a direct signal that closes the two MBFP discharge valves. When both MBFP discharge valves move off the open seat, the relay actuates and generates a signal that initiates closure of the four main FW isolation valves (MFIVs) and the four Low Flow FIVs. For this event, all FW isolation capabilities were operable except the 22 MBFP discharge valve BFD-2-21. This event was bounded by the analyzed event described in FSAR Section 14.1.10, (Excessive Heat Removal Due to Feedwater System Malfunctions). Excessive FW additions is an analyzed event postulated to occur from a malfunction of the FW control system or an operator error which results in the opening of a FW control valve. The analysis assumes one FW valve opens fully resulting in the excessive FW flow to one SG. For the FW system malfunction at full power, the FW flow resulting from a fully open control valve is terminated by the SG high level signal that closes all FW control valves and trips the MBFPs. The SG high water level signal also produces a signal to trip the main turbine which initiates a reactor trip. The analysis for all cases of the excessive FW addition initiated at full power conditions with and without automatic rod control, show that the minimum DNBR remains above the applicable safety analysis DNBR limit. In the case of excessive FW flow with the reactor at zero power, the resulting transient is similar to, but less severe than the hypothetical steamline break transient and is bounded by the analysis in UFSAR Section 14.2.5 (Rupture of a Steam Pipe).