Entergy

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John A. Ventosa
Site Vice President

NL-13-049

April 15, 2013

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

SUBJECT: Licensee Event Report # 2013-001-00, "Manual Reactor Trip as a Result of Decreasing Steam Generator Water Levels Caused by the Trip of Both Heater Drain Tank (HDT) Pumps During AOV Diagnostic Testing"
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) 2013-001-00. The attached LER identifies an event where the reactor was manually tripped, which is reportable under 10 CFR 50.73(a)(2)(iv)(A). As a result of the reactor trip, the Auxiliary Feedwater System was actuated, which is also reportable under 10 CFR 50.73(a)(2)(iv)(A). This condition was recorded in the Entergy Corrective Action Program as Condition Report CR-IP2-2013-00721.

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,

JAV/cbr

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

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NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

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

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
INDIAN POINT 2	05000-247	1 OF 5

4. TITLE: Manual Reactor Trip as a Result of Decreasing Steam Generator Water Levels Caused by the Trip of Both Heater Drain Tank Pumps During AOV Diagnostic Testing

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
02	13	2013	2013-	001 -	00	04	15	2013	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE: 1

10. POWER LEVEL: 85%

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)
John Ferrick, Production Manager	(914) 254-5066

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
D	SN	LCV	V037	Y					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO				

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

On February 13, 2013, operators initiated a manual reactor trip (RT) as a result of lowering steam generator (SG) levels. All control rods fully inserted and all required safety systems functioned properly. The plant was stabilized in hot standby with decay heat being removed by the main condenser {SG}. The Auxiliary Feedwater System automatically started as expected due to SG low level from shrink effect. An investigation determined the decreasing SG levels was due to reduced main feedwater (FW) flow from a loss of Heater Drain Tank (HDT) pumps. The HDT pumps tripped during valve diagnostics on HDT level control valve LCV-1127B which resulted in HDT Large Dump valves failing open. The open HDT large dump valves resulted in low HDT level and trip of the HDT pumps. The HDT large Dump valves failed open when the current/pressure (I/P) lead was lifted during air operated valve (AOV) diagnostics per procedure 0-IC-PC-AOV. Loss of HDT flow to the main feedwater pumps (FWPs) caused the FWPs speed controller cutback to reduce FW flow to the SGs. The root cause (RC) was inadequate procedure design and content. Corrective actions from the RC will be to revise Maintenance procedures 0-IC-PC-AOV and 0-VLV-404-AOV to: 1) Eliminate conditional steps for equipment setup that allows changes to work scope to be made in the field without proper review prior to performing work, 2) Eliminate the subject Caution block, and 3) Include signature blocks for review of drawings and validation that lifting a I/P lead or disconnecting the instrument tubing will not affect any other valve or component. The event had no 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 February 13, 2013, while at approximately 85% reactor power during power reduction, operators initiated a manual reactor trip (RT) {JC} at 13:55 hours, as a result of lowering steam generator (SG) {AB} levels. All control rods {AA} fully inserted and all required safety systems functioned properly. The plant was stabilized in hot standby with decay heat being removed by the main condenser {SG}. The Auxiliary Feedwater System {BA} automatically started as expected due to SG low level from shrink effect. There was no radiation release. The Emergency Diesel Generators {EK} did not start as offsite power remained available. The event was recorded in the Indian Point Energy Center corrective action program (CAP) as CR-IP2-2013-00721. A post trip evaluation was initiated and completed on February 13, 2013.

Prior to the event, Instrumentation and Control (I&C) personnel were performing air operated valve (AOV) diagnostics per procedure 0-IC-PC-AOV (Use of Air Operator Valve Diagnostics) which directed lifting the Current/Pressure (I/P) lead to Heater Drain Tank (HDT) {SN} level control valve LCV-1127B {LCV}. When the lead was lifted valves LCV-1127C and LCV-1127D failed open. LCV-1127C and LCV-1127D are large dump valves for drain lines to the condensers. The open dump valves resulted in draining the HDT causing a low level in the HDT that resulted in a trip signal to the heater drain pumps {P}. Loss of heater drain pump flow to the suction of the main feedwater {SJ} pumps was sensed by the feedwater pump suction header pressure transmitter and provided an input signal to the feedwater pump speed control system {JK} (low suction pressure cutback) reducing FW pump discharge flow to the SGs.

On February 13, 2013, Control Room operators received a hotwell low level alarm followed by a hotwell low low level alarm at 13:50 hours. At 13:52 hours, both HDT pumps tripped and operators entered abnormal operating procedure 2-AOP-FW-1 (Loss of Main Feedwater) and commenced turbine load reduction. As a result of decreasing SG levels and the inability to maintain SG levels, operators initiated a manual RT at 13:55 hours and entered emergency operating procedure EOP 2-E-0 (Reactor Trip or Safety Injection) and transitioned to 2-ES-0.1 (Reactor Trip Response) at 14:03 hours. Equipment that did not perform properly included 1) neutron source range detector N-31 (failed low), 2) neutron intermediate range detector N-35 (pegged low), and 3) 22 Main FW pump High Pressure stop valve did not close.

During normal operation approximately 65 percent of main feedwater (FW) pump suction water is supplied by condensate flow from the low pressure heaters {SM} and approximately 35 percent is provided by Heater Drain Tank (HDT) pumps discharge. The HDT and its two heater drain pumps are located on the 15 foot evaluation of the Turbine Building {NM}. The primary function of the extraction steam and heater drains and vents system is to extract steam from the turbines at various stages, condense it in the FW heaters and return it to the feed cycle through a cascading drain system. The heater drain pumps take suction from the HDT and pump the contents of the HDT to the suction of the main FW pumps.

The HDT system collects high temperature drains {SN} from the three number 26 FW heaters, the three number 25 FW heaters, and the six moisture separator drain tanks. FW heaters 25A, 25B and 25C drain through a loop seal to the HDT without level control. The HDT is vented back to the 25 FW heaters as drainage is by gravity since the pressure in these heaters and the HDT are essentially equal.

FW heaters 26A, 26B and 26C drain to the HDT through level control valves LCV-1101, 1102 and 1103. The level in the HDT is maintained by electronic level controllers LIC-1127 and LIC-1127A which generate a control signal for level control valves LCV-1127 and LCV-1127A on the discharge of the heater drain pumps. Separate drain lines to each of the three condensers are available through three 10 inch level control valves LCV-1127B, LCV-1127C and LCV-1127D (Large dumps), and through three 4 inch level control valves LCV-5001, LCV-5002 and LCV-5003 (Small dumps).

The HDT large dump valves (LCV-1127B, LCV-1127C, LCV-1127D) are Valtek {V037} Model 06616 globe valves. The actuator and valve are direct acting air to close, fail open valves. The control of the valves is from electronic level transmitter LT-5000 {LT} and level controller LIC-1127E {LIC} when the HDT level is greater than eight inches above the normal level. A high level signal on LT-5000 results in LCV-1127B, LCV-1127C, LCV-1127D opening to drain the HDT. At the valves the electronic signal is converted to a pneumatic signal using an I/P converter. The I/P output pressure is input to the AOV positioner. The positioner has feedback from the valve position and will continue to send a signal to the valve until the desired set point is obtained.

A review of the I/P drawing showed that the LIC-1127E output signal is in a series circuit (daisy chained) through the I/Ps for all three large dump valves. Valve LCV-1127B had a mechanical protective tagout but the remaining two dump valves were not included as part of the protective tagout and were not anticipated to open. Review of the process for performing work on the valve determined the AOV diagnostic portion of the Work Order had never been performed on LCV-1127B. A new PM was created merging the calibration of the valve with the AOV diagnostic. When the work scope was changed from outage to online, it was not recognized as a new PM or a unit trip risk and therefore was not flagged for critical evolution risk review. Electrical prints were not included within the planned package for the control lead that was to be lifted because it was not recognized leads needed to be lifted. The criteria threshold for performing a walk-down was not met as the work was considered a frequently performed diagnostic test. The procedure for AOV diagnostics is generic and does not provide adequate instructions for performing AOV diagnostics on the LCV-1127 series valves with the unit online. Specifically, there is no caution or warning indicating that the I/P lead affects all three large HDT dump valves.

An extent of condition investigation determined the condition can be limited to the AOVs that have active PM's to perform diagnostic testing or calibration. Motor Operated Valves (MOVs) were eliminated as a potential problem based on the design differences between AOVs and MOVs. MOV wiring diagrams were determined to be included within the MOV diagnostic package and lifting leads is reviewed and included in the tag-out boundary.

Cause of Event

The direct cause of the manual RT was lowering SG levels and the inability to maintain SG levels. The decreasing SG levels were due to reduced FW flow from low FW suction pressure. The low FW suction was a result of the loss of HDT pump flow due to the trip of both HDT pumps. Loss of both HDT pumps was caused by a trip signal due to low HDT level. All three HDT large dump valves failed open after de-terminating the I/P leads on valve LCV-1127B in accordance with Work Order (WO) 52202988 during performance of Preventive Maintenance (PM) with AOV Diagnostics per procedure 0-IC-PC-AOV. The open HDT large dump valves drained the HDT resulting in a low level in the HDT.

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

The root cause was inadequate procedure design and content. The procedural steps for equipment setup (specifically Section 4.2) in procedure 0-IC-PC-AOV are conditional and allow changes in testing work scope to be made in the field without proper review prior to performing work. Additionally, the Caution note in the procedure did not provide adequate instructions to field personnel on how to verify no other components were affected. Also, the procedure layout was not adequate for reviewers to determine which test methodology was to be used (installed I/P or test I/P).

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:

- Maintenance procedures 0-IC-PC-AOV and 0-VLV-404-AOV will be revised to: 1) Eliminate conditional steps for equipment setup (Section 4.2) that allows changes to work scope to be made in the field without proper review prior to performing work, 2) Eliminate the subject Caution block, and 3) Include signature blocks that state Instrumentation & Control technician or mechanic has reviewed the I/P signal and instrument air drawings and has validated that lifting the I/P signal lead or disconnecting the instrument tubing will not affect any other valve or component.
- Maintenance procedure EN-MA-143 will be revised to eliminate conditional steps for equipment setup that allows changes to work scope to be made in the field without proper review prior to performing work and the Caution note will be revised to provide clear direction to field personnel performing AOV diagnostics for this component.
- Maintenance procedure 0-VLV-491-ACT will be revised to eliminate conditional steps for equipment setup that allows changes to work scope to be made in the field without proper review prior to performing work and the Caution note will be revised to provide clear direction to field personnel performing AOV diagnostics for this component.
- Work Order packages requiring the lifting of leads will contain electrical prints/drawings related to those leads being lifted in the work package. Proper expectations were developed and communicated for all planners to consistently apply the new work package creation criterion.
- AOV PMs will be converted, where I/P and/or other components are calibrated, to work items with equipment lists to ensure all components are clearly within scope of the PM.

Event Analysis

The event is reportable under 10CFR50.73(a)(2)(iv)(A). The licensee shall report any event or condition that resulted in manual or automatic actuation of any of the systems listed under 10CFR50.73(a)(2)(iv)(B). Systems to which the requirements of 10CFR50.73(a)(2)(iv)(A) apply for this event include the Reactor Protection System (RPS) including RT and AFWS actuation. This event meets the reporting criteria because a manual RT was initiated at 13:55 hours, on February 13, 2013, and the AFWS actuated as a result of the RT. On February 13, 2013, a 4-hour non-emergency notification was made to the NRC at 16:41 hours, for an actuation of the reactor protection system {JC} while critical and included an 8-hour notification under 10CFR50.72(b)(3)(iv)(A) for a valid actuation of the AFW System (Event Log #47999). As all primary safety systems functioned properly there was no safety system functional failure reportable under 10CFR50.73(a)(2)(v).

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Indian Point Unit 2	05000-247	2013	- 001 -	00	5 OF 5

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

Past Similar Events

A review was performed of the past three years for Licensee Event Reports (LERs) reporting a RT as a result of main FW transient. The review identified LER-2010-007. LER-2010-007 reported an automatic RT on September 3, 2010, due to a turbine trip as a result of a high SG level after transition to single FW pump operation. The root cause was inadequate design control of the proportional band and reset settings of the main FW pump speed controller. The cause of the event reported in LER-2010-007 is different from this event therefore, the corrective actions for that event would not have prevented this event.

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 the event was an uncomplicated reactor trip with no other transients or accidents. Required primary safety systems performed as designed when the RT was initiated. The AFWS actuation was an expected reaction as a result of low SG water level due to SG void fraction (shrink), which occurs after a RT and main steam back pressure as a result of the rapid reduction of steam flow due to turbine control valve closure.

There were no significant potential safety consequences of this event. Operators for this event anticipated a possible low SG level and actuated a manual RT. The manual actuating devices are independent of the automatic trip circuitry and are not subject to failures which make the automatic circuitry inoperable. There are two manual trip buttons, one located on flight panel FCF and the other on safeguards supervisory panel SBF2. Either one of these buttons will directly energize the trip coils of the reactor trip and bypass breakers in addition to de-energizing the undervoltage coils of the reactor trip and bypass breakers. The Reactor Protection System (RPS) is designed to actuate a RT for any anticipated combination of plant conditions to include low SG level. The reduction in SG level and RT is a condition for which the plant is analyzed. A low water level in the SGs initiates actuation of the AFWS. Redundant safety SG level instrumentation was available for a low SG level actuation which automatically initiates a RT and AFWS start providing an alternate source of FW. The AFW System has adequate redundancy to provide the minimum required flow assuming a single failure.

The analysis of a loss of normal FW (UFSAR Section 14.1.9) shows that following a loss of normal FW, the AFWS is capable of removing the stored and residual heat plus reactor coolant pump waste heat thereby preventing either over pressurization of the RCS or loss of water from the reactor. For this event, rod control was in automatic and all rods inserted upon initiation of a RT. The AFWS actuated and provided required FW flow to the SGs. RCS pressure remained below the set point for pressurizer PORV or code safety valve operation and above the set point for automatic safety injection actuation. Following the RT, the plant was stabilized in hot standby.