

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Indian Point Unit No. 2	DOCKET NUMBER (2) 0 5 0 0 0 2 4 7	PAGE (3) 1 OF 05
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TITLE (4)
Manual Reactor Trip Due to Loss of Main Boiler Feed Pump

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)
10	23	86	86	036	00	11	22	86			0 5 0 0 0
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THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)

OPERATING MODE (9) N	20.402(b)	20.406(a)	<input checked="" type="checkbox"/>	80.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 3 8 %	20.406(a)(1)(i)	80.36(a)(1)	<input type="checkbox"/>	80.73(a)(2)(v)	73.71(c)
	20.406(a)(1)(ii)	80.36(c)(2)	<input type="checkbox"/>	80.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 365A)
	20.406(a)(1)(iii)	80.73(a)(2)(i)	<input type="checkbox"/>	80.73(a)(2)(vii)(A)	
	20.406(a)(1)(iv)	80.73(a)(2)(ii)	<input type="checkbox"/>	80.73(a)(2)(vii)(B)	
	20.406(a)(1)(v)	80.73(a)(2)(iii)	<input type="checkbox"/>	80.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Raymond Sutton Failure Analysis Engineer	TELEPHONE NUMBER 9 1 4 5 2 6 1 - 5 6 1 9 7
AREA CODE	

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC
B	S	J V	C 6 8 4	Y	B	S	P C V	C 6 3 1 5	Y
B	S	J I S V	L 2 0 0	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

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

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

At 1330 on October 23, 1986, a manual reactor trip was initiated from a power level of 38% following an automatic trip of the #21 Main Boiler Feed Pump on high discharge pressure. The high discharge pressure was a result of the closure of a flow path back through idle feed pump #22 and subsequent excess feedwater flow caused by the continued operation of feed pump #21.

The Auxiliary Feedwater System was actuated following the loss of the Main Boiler Feed Pump. The two motor driven auxiliary feedwater pumps started as required and supplied sufficient flow, however the turbine driven auxiliary feed pump tripped after receiving its start signal. Turbine driven auxiliary feed pump flow was not required, since the motor driven auxiliary feed pumps provided adequate flow.

Subsequent investigations revealed problems with the main feedwater pump discharge valves and the steam control valve to the turbine driven auxiliary feed pump. These problems were corrected prior to returning to power.

The health and safety of the public were not affected.

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U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

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Plant and System Identification

Westinghouse 4-loop pressurized water reactor - 900 Mwe.

Identification of Occurrence:

Manual Reactor trip following an automatic trip of the operating main boiler feed pump due to high feedwater discharge pressure.

Event Date: October 23, 1986

Past Similar Occurrence: None

Description of Occurrence:

At 1330 on October 23, while returning to power following a short outage, the reactor (RCT) was manually tripped from a power level of approximately 38% following an automatic trip of the #21 Main Boiler Feed Pump (P). Evaluations and observations were being made during the normal feed pump start-up to determine the cause of possible pump or check valve (V) problems which had been noted several days earlier. All evaluations were being performed within the confines of normal operating procedures for the start-up of the #22 feed pump (P).

Main Boiler Feed Pump #21 had been placed in operation several hours earlier. At approximately 1150, #22 feed pump discharge valve (BFD 2-22) was manually opened approximately 4-5 inches to ascertain if the #22 Feed Pump check valve (BFD 1-1) was leaking. This valve is a 20" Crane - Chapman, Fig. 973, swing check valve (V). Backflow through idle feed pump #22 was not observed, and BFD 2-22 was closed manually.

Pump #22 was started and brought to 3000 rpm at approximately 1234 in order to simulate the operating conditions existing on October 18th when feed pump problems were previously noted. Main Boiler Feed Pump #21 was placed in manual control to permit the operator to take direct and immediate control to increase speed if discharge pressure dropped as had occurred on October 18th, and #22 Feed Pump discharge valve BFD 2-22 was then opened from the Control Room. When valve BFD 2-22 was opened, #21 discharge pressure dropped approximately 100-150 psi. The operator increased #21 pump speed to 4900 rpm (from 3700 rpm) in order to maintain pressure at 1000 psi. Steam Generator (SG) level was noticed to begin dropping, and #22 pump discharge

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2-22 was ordered closed because degraded conditions similar to those experienced on October 18th had developed. This tripped MBFP #22 as designed.

Having tested MBFP #22 discharge check valve (BFD 1-1) in the static condition earlier without experiencing any known problem, the need to increase #21 MBFP speed to 4900 rpm demonstrated a condition out of the ordinary. Possible fluttering of the discharge check valve or other dynamic conditions in the discharge/recirculation path of MBFP #22 were suspected. At this point, further data collection was suspended and the observations made to that point were being reviewed. Meanwhile, position indicating lights for the main feed pump discharge valve (BFD 2-22) showed that it was not fully closed, and an operator was dispatched to verify the valve position. The valve was examined locally and determined to be open approximately 1.5". This valve is a 24" Crane - Chapman gate valve with an SMB-3 Limitorque operator.

The plant was stabilized at this time with #21 Main Boiler Feed Pump running at 4800 rpm. The #22 MBFP discharge valve was still not fully closed. At approximately 1327, an operator fully closed the discharge valve. Approximately 2-3 minutes after the valve finally closed, MBFP #21 tripped on high discharge pressure.

Following the manual trip, the auxiliary feed system started as designed due to low-low steam generator level signals. Both motor driven auxiliary feed pumps started, however the steam driven auxiliary feed pump had tripped. The overspeed indication was observed in the control room and the pump steam supply relief valve, MS-52, had opened. Subsequent evaluation revealed problems with the turbine driven auxiliary feed pump steam supply control valve, PCV-1139. The pump is a Worthington, 4-WT-127, horizontal, 940 gpm multi-stage centrifugal pump driven by a Worthington, T2RA, non-condensing 970 horsepower turbine. The steam pressure control valve, PCV-1139, is a 2-1/2" Copes Vulcan D-100 air operated globe valve.

Analysis of Occurrence:

The reactor was tripped manually in accordance with plant procedures. With regard to the auxiliary feedwater system, one motor driven auxiliary feedwater pump is sufficient to satisfy system requirements following a loss of normal feedwater event. Thus, even with the failure of the turbine driven feedwater pump to remain running following its automatic start signal, the remaining two motor driven pumps provided more than adequate auxiliary feedwater flow.

NRC Form 288A
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Cause of Occurrences:

Subsequent examinations determined that the #22 MBFP discharge check valve (BFD 1-1) had failed as suspected, and that there was backflow through pump #22 which diverted feedwater flow from the Steam Generators when its motor operated discharge valve (BFD 2-22) was opened. With BFD 2-22 closed, as during initial conditions, MBFP #21 was able to maintain the load at 3700 rpm. With BFD 2-22 partly opened, as during the period from 1240 through 1327, pump #21 required an additional 1100 rpm to maintain the same load. When BFD 2-22 was fully closed at 1327, this flow path was closed. Pump #21 was still in manual control and began feeding excess water to the steam generators. The feedwater flow control valves began to close, causing an increase in main boiler feed pump discharge pressure until the high pump discharge pressure trip setpoint of 1450 psi was reached.

Main Boiler Feed Pump #21 then tripped, and the operator manually tripped the reactor due to the loss of the only running main boiler feed pump.

Main Boiler Feed Pump #22 discharge check valve, BFD 1-1, was opened and examined to determine the extent and type of damage. It was discovered that the clapper and seat ring had come free from the valve and were lying loose at the bottom of the valve body. The valve is secured to the body by two bolts and mounting plates which had broken free. The bolts had backed out of the mounting probably due to flow induced vibration, and have not been

MBFP motor operated discharge valve BFD 2-22 did not operate when the control switch was placed in the "Close" position. A vendor was called in to analyze and repair the valve. Both #21 and #22 pump discharge valves were tested and found to be operating at their designed torque. Main Boiler Feed Pump #21 discharge valve BFD 2-21 was tested and found to be operating at its designed torque in the closing direction. Main Boiler Feed Pump #22 discharge valve BFD 2-22 was discovered to be installed in the wrong orientation and replaced in its proper orientation so that it was properly aligned with the Limitorque

control valve PCV-1139 was tested and found to be operating at its designed torque in the closing direction. During subsequent testing the valve was sluggish in response and was found to be caused by binding of the plug in the valve due to metallic particles in the valve. The valve had been recently installed

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Cause of Occurrence:

Subsequent examinations determined that the #22 MBFP discharge check valve (BFD 1-1) had failed as suspected, and that there was backflow through pump #22 which diverted feedwater flow from the Steam Generators when its motor operated discharge valve (BFD 2-22) was opened. With BFD 2-22 closed, as during initial conditions, MBFP #21 was able to maintain the load at 3700 rpm. With BFD 2-22 partly opened, as during the period from 1240 through 1327, pump #21 required an additional 1100 rpm to maintain the same load. When BFD 2-22 was fully closed at 1327, this flow path was closed. Pump #21 was still in manual control and began feeding excess water to the steam generators. The feedwater flow control valves began to close, causing an increase in main boiler feed pump discharge pressure until the high pump discharge pressure trip setpoint of 1450 psi was reached.

Main Boiler Feed Pump #21 then tripped, and the operator manually tripped the reactor due to the loss of the only running main boiler feed pump.

Main Boiler Feed Pump #22 discharge check valve, BFD 1-1, was opened and examined to determine the extent and type of damage. It was discovered that the clapper and seat ring had come free from the valve body and were lying loose at the bottom of the valve body. The assembly is secured to the body by two bolts and mounting plates which had broken free. The bolts had backed out of the mounting holes, probably due to flow induced vibration, and have not been found.

Because #22 MBFP motor operated discharge valve BFD 2-22 did not fully close when the control switch was placed in the "Close" position, an outside vendor was called in to analyze and repair the motor operator as required. Both #21 and #22 pump discharge valves were tested. Main Boiler Feed Pump #21 discharge valve BFD 2-21 was verified to be producing its designed minimum torque. Main Boiler Feed Pump #22 discharge valve BFD 2-22 was tested and found to be producing less than the designed torque in the closing direction. The torque switch on BFD 2-22 was discovered to be installed improperly. It was removed and replaced in its proper orientation so the torque switch gear was properly aligned with the Limitorque gearing.

Auxiliary Feed Pump #22 steam control valve PCV-1139 was tested and found to open too quickly under some conditions. During subsequent stroking it was noted that the valve was sluggish in response and eventually became stuck closed because of binding of the plug in the seat due to the presence of foreign metallic particles in the valve. The valve and controller were new, having been recently installed

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during the previous refueling outage. The controller is sensitive to the dynamic conditions experienced following a reactor trip. The set point of the valve was readjusted to ensure that the valve would operate under the required conditions.

Corrective Action:

The reactor was manually tripped in accordance with plant procedures as a result of the loss of the only operating Main Boiler Feed Pump.

Because of the failure of check valve BFD 1-1 and known generic feedwater system check valve problems, it was also decided to verify the condition of the #21 pump discharge check valve (BFD 1). This valve was intact, however the head of one of the hold down bolts had broken off and the bolt was beginning to back out of the bolt hole. Downstream valves were stroked to ensure that the loose parts were not lodged in that part of the system. The NSSS supplier (Westinghouse) determined that parts of this size would not cause a problem during this operating cycle, even if they worked their way into the steam generators. The remaining check valves in the system had been inspected during a previous outage and no problems were found.

Both pump check valves were repaired and reassembled. New hold down bolts were installed and welded to the seat ring plate, and an engineering review of the valve integrity was initiated.

The motor operated feed pump discharge valves were tested. The torque switches were set to their required positions, and tested several times under static conditions. During pump start-up on the evening of October 25th, the MBFP #22 discharge valve was tested and verified to be able to operate against maximum delta-p with pump #21 operating. Both discharge valves were also tested to verify that valve stroking times were within specifications.

The turbine driven auxiliary feed pump control valve (PCV-1139) was removed, repaired and recalibrated to ensure it would control properly under various conditions. The valve manufacturer was called in for assistance, and the plug was polished to remove scoring and reinstalled. The turbine speed change controller, which had been previously set to remain open 20% for startup conditions, was changed back to 0% open. The valve setpoints have been identified on labels at the controller to ensure that the correct values are maintained.

Additional improvements are also under study to enhance the auxiliary feed pump reliability. A replacement controller is being considered for the steam control valve, and the overspeed trip latch assembly will be reviewed based on its sensitivity to being reset properly.

Murray Selman
Vice President

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November 21, 1986

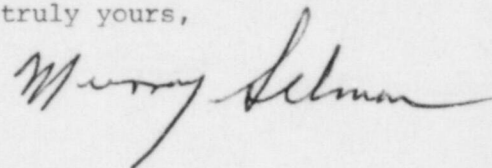
Re: Indian Point Unit No. 2
Docket No. 50-247
LER-86-36-00

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Sirs:

The attached Licensee Event Report LER-86-36-00 is hereby submitted in accordance with the requirements of 10 CFR Part 50.73.

Very truly yours,



att

cc: Dr. Thomas E. Murley
Regional Administrator - Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
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