James A. FitzPatrick
Nuclear Power Plant
268 Lake Road
P.O. Box 41
Lycoming, New York 13093

315-342-3840

NewYorkPower Authority

Michael J. Colomb
Site Executive Officer

March 1, 2000
JAFP-00-0048

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

Subject: **Docket No. 50-333**
LICENSEE EVENT REPORT: LER-00-002 (DER-00-00348)

HPCI Inoperable Due To Speed Control Problem

Dear Sir:

This report is submitted as a voluntary report.

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Mark Abramski at (315) 349-6305.

Very truly yours,

MICHAEL J. COLOMB

MJC:MA:las
Enclosure

cc: USNRC, Region 1
USNRC, Project Directorate
USNRC Resident Inspector
INPO Records Center

IE22

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If 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)

(See reverse for required number of digits/characters for each block)

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TITLE (4)

HPCI Inoperable Due To Speed Control Problem

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 NAME	DOCKET NUMBER
									N/A	05000
01	31	00	00	002	00	03	01	00	FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)	X	OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Mr. Mark Abramski, Sr. Licensing Engineer	315-349-6305

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

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

On January 31, 2000 the plant was operating at 86.1% Core Thermal Power due to limitations in main condenser differential temperature. Surveillance Test (ST) 4-P, "HPCI Annual Transient Monitoring Test" was being conducted to monitor the condition of the HPCI speed control system. ST-4P is normally conducted annually as a means of monitoring HPCI system dynamic response characteristics but was being performed at a monthly frequency to monitor for an intermittent speed anomaly during the HPCI system start sequence (refer to corrective action 2 of LER 99-011). The condition recurred and transient-monitoring instrumentation installed per ST-4P captured the transient data for analysis. The HPCI system was declared inoperable at 1727 on January 31, 2000. Troubleshooting determined the speed transient was due to improperly set system oil pressure. The oil pressure was reset and the system was declared operable on February 6, at 0045. This report is being submitted as a voluntary report.

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

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Event Description

On January 31, 2000 the plant was operating at 86.1% Core Thermal Power due to limitations in main condenser differential temperature. Surveillance Test (ST) 4-P, "HPCI Annual Transient Monitoring Test" was being conducted to monitor the condition of the HPCI [BJ] speed control system. ST-4P is normally conducted annually as a means of monitoring HPCI system dynamic response characteristics but was being performed at a monthly frequency to monitor for an intermittent speed transient condition during the HPCI system start sequence (refer to corrective action 2 of LER 99-011). The condition recurred and transient-monitoring instrumentation installed per ST-4P captured the transient data for analysis. The HPCI system was declared inoperable at 1727 on January 31, 2000.

Cause

An evaluation was conducted based on the data captured during the January 31, run of ST-4P. Plant technical staff performed this analysis with the assistance of an individual with expertise in the design and operation of the HPCI turbine and speed control system. It was determined that the cause of the speed transient was improperly set (high) lubricating oil pressure for the HPCI system. The discussion below describes how high lubricating oil pressure causes the speed transient observed during the January 31, 2000 run of ST-4P as well as during previous HPCI surveillance tests. Refer to Figure 1 for this discussion.

The HPCI turbine steam chest is configured with 5 control valves (CVs) of varying diameters, which open in stages to admit steam to the HPCI turbine. These valves are sized to maintain adequate turbine horsepower over the entire spectrum of reactor pressures for which the HPCI system is credited (150-1195 psid-Reactor to Torus). In order to open any one CV, the hydraulic oil pressure must overcome the combined force of the spring, which closes all CVs on loss of oil pressure, and the force due to reactor pressure acting on the upstream side of the respective CV.

The HPCI turbine governor is an electro-hydraulic design, which uses turbine lubricating oil as the hydraulic working fluid. HPCI hydraulic oil pressure is initially supplied by a DC motor driven, positive displacement oil pump until the turbine has reached sufficient speed for the shaft driven positive displacement oil pump to develop discharge pressure. Prior to this event, HPCI Turbine oil pressure was set with the turbine running

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Cause (cont'd.)

at approximately 2800 rpm. During the start-up transient, the turbine reaches speeds in excess of 4000 rpm (by design) until system flow is established and the flow control loop of the turbine speed control system regulates speed to approximately the 2800 rpm nominal value. Under these conditions, with the turbine speed near 4000 rpm, the shaft driven oil pump was developing high discharge pressure.

The high hydraulic oil pressure resulted in the equilibrium force balance on CV5 occurring at higher reactor pressures than intended by original design, resulting in opening CV5. When CV5 opened at these higher reactor pressures, high-energy steam was admitted to the turbine steam chest through CV5 causing speed transient which was corrected by the HPCI System speed control loop.

Post event evaluation also determined that the spring tension on the HPCI governor control beam was not in accordance with the vendor manual. This discrepancy had an effect analogous to high system oil pressure because it took less force from the hydraulic control system to open CV5 than it would have with the spring tension set in accordance with the vendor manual.

An evaluation of the relative contribution of these discrepancies determined that the oil system setpoint was the predominant contributor to the speed transient and that the spring tension setting contributed to a lesser degree.

The turbine oil pressure should have been set with the turbine operating at approximately 4000 rpm to preclude the scenario described above. The incorrect HPCI system oil pressure setpoint was caused by a defective procedure (cause code D). The procedure was defective because the overall effect of the increased oil pressure on the HPCI control system during the startup transient was not understood and therefore the procedure did not properly address this parameter.

Analysis

The design of the system is such that turbine speeds below the overspeed trip can result in the HPCI system discharge piping and associated instrumentation being subjected to pressures beyond design. The condition of the piping and associated instrumentation was evaluated and determined to be operable.

The first recognized occurrence of this speed transient was during the October 14, 1999 reactor scram (LER 99-010) when the HPCI turbine tripped on overspeed. During this event, the HPCI system discharge valve opening logic had not been satisfied, therefore the HPCI turbine had been running

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Analysis (cont'd.)

in an unloaded condition. An analysis was conducted subsequent to the October 14, 1999 event to determine if the HPCI system would have successfully injected during that event had the discharge valve opening logic been satisfied. This analysis concluded that during that event, with the HPCI turbine loaded by pump flow, the system most likely would have injected.

The HPCI system is required to function as an injection source to mitigate Loss of Coolant Accidents over a reactor pressure range from 150 psig to 1195 psig. Following the January 31, 2000 event, an evaluation was conducted based on data taken during troubleshooting and increased frequency surveillance testing to determine if the condition described in this report would have prevented the HPCI system from successfully injecting to the reactor. This evaluation concluded that for reactor pressures below 948 psig and above 1059 psig, the HPCI system would have successfully injected. The evaluation was not able to predict how the HPCI system would have functioned for reactor pressures greater than 948 psig but less than 1059 psig.

All data taken during troubleshooting and increased frequency surveillance testing was taken at reactor pressures greater than 948 psig but less than 1059 psig. At no time during these testing or troubleshooting evolutions did the HPCI turbine trip on overspeed. Therefore, for these events, the HPCI system would have performed its intended function. Given the HPCI system's performance at reactor pressures greater than 948 psig but less than 1059 psig, there is not sufficient evidence to conclude that this condition alone would have prevented fulfillment of the HPCI system's safety function.

This condition is therefore not considered to be reportable under 10 CFR 50.73(a)(2)(v) "Any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems needed to mitigate the consequences of an accident. This condition is therefore not considered to be a Safety System Functional Failure in the context of NEI 99-02 (Draft Rev. D).

While this condition is not considered to be reportable under 10 CFR 50.73, it is recognized as a challenge to the operability of the HPCI system. Therefore the causes, circumstances and corrective actions for this condition are being reported on a voluntary basis.

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Extent of Condition

This condition is limited to the HPCI system. The RCIC system has an electro-mechanical governor which does not use the lubricating oil system as a hydraulic working fluid.

Corrective Actions

1. The HPCI system oil pressure was reset to a lower value with the turbine running at 4000 RPM. This resolved the degraded condition. **(Complete)**

2. This condition resulted in the HPCI system discharge piping and associated instrumentation being subjected to pressures beyond design. The condition of the piping and associated instrumentation was evaluated and determined to be operable. **(Complete)**

3. An industry Operating Experience report will be submitted to the INPO Nuclear Network to alert other plants with a HPCI system of this potential scenario. **(Scheduled Completion Date: 3/25/00)**

4. An evaluation is being conducted to determine the cause of the incorrect oil pressure setpoint in the procedure used to set the HPCI system oil pressure. **(Scheduled Completion Date: 4/1/00)**

5. The spring tension on the HPCI governor control beam will be reset in accordance with the vendor manual. **(Scheduled Completion Date: Prior to Restart from RO14)**

Additional Information

Previous Similar Events:

LER 99-010
LER 99-011

Simplified Diagram
HPCI Control Valve
Configuration

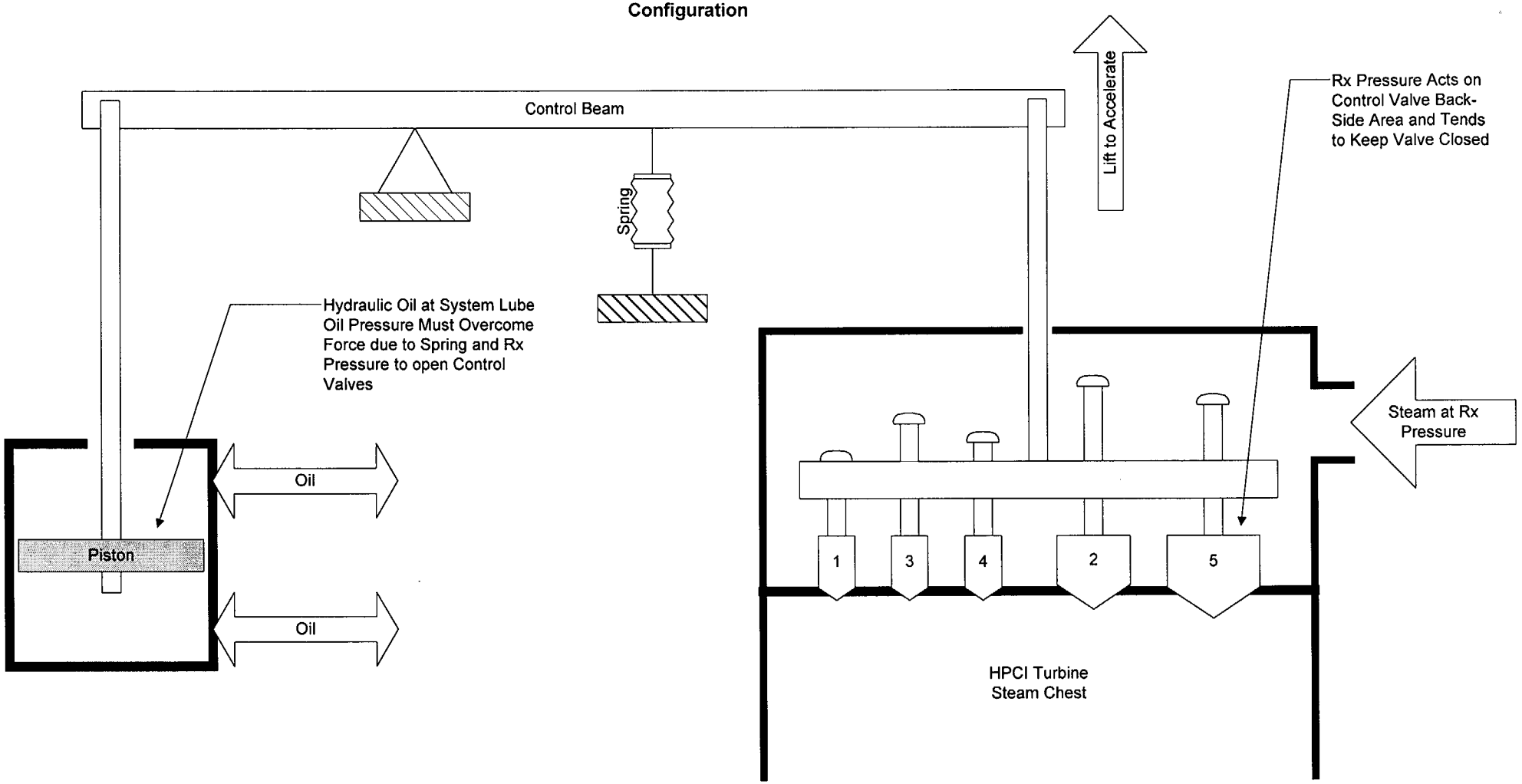

Figure 1
LER 00-002