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

315-342-3840



Michael J. Colomb Site Executive Officer

June 27, 2000 JAFP-00-0138

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-00-002-01 (DER-00-00348)

HPCI Inoperable Due To Speed Control Problem

Dear Sir:

This report is submitted in accordance with 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 that are needed to mitigate the consequences of an accident."

This report is being generated to revise the reporting criteria under which this LER was originally submitted.

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. COLOM

MJC:MA:las Enclosure

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

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NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (6:1998) APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/200 Estimated burden per response to comply with this mandatory information collective request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimated the Records Management Branch (T-6 F33). U.S. Nuclear Regulatory Commission Washington, DC 2055-0001, and to the Paperwork Reduction Project (3150-0104/Office of Management and Budget, Washington, DC 20503 if an informative collection does not display a currently valid OMB control number, the NRC may n conduct or sponsor, and a person is not required to respond to, the informative collection.									S 06/30/2001 formation collection into the licensing burden estimate to latory Commission, Project (3150-0104), If an information r, the NRC may not to, the information					
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Mr. Mark Abramski, Sr. Licensing Engineer 315							-349-6305							
CAUSE	SYSTEM	COMPONENT	MANUFAC	CTURER	REPORTABLE TO EPIX		CAUSE		SYSTEM COMPDNENT		MANUFACTURER		REPORTABLE To Epix	
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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 LER supplement is being generated to revise the reporting criteria from a voluntary report to a report required under 10 CFR 50.73(a)(2)(v).														

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lames A. FitzPatrick Nuclear Power Plant	05000333	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF	5	
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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 NRC FORM 366A (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

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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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<u>Analysis</u> (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.

This condition is therefore 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 considered to be a Safety System Functional Failure in the context of NEI 99-02.

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

 The HPCI system oil pressure was reset to a lower value with the turbine running at 4000 RPM. This resolved the degraded condition. (Complete) NRC FORM 366A

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Corrective Actions (cont'd.)

- 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 was submitted to the INPO Nuclear Network to alert other plants with a HPCI system of this potential scenario. (Complete))
- 4. An evaluation was conducted to determine the cause of the incorrect oil pressure setpoint in the procedure used to set the HPCI system oil pressure. The results of this review were reported in the Authority's Reply to Notice of Violation 2000-001 (JAFP-00-00955 dated 4/19/00). (Complete)
- 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

