Northern States Power Company

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November 22, 1994

Report Required by
10 CFR Part 50, Section 50.73

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

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

LER 94-017
HPCI Isolates on High Steam Flow During Test at Lower than Normal Pressure

The Licensee Event Report for this occurrence is attached. This report contains the following new NRC commitments:

The surveillance procedure for demonstrating High Pressure Coolant Injection pump operability will be modified to provide guidance to perform this test near a steam pressure of 1000 psig.

Removal of the 150,000 lbm/hr isolation for the High Pressure Coolant Injection system will be investigated.

Please contact Tom Parker at (612) 295-1014 if you require further information.

William J Hayes RSP

Roger O Anderson
Director
Licensing and Management Issues

c: Regional Administrator - III NRC
Sr Resident Inspector, NRC
NRR Project Manager, NRC
State of Minnesota,
Attn: Kris Sanda

Attachment

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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)
HPCI Isolates on High Steam Flow During Test at Lower than Normal Pressure

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
10	23	94	94	017	00	11	22	94	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10)	12%		20.402(b)		20.405(c)	X	50.73(a)(2)(iv)		73.71(b)		
			20.405(a)(1)(i)		50.36(c)(1)	X	50.73(a)(2)(v)		73.71(c)		
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER		
			20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract		
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		below and in Text, NRC		
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		Form 366A)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Tom Parker	612-295-1014

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

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)
NCR FORM 366 (5-91)

During a surveillance test of the High Pressure Coolant Injection System, the system steam supply valves closed on an automatic isolation signal of 150,000 lbm/hr steam flow for 45 seconds. The combination of performing the test at a reduced steam supply pressure and an indicated turbine speed error caused the steam flow to produce a differential pressure across the venturi that was greater than the isolation setpoint. As a procedure enhancement, the preventative maintenance procedure for the High Pressure Coolant Injection system will be modified to narrow the calibration tolerance for the turbine speed control system at the turbine speed of concern. The surveillance procedure for demonstrating High Pressure Coolant Injection pump operability will be modified to perform this test near 1000 psig.

Description

On October 23, 1994, the High Pressure Coolant Injection System (EIIS System Code: BJ) steam supply valves closed. The valves (MO-2034 and MO-2035) (EIIS Component Code: ISV) were closed by an automatic isolation signal, 150,000 lbm/hr steam flow for 45 seconds. The automatic isolation signal occurred while operating the steam turbine (EIIS Component Code: TRB) driven High Pressure Coolant Injection pump (EIIS Component Code: P) for the performance of surveillance testing in accordance with the Inservice Testing Program.

This automatic isolation, along with the 300,000 lbm/hr steam flow signal (instantaneous), are designed to isolate the steam supply from a possible pipe leak and/or break in the High Pressure Coolant Injection System. In this case, the isolation occurred with no steam leaks present.

Cause

The surveillance procedure for performing inservice testing of the steam turbine driven High Pressure Coolant Injection pump directs establishing reference conditions as well as obtaining acceptance criteria data at the reference conditions. As the turbine is a variable speed driver, the surveillance procedure specifies a reference value for turbine speed. The turbine governor controls turbine speed to maintain pump flow at the flow indicating controller setpoint. The turbine speed reference value is established by adjusting the flow indicating controller, with the control loop in manual. The pump flow is adjusted to the reference value by positioning the pump test return valve with the pump discharging to the plant Condensate Storage Tanks. The plant was returning to power operation following a refuel outage with Reactor thermal power at 12% and Reactor pressure at 910 psig during execution of the surveillance procedure. This surveillance is normally performed at a reactor pressure of 1000 psig which corresponds to the steam supply pressure for which the pump reference conditions were established.

The cause of the isolation signal was due to the differential pressure across the steam flow venturi (EIIS Component Code: NZL) reaching the setpoint associated with 150,000 lbm/hr steam flow. This setpoint is calibrated for a steam pressure of 1120 psig. At lower steam pressure, the specific volume of the steam is greater. The differential pressure developed across the steam flow venturi is directly proportional to the specific volume of the steam for equal mass flow rates. Therefore, with a higher specific volume of steam at 910 psig, the differential pressure developed across the steam flow venturi was higher than for a normal

surveillance at 1000 psig steam pressure. This had the effect of lowering the mass flow rate for the differential pressure established to provide an isolation signal.

A contributing cause was that the turbine speed control loop calibration was found to be within tolerance, but near the acceptance limit for the turbine operating point. This caused the indicated turbine speed to be approximately 100 rpm less than the actual turbine speed. With the steam turbine governor set to maintain the indicated turbine speed at the surveillance procedure reference value, a pump flow greater than the reference value was being delivered (pump flow is proportional to speed). To maintain the pump flow within the reference value, the test return valve for the High Pressure Coolant Injection pump was adjusted per procedure to maintain the reference value of 3000 gpm. This resulted in an increase in the pump head, an increase in the work required from the High Pressure Coolant Injection turbine, and thus an increase in the steam mass flow rate required to maintain the turbine speed setting established at the turbine governor.

The combination of performing the test at a reduced steam supply pressure and the indicated turbine speed error caused the steam flow to produce a differential pressure across the venturi that was greater than the isolation setpoint. The greater specific volume at lower steam pressure, and the resultant lower mass flow rate for the developed differential pressure, had the most significant contribution to receiving the isolation signal.

Analysis

This event is reportable per 10 CFR Part 50, Section 50.73(a)(2)(iv) since an automatic actuation of a Engineered Safety Feature occurred. The signal was an valid high differential pressure signal and caused two containment isolation valves to close. This is also reportable under Section 50.73(a)(2)(v) since this condition alone could have prevented the fulfillment of the High Pressure Coolant Injection system which is needed to mitigate the consequences of an accident. Therefore this event is reportable.

During the time when the High Pressure Coolant Injection system was declared inoperable (approximately 24 hours), redundant systems (Reactor Core Isolation Cooling and the Automatic Pressure Relief System) plus all the low pressure Emergency Core Cooling Systems were operable. The High Pressure Coolant Injection System was available for manual actuation during the time it was declared inoperable.

For these reasons the health and safety of the public was not affected.

This event does not affect the operability of the system at lower steam pressures. With the system in the normal line-up for standby service, as steam pressure decreases the isolation will occur at lower mass flow rates, but also the differential pressure across the pump will be lower (since it is pumping against the same pressure as that of the source of the steam) and the turbine will require less steam flow to pump 3000 gpm. In conclusion, the system will deliver 3000 gpm over the range of 150 to 1120 psig without a steam flow isolation.

Corrective Actions

As a procedure enhancement, the preventative maintenance procedure for the High Pressure Coolant Injection system will be modified to narrow the calibration tolerance for the turbine speed control system at the turbine speed of concern.

The surveillance procedure for demonstrating High Pressure Coolant Injection pump operability will be modified to provide guidance to perform this test near a steam pressure of 1000 psig.

Removal of the 150,000 lbm/hr isolation will be investigated.

Failed Component Identification

None

Previous Similar Events

There have been several isolations of the High Pressure Coolant Injection system (AO 73-28, LERs: 83-014, 83-017, 87-007, 89-005) but none occurred at reduced pressure conditions.