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Monticello Nuclear Generating Plant
Operated by Nuclear Management Company, LLC

March 15, 2002

10 CFR Part 50
Section 50.73

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

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

LER 2002- 001
Mechanical Pressure Regulatory Failure Causes Reactor Scram

A Licensee Event Report for this occurrence is attached. This report contains no new NRC commitments.

Contact Doug Neve, Licensing Project Manager, at (763) 295-1353 if you require further information.

Jeffrey S. Forbes
Site Vice President
Monticello Nuclear Generating Plant

Enclosure

c: Regional Administrator - III NRC
NRR Project Manager, NRC
Sr. Resident Inspector, NRC
Minnesota Department of Commerce

2807 West County Road 75 • Monticello, Minnesota 55362-9637
Telephone: 763.295.5151 • Fax: 763.295.1454

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Monticello Nuclear Generating Plant	05000263	1 OF 4

4. TITLE
Mechanical Pressure Regulator Failure Causes Reactor Scram

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
01	21	2002	2002	– 001	– 00	03	15	2002	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	N
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20.2203(a)(1)		50.36(c)(1)(i)(A)	X	50.73(a)(2)(iv)(A)		73.71(a)(4)
	20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		
	20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
David M Musolf, Principal Engineer	763-295-1201

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	TA	RG	General Electric	Y						

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

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

While operating at 100% power at 1735 on January 21, 2002, a turbine control valve fast closure (load rejection) signal resulted in a reactor scram. All rods fully inserted and all safety systems functioned as designed. The primary cause of the scram was failure of the main turbine pressure control system. A detailed review of plant computer data revealed that the mechanical pressure regulator (MPR) had been behaving erratically for several days prior to the scram. This erratic behavior eventually caused the MPR to take control from the electric pressure regulator. This initiated rapid cycling of the turbine control and bypass valves which tripped both protection system sub-channels on reduced hydraulic oil pressure at the control valve acceleration relay. Investigation determined that failure of the MPR was caused by a damaged rate feedback bellows. Following repair of the MPR, and completion of other unrelated maintenance, the unit was returned to service at 1327 on January 27, 2002.

Description

While operating at 100% power at 1735 on January 21, 2002, a turbine control valve fast closure (load rejection) signal resulted in a reactor scram. All rods fully inserted and all safety systems functioned as designed. A Group II containment isolation occurred, as expected, on a reactor low water level signal following the scram. The scram was the result of erratic behavior of the mechanical pressure regulator (MPR).

The Monticello reactor steam pressure control scheme is composed of two independent pressure regulators, the wide range MPR and the narrow range electric pressure regulator (EPR). Each regulator is capable of overriding the other. The regulator adjusted for the lowest pressure assumes control. During startup, the MPR is normally controlling reactor pressure. During full power operation, the EPR is normally controlling.

A review of plant computer data showing the response of the pressure control system before and during the event showed unusual abnormal spiking behavior in the MPR piston. Small spiking was observed to have begun on January 10, 2002. These spikes were small enough, however, to allow the MPR to remain the backup to the EPR, which was controlling.

On January 20, 2002, weekly turbine tests were conducted. Following these tests, the control position of the MPR was left with slightly less margin to the EPR setting than prior to the tests. As a result, on January 21, 2002, resumption of the spiking caused the MPR to assume control of the turbine control and bypass valves from the EPR and initiate rapid cycling of the valves.

The rapid cycling of the turbine control and bypass valves resulted in a turbine control valve fast closure scram. This scram, which is initiated earlier than either the high neutron fluence or high reactor pressure signals, provides additional margin to core safety limits.

Following the scram, No. 11 Reactor Feedwater Pump (RFP) was manually tripped in accordance with plant procedures. Before No. 12 RFP could be manually tripped, an automatic trip on high reactor water level occurred. A turbine lockout on high reactor water level also resulted which automatically tripped the main turbine and opened the generator output and field breakers. No. 12 RFP was restarted, the feedwater block valves closed, and reactor water level was controlled using the low flow feedwater regulating valve. Operator actions were determined to be timely, consistent with procedures, and reflected an appropriate sensitivity to operating conservatism. All major plant and substation equipment functioned as designed in response to the scram.

At 2330 on January 21, 2002, reactor depressurization and cooldown was initiated to place the plant in cold shutdown. The plant shutdown provided an opportunity to perform maintenance unrelated to the scram.

At 0814 on January 25, 2002, following completion of all planned maintenance and pre-start checklists, a normal reactor startup was commenced. The generator was synchronized to the grid at 1327 on January 27, 2002. Reactor power was increased to 100% following normal plant procedures.

Event Analysis

Analysis of Reportability

The event is reportable under 10CFR 50.73(a)(2)(iv)(A), as an automatic activation of the Reactor Protection System and reactor scram, initiated by failure of the MPR.

The event does not constitute a safety system functional failure.

Safety Significance

The safety significance of the event is considered to be low. Operator actions were timely, consistent with procedure, and conservative. All major plant and substation equipment functioned as designed in response to the scram. Therefore, the health and safety of the public was not affected by the event.

With the exception of the MPR itself, there were no equipment failures that resulted in the unavailability of systems modeled in the Monticello PRA. The MPR failure, aside from its potential to cause a transient as in this event, has no significant impact on Monticello's core damage frequency (CDF). Recent operating history, including this event, is well within the bounds of the initiating event frequency used in the current PRA model.

Cause

To identify the cause of this event, initial field walk downs were completed to look for broken or loose components. The primary valve limit stop was found loose, but was not believed to have contributed to this event.

Following these walk downs, the MPR and EPR were functionally tested. During these tests it was noted that the MPR output linkage was pulsating. A worn rotating bushing assembly was thought to be responsible for the pulsating and it was replaced. Further

investigation after replacement of the bushing assembly revealed an abnormal temporary spiking behavior in the MPR piston.

The erratic behavior of the MPR piston was determined to be a faulty rate feedback bellows. The bellows was found to have a 2-inch crack, another smaller crack, and a pin hole. Discussions with General Electric confirmed that these defects would affect the dampening characteristic of the MPR and cause the erratic behavior which led to the scram. An undocumented modification made to the rate feedback bellows in 1973, in which clamp bars were soldered to the bellows to adjust its spring rate, may have contributed to this failure.

The root cause of this event was determined to be failure to perform adequate preventative maintenance on the MPR.

Corrective Actions

The rate feedback bellows was replaced with a new bellows obtained from another plant. The new bellows meet the original design specifications (without the clamp bars).

Other MPR components were inspected and cleaned. Oil samples were obtained and found to meet specifications. As a precaution, the MPR steam pressure sensing lines were flushed. Linkages and switches were inspected and checked. It is believed that none of these other components contributed to failure of the MPR.

In the future, the MPR piston position will be monitored and trended by the system engineer using the plant process computer. Existing preventive maintenance practices on the MPR will be reviewed and improvements made where indicated.

The affect of the loose primary valve stop adjustment found during the investigation of this event will be investigated for possible impact on the plant transient analyses.

Failed Component Identification

General Electric Force-Restored Pressure Regulator, Rate feedback bellows
GE Technical Manual GEK-17955, Dwg 945D 604, rev 0 (modified)

Previous Similar Events

None.