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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Monticello Nuclear Generating Plant
Docket 50-263
Renewed Facility Operating License No. DPR-22

LER 2017-006-00, Loss of Reactor Protection System Scram Function During Main Steam Isolation Valve and Turbine Stop Valve Channel Functional Tests due to Use of a Test Fixture

Pursuant to 10CFR 50.73(a)(2)(v)(A) and 10CFR 50.73(a)(2)(v)(D), Northern States Power Company, a Minnesota Corporation (NSPM), doing business as Xcel Energy, hereby submits the Monticello Nuclear Generating Plant (MNGP) Licensee Event Report (LER) 2017-006.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

Christopher R. Church
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC
Minnesota Department of Commerce

NRC FORM 366 (04-2017) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

Loss of Reactor Protection System Scram Function During Main Steam Isolation Valve and Turbine Stop Valve Channel Functional Tests due to Use of a Test Fixture

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
11	14	2017	2017	- 006	- 00	01	12	2018	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☒ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Andrew Kouba, Regulatory Affairs Engineer	(612) 342-8971

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
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO		N/A	N/A	N/A

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

On November 14, 2017, it was identified that the use of the Reactor Protection System (RPS) test fixture described in some operations procedures would result in the loss of two RPS reactor Scram functions. Technical Specification 3.3.1.1 requires that RPS Instrumentation for Table 3.3.1.1-1 Function 5, Main Steam Isolation Valve-Closure and Function 8, Turbine Stop Valve-Closure, remain operable. It was concluded that a closure of three of four Main Steam Lines or Turbine Stop Valves would not necessarily have resulted in a full Scram during testing depending on the combination of closed valves occurring during the bypass condition. Operations procedures were revised to incorporate the use of the test fixture in December, 2008 for the Turbine Stop Valve Closure Scram Test Procedure and February, 2009 for the Main Steam Isolation Valve Closure Scram Test Procedure. The operations procedures were inappropriately revised to allow use of the test fixture on all RPS functions to prevent a half Scram.

The operations procedures were quarantined until revisions were issued in December, 2017 that removed use of the test fixture.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Monticello Nuclear Generating Plant	05000-263	2017	- 006	- 00

EVENT DESCRIPTION

On November 14, 2017, the Monticello Nuclear Generating Plant (MNGP) was operating in Mode 1 at 100% Power. It was identified that the use of the Reactor Protection System (RPS) test fixture described in some operations procedures would result in the loss of two RPS reactor Scram functions. The test fixture used in surveillance procedures 0008, Main Steam Isolation Valve Closure Scram Test Procedure and 0009, Turbine Stop Valve Closure Scram Test Procedure, unintentionally resulted in the loss of Technical Specification (TS) Table 3.3.1.1 Function 5, Main Steam Isolation Valve-Closure and Function 8, Turbine Stop Valve-Closure. It was concluded that closure of three of four Main Steam Lines (MSLs) or Turbine Stop Valves (TSVs) would not necessarily have resulted in a full Scram during testing depending on the combination of closed valves during the bypass condition.

Operations procedures were revised to incorporate the use of the test fixture on December 29, 2008 for the TSV Closure Scram Test Procedure and February 4, 2009 for the Main Steam Isolation Valve (MSIV) Closure Scram Test Procedure. Use of the test fixture was intended to eliminate the need to initiate half Scrams during calibration or functional testing of the RPS instrumentation.

On March 7, 2009, the test fixture was first applied during the TSV functional test and during MSIV functional testing on July 11, 2009. The test fixture was applied during quarterly surveillances through September 16, 2017.

On November 14, 2017, a condition report was generated after performance of an operating experience evaluation of a similar event at another station. The event was determined to be applicable to the MNGP and concluded that MNGP's method of using the test fixture for channel functional testing of the MSIV and TSV RPS functions makes the required number of operable instrument channels insufficient to meet the TS Bases B 3.3.1.1 description for Action C.1. The operations procedures utilizing the RPS test fixture were subsequently quarantined.

On December 8, 2017 and December 11, 2017, the 0009 and 0008 surveillance procedures were revised to remove the use of the RPS test fixture.

EVENT ANALYSIS

The unintended loss of RPS trip functions during performance of RPS surveillance procedures 0008 and 0009 resulted in a NRC reportable condition under 10CFR 50.73(a)(2)(v) as, any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to: 10CFR 50(a)(2)(v)(A) shutdown the reactor and maintain it in a safe shutdown condition, and 10CFR 50(a)(2)(v)(D) mitigate the consequences of an accident. This event is considered a Safety System Functional Failure per NEI 99-02, Revision 7.

The RPS is arranged as two separately powered trip systems, trip system A and trip system B. The automatic trip logics of trip system A are trip logics A1 and A2. Similarly, the trip logics for trip system B are trip logics B1 and B2. Each of the two trip logics used for automatic trip signals receives input signals from at least one trip channel for each monitored variable. Thus, two trip channels are required for each monitored variable to provide independent inputs to the trip logics of one trip system. At least four trip channels for each monitored variable are required for the trip logics of both trip systems.

For Function 5, Main Steam Isolation Valve-Closure, the logic arrangement within the automatic Scram trip logic is arranged as such that a reactor trip occurs for the condition where three or more MSLs are less than 90% open. This means that one of two, or both, MSIVs in a MSL are less than 90% open. This occurs as the logic uses valves A and B for the A1 trip logic, C and D for the A2 trip logic, A and C for the B1 trip logic, and B and D for the B2 trip logic. By varying the order in which the auxiliary relay contacts are paralleled within each RPS trip logic it can be assured that a half Scram will occur in each trip system even if a failure of all the MSL switches occurs on a MSL. In total, the MSIV

closure function contains eight trip channels and four auxiliary relays per trip system.

For Function 8, Turbine Stop Valve-Closure, the logic arrangement within the automatic Scram trip logics is arranged as such that a reactor trip occurs for the condition where three or more TSVs are less than 90% open. This occurs as the logic uses TSV-1 and TSV-2 for the A1 trip logic, TSV-3 and TSV-4 for the A2 trip logic, TSV-1 and TSV-3 for the B1 trip logic, and TSV-2 and TSV-4 for the B2 trip logic. By varying the order in which the auxiliary relay contacts are paralleled within each RPS trip logic it can be assured that a half Scram will occur in each trip system provided both contacts on a TSV fail. In total, the TSV closure function contains four trip channels and four auxiliary relays per trip system.

When the test fixture is applied while testing Function 5, Main Steam Isolation Valve-Closure, in the A1 trip logic, the test fixture is applied over two different auxiliary relay contacts, which are arranged in parallel. The MSIV function contains two trip channel sensors (inboard and outboard MSIV limit switches) in series with the trip auxiliary relay. When the test fixture is applied, four trip channels or two MSL channels are placed in an inoperable status within a trip logic due to its parallel configuration. Similarly, when testing is performed on Function 8, Turbine Stop Valve-Closure, the test fixture is applied over two different auxiliary relay contacts, which are arranged in parallel. Each auxiliary relay receives input from a TSV trip channel sensor within a trip channel. When the test fixture is applied, two trip channels or TSVs are placed in an inoperable status within a trip logic due to its parallel configuration.

While a valid Group 1 Isolation (closure of all four MSLs) would still have resulted in a full Scram, the TS Bases statement for operability of the MSIV logic was not met. Similarly, when the test fixture is applied for TSV testing two of the four channels are bypassed. A turbine trip resulting in a hydraulic trip signal to all four of the TSVs would still have resulted in a full Scram, however, the TS Bases statement for operability of the TSV logic was not met. Certain combinations of three of four MSLs and TSVs would not have resulted in a Scram. It is therefore concluded that MNGP's method of using the test fixture for channel functional testing of the MSIV and TSV RPS functions makes the required number of operable instrument channels insufficient to meet the TS Bases B 3.3.1.1 description for Action C.1.

TS 3.3.1.1 Condition C requires restoring RPS trip capability. For Function 5, Main Steam Isolation Valve-Closure, this would require both trip systems to have each channel associated with the MSIVs in three MSLs (not necessarily the same MSLs for both trip systems) OPERABLE or in trip (or the associated trip system in trip). For Function 8, Turbine Stop Valve-Closure, this would require both trip systems to have three channels, each OPERABLE or in trip (or the associated trip system in trip).

The required action and completion time for TS 3.3.1.1 CONDITION C:

C. REQUIRED ACTION - Restore RPS trip capability, COMPLETION TIME - 1 hour

Condition C was applicable to both the MSIV and TSV RPS logic functional testing.

The longest time the test fixture was applied during the last three years was 37 minutes for the MSIV surveillance and 62 minutes for the TSV surveillance. TS 3.3.1.1 Required Action C.1 was not entered during the performance of the surveillance and in one case the test fixture was applied longer than the one hour allowance for restoring the inoperable RPS channel to service (62 minutes on January 6, 2017 for TSV testing). However, the channel functional test completion time of 62 minutes was within required four hours to reduce thermal power to less than or equal to 40% RTP per TS 3.1.1.1 Required Action E.1.

SAFETY SIGNIFICANCE

The RPS initiates a reactor Scram when at least one MSIV in three of four MSLs close (Function 5) or when three of four TSVs close (Function 8). The automatic MSIV and TSV closure reactor Scrams preserve the integrity of the fuel cladding

and the Reactor Coolant System (RCS) in anticipation of the transients caused by closure of these valves.

With the test fixture applied, certain combinations of three of four MSL or TSV closure signals would not necessarily have resulted in a full Scram. This condition would require a single failure, or multiple failures, within a RPS trip system that is being functionally tested. A single failure of an inboard or an outboard MSIV position indication switch associated with either MSL channel not bypassed by the test fixture will not prevent a half scram from occurring. Only the simultaneous failure of both the inboard and outboard valves to close, failure of both the inboard and outboard position indicating switches to open, or an auxiliary relay failure which causes an auxiliary relay to not drop out (armature binding) would defeat a scram. Similarly for TSV testing, a failure of a TSV to close, failure of a position indicating switch, or a failure of the auxiliary relay to drop out would need to occur to prevent a Scram. Each of these MSIV and TSV events would be highly unlikely to occur and would need to occur within the same trip system that is being functionally tested but on the opposite trip logic. As a result, the safety significance of this condition is low.

While a valid Group 1 Isolation (closure of all four MSLs) would still have resulted in a full Scram, the Technical Specification Bases action statement for operability of the MSIV logic was not met. Similarly, a turbine trip resulting in a hydraulic trip signal to all four of the TSVs would still have resulted in a full Scram, however, the Technical Specification Bases action statement for operability of the TSV logic was not met.

CAUSE

Operations procedures were revised to incorporate the use of the test fixture to reduce the number of half Scrams received during surveillance testing in December, 2008 for the TSV Closure Scram Test Procedure and February, 2009 for the MSIV Closure Scram Test Procedure, which unintentionally resulted in the loss of TS Table 3.3.1.1 Function 5, Main Steam Isolation Valve-Closure and Function 8, Turbine Stop Valve-Closure. The preparer and reviewers of the screenings and procedure changes did not recognize the installation of the test fixture disabled trip Function 5, Main Steam Isolation Valve-Closure and Function 8, Turbine Stop Valve-Closure. The preparer and reviewer had an inaccurate mental model that it was acceptable to use the test fixture on all RPS functions to prevent a half Scram. Due to the inaccurate mental model, the potential impact of the parallel auxiliary relay was not evaluated. This allowed the number of operable channels of both MSIV and TSV RPS functions to be reduced such that the RPS trip capability was not maintained as described by the TS 3.3.1.1 Bases B 3.3.1.1 description for Action C.1.

CORRECTIVE ACTION

The operations procedures were quarantined until December 8, 2017 and December 11, 2017 when the 0009 and 0008 surveillance procedures were revised to remove the use of the RPS test fixture.

PREVIOUS SIMILAR EVENTS

There were no similar MNGP Licensee Event Reports during the past three years.