Xcel Energy®

June 30, 2011

L-PI-11-052
10 CFR 50.73

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

Prairie Island Nuclear Generating Plant Unit 2
Docket: 50-306
Renewed License No. DPR-60

LER 50-306/2011-002-00, Unit 2 Trip As A Result Of A Weather Related Turbine Trip

Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, herewith encloses Licensee Event Report (LER) 50-306/2011-002-00.

On May 9, 2011, Prairie Island Nuclear Generating Plant (PINGP) Unit 2 tripped from approximately 100% steady-state power as a result of a turbine trip from a generator lockout signal. At the time of the trip, thunderstorms were in the vicinity of the plant.

Post event diagnostics determined that the relay ground potential circuit had a missing link (wire) between substation panels which resulted in the loss of the reference ground potential to the associated protective relaying in the Switchyard panels. This resulted in the improper operation of the breaker protection relays.

Summary of Commitments

This letter contains no new commitments and no changes to existing commitments.

Mark A. Schimmel
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island Nuclear Generating Plant (PINGP), USNRC
Resident Inspector, PINGP, USNRC
Department of Commerce, State of Minnesota

1717 Wakonade Drive East • Welch, Minnesota 55089-9642
Telephone: 651.388.1121

ENCLOSURE

LICENSEE EVENT REPORT 50-306/2011-002-00

4 Pages Follow

NRC FORM 366 (10-2010) | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB NO. 3150-0104 | EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0066), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Prairie Island Nuclear Generating Plant Unit 2	05000 306	1 OF 4

4. TITLE

Unit 2 Trip As A Result Of A Weather Related Turbine Trip

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
05	09	2011	2011	– 002 –	00	06	30	2011	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

Mode 1

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

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Sam J. DiPasquale, P.E.	651.388.1121 x7350

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

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

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

On May 9, 2011, Prairie Island Nuclear Generating Plant (PINGP) Unit 2 tripped from approximately 100% steady-state power as a result of a turbine trip from a generator lockout signal. At the time of the trip Unit 1 was in a planned refueling outage in Mode 6 Operation and thunderstorms were in the vicinity of the plant.

Post event diagnostics determined that the relay ground potential circuit had a missing link (wire) between substation panels which resulted in the loss of the reference ground potential to the associated protective relaying in the Switchyard panels. This resulted in the improper operation of the breaker protection relays.

The causal evaluation determined that the proximate cause of the relaying scheme failure was inadequate ground wire installation during a modification to the substation equipment. The evaluation also determined that NSPM (Transmission and Nuclear) did not establish the appropriate standard for procedure quality with respect to work under System Control Center jurisdiction in the PINGP substation such that a means of effectively utilizing human performance tools to minimize errors during work, which directly impacts the safe and reliable operation of nuclear plants, was not in place.

EVENT DESCRIPTION

The Prairie Island Nuclear Generating Plant (PINGP) switchyard breakers[1] use a selective isolation design. The relays[2] are designed to isolate the breakers closest to a detected fault first with the intent of maximizing reliability while protecting the grid from a localized fault. Some PINGP substation relays utilize distance and directional-based sensing to determine the location of a fault. These relays enable selective tripping of the breakers closest to the fault.

Breakers 8H13 and 8H14 serve as Unit 2 Generator[3] output isolations. Unit 1 Generator output isolations are 8H16 and 8H17. Breakers 8H15 and 8H14 isolate the Blue Lake transmission line[4] from 345kV Buses 2 and 1 (respectively). Breakers 8H9 and 8H8 isolate the Byron transmission line from 345kV Buses 2 and 1 (respectively). In November 2010, NSPM implemented a modification to the breakers in the switchyard (under System Control Center (SCC) jurisdiction) to upgrade protective relaying on those breakers to a digital system. The modification was performed under Transmission System Operator (TSO) Work Order (WO) 11209851.

At approximately 07:22 CDT on May 9, 2011, thunderstorms in the vicinity of PINGP and other portions of Southeast Minnesota produced a lightning strike which contacted ground on the Byron transmission line. The strike occurred approximately 25 miles from the Byron station and 15 miles from PINGP. The strike created a grid disturbance and actuated PINGP protective relaying on breakers for the Unit 2 Generator, Blue Lake, and Byron Lines.

As a result, PINGP Unit 2 tripped from approximately 100% steady-state power as a result of a turbine trip from a generator lockout signal. At the time of the trip, Unit 1 was in a planned refueling outage in Mode 6. The Unit 2 steam plant and reactor protection system[5] responded properly to the turbine trip.

EVENT ANALYSIS

Based upon post event diagnostics, Xcel Energy System Relay Specialists determined that the relay ground potential circuit was missing a link (wire) between substation panels[6] (from a latent wiring error) resulting in the loss of the reference ground potential to associated protective relaying in the Switchyard panels associated with the Unit 1 Generator, Unit 2 Generator, and the Blue Lake transmission line.

The loss of the reference ground potential was sufficient to "disorient" the distance and directional-sensing of the relays for the affected breakers; ultimately resulting in the relays detecting a "fault" on

---

[1] EIIS Component Identifier: BKR
[2] EIIS Component Identifier: RLY
[3] EIIS System Code: EL
[4] EIIS System Code: FK
[5] EIIS System Code: JC
[6] EIIS Component Identifier: PL

the Blue Lake and/or Generator sides of the breaker when no fault existed. In essence, breakers 8H13, 8H14, and 8H15 tripped when a fault requiring relay actuation was not present, with the net effect of causing a generator, turbine, and reactor trip. This event is reportable under 10 CFR 50.73(a)(2)(iv)(A) since there was an automatic actuation of the Reactor Protection system (RPS) and the auxiliary feedwater system (AFW).

SAFETY SIGNIFICANCE

This event did not challenge nuclear safety as all plant systems responded as designed. Therefore, this event does not represent a safety system functional failure for Unit 2. However, the lightning strike and latent system installation flaws combined to create an initiating event which did challenge reliable operation. Additionally, the root cause investigation determined that the Unit 1 Generator output breakers would also have been affected if Unit 1 were online at the time (creating the potential for a dual-unit trip). Any unplanned reactor trip is a significant event.

The plant systems responded as designed so there were no radiological, environmental, or industrial impacts associated with this event. Therefore, this event did not affect the health and safety of the public.

CAUSE

The causal evaluation determined that the proximate cause of the relaying scheme failure was inadequate ground wire installation during the November 2010, modification to the substation equipment.

The root cause of the Unit 2 trip was that NSPM (Transmission and Nuclear) did not establish the appropriate standard for procedure quality with respect to work under SCC jurisdiction in the PINGP substation such that a means of effectively utilizing human performance tools to minimize errors during work which directly impacts the safe and reliable operation of nuclear plants was not in place.

A contributing cause was that the design of the protective relaying circuit includes a single point vulnerability whereby a single floating ground can result in misoperation of multiple breakers, thereby reducing transmission reliability.

Another contributing cause was that PINGP has, in the past, not rigorously implemented corrective actions from external assessments and recommendations, thereby resulting in vulnerabilities in oversight of substation work not being adequately addressed.

CORRECTIVE ACTION

WO 430439 replaced the missing section of the reference ground circuit on May 9, 2011. Unit 2 was placed online on May 10, 2011.

In accordance with the Corrective Action Program (CAP), NSPM will implement a program to identify new installation and modification work under SCC jurisdiction that may impact nuclear plant reliability and implement procedural controls to enable human performance tool usage. This program will ensure that, prior to conduct of work, procedures of sufficient quality to enable human performance tool usage are in place.

In accordance with the CAP, NSPM will implement a modification to the ground circuit for protective relaying to remove the single point vulnerability.

In accordance with the CAP, NSPM will evaluate recommendations of industry documents against current procedures and practices. The evaluation will, at a minimum, address recommendations and describe how current practices and procedures support implementation or identify actions needed to address identified gaps.

PREVIOUS SIMILAR EVENTS

A LER search was conducted and no similar events at PINGP involving grid disturbances were identified in the last three years.