Xcel Energy®

AUG 20 2014

L-PI-14-083
10 CFR 50.73

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

Prairie Island Nuclear Generating Plant Unit 1
Docket 50-282
Renewed License No. DPR-42

Licensee Event Report (LER) 50-282/2014-003-00, Emergency Diesel Generator Auto Start Due to Degraded Bus Voltage Signal

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), encloses LER 50-282/2014-003-00, Emergency Diesel Generator Auto Start Due to Degraded Bus Voltage Signal

Summary of Commitments

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

Scott Sharp FOR Kevin Davison

Kevin Davison
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosure (1)

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC
Department of Commerce, State of Minnesota

# ENCLOSURE 1

# LICENSEE EVENT REPORT 50-282/2014-003-00

4 Pages Follow

NRC FORM 366 (01-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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, (3150-0104), 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 Page 2 for required number of digits/characters for each block)

| 1. FACILITY NAME | 2. DOCKET NUMBER | 3. PAGE |
|---|---|---|
| Prairie Island Nuclear Generating Plant Unit 1 | 05000 - 282 | 1 OF 4 |

**4. TITLE**

Emergency Diesel Generator Auto Start Due to Degraded Bus Voltage Signal

| 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 |
| 6 | 23 | 14 | 2014 | – 003 | – 00 | 8 | 20 | 2014 | 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**

| FACILITY NAME | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Frank Sienczak | 651-267-1740 |

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

| CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU-FA CTURER | 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)*

At 1107 on June 23, 2014, Safeguards Bus 15 received a degraded voltage signal that resulted in the bus load shed and the automatic start of the D1 Emergency Diesel Generator (EDG). Bus 15 reenergized to normal voltage after the source breaker from D1 (EDG) automatically closed. This event is reportable under 10 CFR 50.73(a)(2)(iv)(A); Any event or condition that results in valid actuation of emergency AC electrical power systems, EDG.

The initiating condition was a failure of the Load Tap Changer (LTC) on the 10-Bank transformer which affected voltage to the normal offsite power supply to the 1R transformer and Safeguards Bus 15.

The Causal Evaluation determined that the failure in the Load Tap Changer (LTC) for control for Prairie Island Nuclear Generating Plant (PINGP) transformer bank (TR 10) was caused by the failure of the 84Y coil[1] from a General Electric (GE) CR120A relay that was installed in 1967. There are no periodic inspections or replacement activities (preventive maintenance) to prevent the relay failure. Relay cycling was validated during fall 2013 LTC control circuit upgrade. TR 10 is Transmission and Distribution (T&D) owned equipment installed in the PINGP switchyard.

Corrective action has been initiated to evaluate T&D Preventive Maintenance (PM) strategy associated with switchyard components that were credited for offsite power in accordance with SOER 99-1 and develop PM strategy.

Corrective action has been initiated to evaluate a potential design change for T&D owned LTC control circuit to eliminate the single component vulnerability.

## NARRATIVE

On June 23, 2014, the transmission system was in a normal condition. At approximately 0930, the Prairie Island Nuclear Generating Plant (PINGP) 345/161kV transformer bank (TR 10) had a failure in its load tap changer (LTC) control scheme which caused the load tap changer to move to its full lower position in a one minute time frame. The impact of this tap changer moving to full lower was that the PINGP 161kV bus voltage went from 165.5kV to 154.9kV (102.8 to 96.2 percent).

The impact of the 154.9kV (96.2 percent) voltage was that it was below the minimum threshold of 99.7 percent required by the plant. The normal range for transmission system voltages is between 95 and 105 percent of nominal.

At 0934, PINGP bus 15 was declared inoperable.

At 1107, the PINGP 161kV bus voltage had dropped to 153.9kV (95.6 percent). At this voltage level, the internal plant bus 15 reached a voltage level which initiated the plant D1 Emergency Diesel Generator to start, load and transfer the safeguard load for bus 15 to the diesel.

This event is reportable under 10 CFR 50.73(a)(2)(iv)(A) for valid actuation of the D1 EDG.

The initiating condition was a failure of the LTC on the 10-Bank transformer which affected voltage to the normal offsite power supply to the 1R transformer and Safeguards Bus 15.

At 1139, Bus 15 power supply was transferred from D1 EDG to CT-11 transformer. This action restored offsite power to the Engineered Safety Feature (ESF) Bus 15.

## EVENT ANALYSIS

Each EDG, as a backup to the normal standby AC power supply, is capable of sequentially starting and supplying the power requirements of one of the redundant sets of engineered safety features for its reactor unit. In addition, in the event of a station blackout (SBO) condition, each EDG is capable of sequentially starting and supplying the power requirements of the hot shutdown (Mode 3, Hot Standby in ITS) loads for its unit, as well as the essential loads of the blacked out unit, through the use of manual bus tie breakers interconnecting the same train 4160V ESF buses.

Each EDG is automatically started by either of the following events:
a. Undervoltage, which envelopes loss of voltage (including LOOP), or degraded voltage on the associated 4160 Volt buses (buses 15 and 16 for D1 and D2 respectively). Automatic starting of the EDG is initiated by a modified 2-out-of-4 voltage relay scheme on each 4160 Volt ESF bus to which the EDG is to be connected.
b. Initiation of a Safety Injection (SI) Signal (both of the affected Unit's EDGs start on this signal).

Safety related (safeguards) 4160 volt buses 15, 16, 25 and 26 can be supplied from the 345 KV/161KV system through the Reserve Auxiliary Transformers (1R for Unit 1) and the Cooling Tower Substation Transformers (CT11 for Unit 1), or from either the Unit 1 or Unit 2 same-train EDGs. Buses 15 (A-Train) and 16 (B-Train) serve engineered safety feature auxiliaries on Unit 1.

Degraded Voltage Logic

The degraded voltage setpoint is 95.5 ± 0.7 percent with time delays of 8 ± 0.5 seconds and 60 ± 3 seconds. The upper limit to the setpoint has been established to preclude unnecessary actuations of the voltage restoration scheme at the minimum expected grid voltage. Analysis has shown that the 8 second delay is adequate to account for normal transients, such as voltage dips from the starting of large loads, and is longer than the time required to start the Safety Injection pump at minimum voltage. This first delay annunciates that a degraded voltage condition exists. The second delay of 60 seconds allows the degraded condition to be corrected by external actions within a time period that will not cause damage to the operating equipment. With degraded voltage on any of the four safeguards 4160V buses, the associated PLC based Load Sequencer automatically initiates the following steps after the 60 second delay.

a. Auto start the Emergency Diesel Generator and trip the offsite source breakers to the bus.

b. Load rejection of the designated loads on the bus.

c. Close the breaker to the EDG once it has met established voltage and frequency criteria (within 10 seconds of receiving start signal).

d. Load restoration by sequencing loads at 5 second intervals.

If a SI signal is received during the 60 second degraded voltage time delay, the above logic is immediately actuated by the Load Sequencer with SI loads added during the last step, item d.

In both the undervoltage and degraded voltage scenarios described above, after voltage is re-established on the subject 4160 Volt bus, either from an offsite source or from an EDG, the EDG, if started, continues to run (loaded or unloaded) until manually shut down. The 480 Volt buses are immediately energized at the same time as the 4160 Volt bus from which it is fed.

For this event, a degraded voltage condition on Bus 15 caused valid actuation of the D1 EDG.

SAFETY SIGNIFICANCE

There were no actual nuclear, radiological, industrial, and/or environmental events. There was regulatory impact in that this event is reportable under 10 CFR 50.73(a)(2)(iv)(A); Any event or condition that results in valid actuation of emergency AC electrical power systems, EDG.

## CAUSE

The Causal Evaluation determined that the failure in the Load Tap Changer (LTC) for control for Prairie Island Nuclear Generating Plant (PINGP) transformer bank (TR 10) was caused by the failure of the 84Y coil[1] from a General Electric (GE) CR120A relay that was installed in 1967. There are no periodic inspections or replacement activities (preventive maintenance) to prevent the relay failure. Relay cycling was validated during fall 2013 LTC control circuit upgrade. TR 10 is Transmission and Distribution (T&D) owned equipment installed in the PINGP switchyard.

## CORRECTIVE ACTION

Immediate action(s) taken:

1. The LTC for TR 10 was replaced in accordance with Transmission and Distribution (T&D) procedure(s).

2. Bus 15 was restored to CT11 source from the D1 EDG source in accordance with site procedure.

3. The D1 EDG was restored to operable status and became available as an ESF Bus 15 source in accordance with site procedure(s) before Technical Specification LCO requirement to go to Mode 3.

Corrective action has been initiated to evaluate T&D Preventive Maintenance (PM) strategy associated with switchyard components that were credited for offsite power in accordance with SOER 99-1 and develop PM strategy.

Corrective action has been initiated to evaluate a potential design change for T&D owned LTC control circuit to eliminate the single component vulnerability.

## PREVIOUS SIMILAR EVENTS

None.

[1] IEEE Component Function Identifier – CL