RG&E
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**Robert C. Mecredy**
Vice President
Nuclear Operations

October 9, 2003

Mr. Robert L. Clark
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: LER 2003-002, Major Power Grid Disturbance Causes Loss of Electrical Load and Reactor Trip
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Clark:

The attached Licensee Event Report (LER) 2003-002 is submitted in accordance with 10 CFR 50.73, Licensee Event Report System, item (a)(2)(iv)(A).

This event has in no way affected the public's health and safety.

Very truly yours,

Robert C. Mecredy

xc: Mr. Robert L. Clark (Mail Stop O-8-C2)
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

U.S. NRC Ginna Senior Resident Inspector

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tel (585) 546-2700
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| NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION<br>**LICENSEE EVENT REPORT (LER)**<br>(See reverse for required number of digits/characters for each block) | APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004<br>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 |

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4. TITLE
Major Power Grid Disturbance Causes Loss of Electrical Load and Reactor Trip

| 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 |
| 08 | 14 | 2003 | 2003 | 002 | 00 | 10 | 09 | 2003 | FACILITY NAME | DOCKET NUMBER 05000 |

| 9. OPERATING 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)(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) |
|---|---|
| Mike Ruby, Senior Licensing Engineer | (585)771-3572 |

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 |
|---|---|---|---|---|---|---|---|---|---|
| A | BA | P | W318 | 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)


On August 14, 2003, the plant was in Mode 1 at approximately 100% steady state reactor power. At approximately 1611 EDST, a major electrical grid disturbance occurred, affecting the Northeastern United States and areas of Southern Canada. The disturbance caused a complete loss of electrical load and an automatic Reactor Trip. The Shift Supervisor conservatively declared an Unusual Event at 1646 EDST based on Emergency Action Level 6.1.1, "Loss of ability to supply power to the safeguard trains from offsite circuits 751 and 767 for greater than 15 minutes," and exited the Unusual Event at 2108 EDST.

The cause of the Reactor Trip was 2/4 Over Temperature Delta T (OTDT) channels reaching their setpoints due to the load rejection and ensuing Reactor Coolant System transient.

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I. PRE-EVENT PLANT CONDITIONS:

On August 14, 2003 the plant was in Mode 1 at approximately 100% steady state reactor power. Turbine Generator Volt-Amps Reactive (VAR) testing had been performed earlier in the day and the systems had been returned to normal operation. There were no electrical grid problems apparent from the Control Room and the operators had not been notified of any problems by RG&E Energy Operations.

II. DESCRIPTION OF EVENT:

A. EVENT:

At approximately 1611 EDST on August 14, 2003 the Control Room received several alarms associated with a loss of main generator electrical load and the associated plant transient. The plant initially experienced a turbine runback as the control systems responded to the loss of electrical load. Both Pressurizer Power Operated Relief Valves (PORVs) lifted and re-closed per design to limit the reactor Coolant System pressure transient. Approximately 28 seconds after receiving the first indication of a transient, the Reactor automatically tripped on Over Temperature Delta T (OTDT). The main generator tripped as designed due to the reactor/turbine trips.

Subsequent to the trip, Main Feedwater Isolation occurred as designed on low Tavg coincident with a reactor trip. However, due to voltage swings from the grid disturbance, instrument variations caused the Advanced Digital Feedwater Control System (ADFCS) to transfer to manual control. This transfer overrode the isolation signal causing the Main Feedwater Regulating Valves (MFRVs) to go to, and remain at, the normal or nominal automatic valve demand position at the time of the transfer, resulting in an unnecessary feedwater addition. The feedwater addition was terminated when the MFRVs closed on the high-high steam generator level (85%) signal. Although indicated level continued to increase due to overshoot and heatup of the water in the steam generators, subsequent evaluation of the level trends and walk down of the main steam header supports by Engineering personnel determined that an overfill condition did not occur.

The Main Steam Isolation Valves (MSIVs) were manually closed per procedure FR-H.3, "Response to Steam Generator High Level." This event does not meet the definition for NRC Performance Indicator (PI) "scram with loss of normal heat removal." A Frequently Asked Question (FAQ) has been submitted to clarify this position.

At approximately 1635, both Reactor Coolant Pumps (RCPs) tripped on Under Frequency (UF) as designed due to continued grid disturbances. The plant was stabilized in Mode 3 in natural circulation. Subsequent to the trip of the RCPs, the #2 seal on both pumps opened

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causing #1 seal return flow to decrease to zero. After consultation with Westinghouse, the RCPs were successfully restarted at 0437 and 0530 EDST on August 15, 2003. The seal flow indications then returned to normal values. The plant is designed to operate in natural circulation in Mode 3 with heat removal through the steam generators.

While off-site power was lost to several on site buildings, off-site power was never lost to the busses supplying the power block area. Although the safeguards bus voltage was swinging as a result of the grid transient, the voltage did not reach the undervoltage setpoints. However, the Operators determined that the off-site supply was unreliable, manually started the Emergency Diesel Generators (EDGs), and then manually transferred the safeguards busses to the EDGs. This resulted in declaring an Unusual Event that was terminated after power was later transferred back to the off-site sources.

When the Main Feedwater Pumps were stopped per procedure, the Motor Driven Aux Feedwater (MDAFW) pumps started coincident with the existing turbine trip signal. During subsequent recovery operations the B MDAFW Pump was damaged due to an error in pump alignment. The error was the result of a missed procedure step.

Seventy two (72) of ninety six (96) sirens associated with the Ginna prompt notification system were out of service due to power outages across the RG&E system, and were returned to service as power was restored to the respective service areas by August 15, 2003.

B. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT:

None

C. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:

- August 14, 2003, 1611 EDST: Event Date and Time, Onset of grid disturbance, PORVs cycle, and Reactor Trip.
- August 14, 2003, 1612 EDST: Main Generator Trip
- August 14, 2003, 1631 EDST: Main Steam Isolation Valves Closed
- August 14, 2003, 1635 EDST: Both RCPs trip, plant enters natural circulation.
- August 14, 2003, 1646 EDST: Declaration/Notification of Unusual Event, event #40068, Under 10CFR 50.72a(1)(i)

- August 14, 2003, 2007 EDST: Notification of Reactor Trip, MDAFW pumps auto start, and inoperability of sirens, event #40074, under 10CFR50.72b(2)(iv)(B) and 10CFR50.72b(3)(iv)(A)

- August 14, 2003, 2108 EDST: Terminated Unusual Event

- August 15, 2003, 0437 EDST: First RCP restarted.

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None, since there were no failures of any components with multiple functions.

E. METHOD OF DISCOVERY:

The condition was immediately apparent from plant indications and response in the Control Room.

F. SAFETY SYSTEM RESPONSES:

The Reactor trip occurred as designed, placing the plant in Mode 3. Other safety systems functioned as designed with the exception of the B MDAFW pump that was damaged due to personnel error. This event does not meet the definition for the NRC PI "Safety System Functional Failure," because multiple means existed to remove core decay heat (e.g., four additional AFW pumps).

III. CAUSE OF EVENT:

The cause of the event was a severe disturbance on the electrical grid affecting the Northeastern United States and Southeastern Canada. This voltage and frequency disturbance caused a 100% electrical load rejection at the station. Since Ginna is only designed to sustain a 50% load rejection without a reactor trip, the reactor tripped due to the ensuing transient.

This event is NUREG-1022 Cause Code (C), "External Cause"

IV. ASSESSMENT OF THE SAFETY CONSEQUENCES OF THE EVENT:

This event is reportable in accordance with 10 CFR 50.73, Licensee Event Report System, item (a)(2)(iv)(A), which requires a report of, "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section, except when:

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*(1)* The actuation resulted from and was part of a pre-planned sequence during testing or reactor operation; or
*(2)* The actuation was invalid and;
*(i)* Occurred while the system was properly removed from service; or
*(ii)* Occurred after the safety function had been already completed."

As an assessment considering the consequences and implications of this event, a review of the UFSAR transients was conducted. For evaluation of analyzed transients versus this event, the UFSAR specifically analyzes a loss of external electrical load in Section 15.2.2. Four cases are considered, two at beginning of life (BOL) and two at end of life (EOL), with and without automatic pressurizer pressure control. The case analyzed for EOL with automatic pressure control would normally be expected to more closely reflect the actual transient. However, the BOL case with automatic pressure control was more representative. This is due to the fact that the UFSAR assumes no rod control and loss of main feedwater (MFW) coincident with the trip. This maximizes the reactivity feedback while resulting in a reactor trip on low steam generator level. Since both automatic rod control and MFW functioned, reactivity feedback was minimized and the reactor tripped on OTDT similar to the BOL transient analyzed. No items of concern were noted.

Both Emergency Diesel Generators operated as designed throughout the event, ensuring a reliable source of power to the AC emergency busses at all times.

The re-initiation of MFW due to the ADFCS transfer to manual was evaluated for safety concerns. The FW isolation signal from low Tavg coincident with a reactor trip is a control signal rather than a required safety function. Although the unexpected bypass of the signal caused a control problem, the safety related high high level feedwater isolation signal functioned as required, preventing a SG overfill condition. Since the safety related high-high steam generator level feedwater isolation functioned as required, and the steam generators did not enter an over fill condition, there was no compromise of safety as a result of this event.

Regarding the damaged B MDAFW pump, Ginna has a total of four 100% capacity MDAFW pumps, including two Standby Auxiliary Feedwater (SAFW) pumps and one 200% capacity Turbine Driven Auxiliary Feedwater (TDAFW) pump.

Therefore it was determined that the plant responded within it's design and licensing basis, that there were no unreviewed safety questions, and that the public's health and safety was assured at all times.

V. CORRECTIVE ACTIONS:

A. ACTION TAKEN TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL STATUS:

- The MRPI indication returned to normal before the cause could be determined. Extensive trouble shooting during the subsequent 2003 Refueling Outage (RFO) discovered and repaired a loose solder joint in the circuitry.

- The B MDAFW pump was repaired, tested, and returned to service on 8/18/03.

- The ADFCS transferring to manual was evaluated and it was determined that the system operated as designed.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

Note: The following planned actions are for information only and are not intended as regulatory commitments.

- Since the initiating transient was caused by an external event beyond RG&Es control, no immediate action can be taken to prevent recurrence. However, RG&E will cooperate with, and participate in, reasonable industry efforts to improve grid reliability.

- Westinghouse was consulted for assistance with the ADFCS issue and Plant Change Request (PCR) 2003-0033 was initiated to modify the system and prevent reoccurrence of the unnecessary feedwater addition. Modifications are planned for the 2003 RFO.

- The operations procedure that led to the auto start of the MDAFW pumps will be reviewed and revised as necessary to prevent reoccurrence when shifting from Main Feedwater to Auxiliary Feedwater.

- The alignment error which led to the damage of the B MDAFW pump is being addressed by Ginna's corrective action process (AR 2003-1804).

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## VI. ADDITIONAL INFORMATION:

### A. FAILED COMPONENTS:

B MDAFW pump - Worthington Model # 2 WTF-87

### B. PREVIOUS LERs ON SIMILAR EVENTS:

An historical search of LERs was conducted with the following results: There are no similar LERs where power grid disturbances resulted in a reactor trip.

### C. THE ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) COMPONENT FUNCTION IDENTIFIER AND SYSTEM NAME OF EACH COMPONENT OR SYSTEM REFERRED TO IN THIS LER:

| COMPONENT | IEEE 803 FUNCTION IDENTIFIER | IEEE 805 SYSTEM IDENTIFICATION |
|---|---|---|
| Auxiliary Feedwater Pumps | P | BA |
| Main Feedwater Regulating Valves | FCV | SJ |
| Main Steam Isolation Valves | ISV | SB |
| Reactor Coolant Pump | P | AB |
| Emergency Diesel Generators | DG | EK |

### D. SPECIAL COMMENTS:

None