

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

REPORT/DOCKET NOS. 50-244/93-21

LICENSE NO. DPR-18

LICENSEE: Rochester Gas and Electric (RG&E) Corporation  
89 East Avenue  
Rochester, New York 14649

FACILITY: Robert E. Ginna Nuclear Power Plant

INSPECTION AT: Corporate Office

INSPECTION DATES: October 4-13, 1993

INSPECTOR:

*Larry F. Scholl*  
Larry Scholl, Reactor Engineer  
Electrical Section, EB, DRS

11/30/93  
Date

APPROVED BY:

*William H. Ruland Jr.*  
William H. Ruland, Chief  
Electrical Section, EB, DRS

12-2-93  
Date

Areas Inspected: Electrical distribution system deficiencies identified during NRC electrical distribution system functional inspections (EDSFIs) at various facilities. One unresolved item, regarding the lack of a comprehensive coordination analysis for circuit breakers, was also reviewed.

Results: The issues inspected were found to have been adequately reviewed and addressed by RG&E with the exception of the emergency electrical bus logic testing. The surveillance testing was deficient in that load shedding of the emergency buses was not performed as required by the plant technical specifications. This deficiency was of particular concern since problems with the testing of emergency diesel generators have been the subject of recent NRC Information Notices and as such afforded RG&E the opportunity to discover the surveillance test deficiencies.

The inspector found that RG&E performed a comprehensive coordination analyses for 480V and 4160V circuit breakers and the associated unresolved item was closed.

## DETAILS

### 1.0 BACKGROUND

In 1991, the NRC performed a safety system functional inspection on the electrical distribution system at R. E. Ginna Nuclear Power Station. Since 1989 the NRC has performed more than 50 electrical distribution system functional inspections (EDSFIs) at licensed reactor facilities throughout the country. Information regarding significant deficiencies identified during these inspections has been provided to all reactor plant licensees through the issuance of NRC Information Notices. The inspector reviewed several of these deficiencies for applicability to the Ginna plant and to determine if RG&E had taken the appropriate actions in response to the information. One previously unresolved item involving the lack of a comprehensive circuit breaker coordination analysis for circuit breakers was also reviewed.

### 2.0 INSPECTION DETAILS

The inspector held discussions with various members of the licensee's staff and reviewed drawings, calculations and procedures associated with the areas inspected. The issues that were reviewed are discussed in the following NRC Information Notices:

- 91-13 Inadequate Testing of Emergency Diesel Generators (EDGs)
- 91-29 and Supplement 1 Deficiencies Identified During Electrical Distribution System Functional Inspections
- 91-51 Inadequate Fuse Control Program
- 92-40 Inadequate Testing of Emergency Bus Undervoltage Logic Circuitry
- 92-53 Potential Failure of Emergency Diesel Generators Due To Excessive Rate of Loading

#### 2.1 Molded Case Circuit Breaker Testing (IN 91-29)

The NRC has identified deficiencies in licensee programs to test circuit breakers. These deficiencies included inadequate procedures, inadequate test acceptance criteria, inadequate test equipment and inadequate control of testing.

Ginna Station Procedure M-1005, "Electrical Preventive Maintenance of Buses, Motor Control Centers, Transformers and Breakers," specifies the test frequency of electrical components. The inspector reviewed this procedure and confirmed that molded case circuit breakers were included within the scope of the preventive maintenance program. The procedure specifies that testing or replacement of circuit breakers will be performed on a sampling basis and specifies the frequency of testing for the various breakers. The safety-

related breakers are tested at least once every 60 months and the frequency of may be adjusted based on test results in accordance with the Reliability Centered Maintenance program. The detailed testing instructions are specified in Procedure MP-056.01, "AC Motor Control Center Maintenance and Subcomponent Replacement."

The inspector concluded that RG&E has adequately defined the maintenance and testing requirements for molded case circuit breakers and has developed the necessary test procedure.

## **2.2 Interrupting Capacity and Coordination of Fault Protection Devices (IN 91-29)**

NRC inspections have identified conditions in which the interrupting capacities of fault protection devices were not adequate for the application and other cases in which a lack of coordination could have resulted in a branch circuit fault causing the trip of a feeder circuit breaker or fuse.

During the EDSFI at the Ginna Station, the inspection team identified a concern that the margin between some of the Class 1E full load currents and the lower band of the breaker overcurrent trip set point was very narrow. This could result in breaker trips when operating under degraded voltage conditions. At that time RG&E provided some preliminary calculations that indicated there was no cause for concern. The team was also informed that a comprehensive coordination analysis was in progress to document the basis for all of the set points for the 480V and 4160V breakers.

The inspector reviewed Design Analysis DA-EE-93-107-07, "4160 Volt Overcurrent Relay Coordination and Circuit Protection Study," and DA-EE-93-104-07, "480 Volt DB Breaker with Amptector Retrofit Coordination and Circuit Protection Study," that document the completed breaker coordination analysis. These documents contain recommended set point changes, intended to optimize the protection of loads and circuit coordination, and the basis for the new set points. The calculations and associated set point changes take into account operation at degraded voltage conditions. BG&E plans to implement the set point changes during the next refueling outage. Based on these actions unresolved item 50-244/91-80-06 is closed.

## **2.3 Emergency Diesel Generator Mechanical Interfaces (IN 91-29 Supplement 1)**

The NRC found deficiencies involving EDG mechanical systems interfaces such as air start systems, fuel oil storage and heating, ventilation and cooling systems.

To verify the adequacy of the EDG air start system RG&E performed test MET-051, "Test Specification for the Diesel Generator Air Start System." The inspector reviewed the results of this test that demonstrated that the diesel would start at least five times from the nominal air receiver pressure, including one start from an air pressure that was below the air receiver low pressure alarm point.



At the D. C. Cook site, it was discovered that the ability of the EDG ventilation system and engine air intake ducting to withstand the differential pressure effects of a tornado may not have been considered during the initial design of these components.

During the Ginna Station Structural Upgrade Program, in response to the Systematic Evaluation Program, RG&E performed a calculation (Engineering Work Request 3296) to determine what vent area would be required for the various structures to minimize the differential pressure effects of a tornado. For the diesel generator building the results of the calculation indicated that the necessary vent area required would be 4.8 square feet. The existing vent area is 72 square feet. Based on this information RG&E concluded that there was reasonable assurance that tornado effects on the emergency diesel generator building ventilation would be negligible.

#### 2.4 Fuse Control Program (IN 91-51)

Numerous problems associated with the control of fuses in the plant electrical systems have been identified during NRC inspections and by licensees as reported in Licensee Event Reports. Fuse control deficiencies include:

- inadequate root cause evaluation of blown fuses
- inadequate verification of design information for installed and replacement fuses
- inadequate identification and labeling of fuses
- improper coordination of fuses and circuit breakers
- personnel errors

The inspector reviewed Plant Procedure M-106, "Replacement or Inspection of D.C. Fuses," and found that it contained detailed directions for the control of DC fuses. The fuse data base was developed under EWR 3341 that also performed a coordination study for the DC fuses. The use of M-106 and the associated schematic drawings will ensure the replacement fuse is of the correct voltage, current and interrupting capacity rating. The preventive maintenance (PM) analyst is required to review the completed M-106 procedures to ensure that adverse trends are detected.

Procedure A-25.1, "Ginna Station Event Report," requires the duty engineer to evaluate if the root cause has been determined and if it has not it is referred to the PM Analyst for further evaluation. This procedure should ensure that the root cause of a blown fuse is investigated.

The inspector concluded that a good dc fuse control program was in place and noted that a similar program for the control of ac fuses was being developed.



## 2.5 Emergency Bus Undervoltage Logic Circuitry Testing (IN 92-40)

During the EDSFI inspection at the LaSalle County Nuclear Station, the NRC found that the surveillance test used for the loss of offsite power test was not testing the capability of the undervoltage logic circuitry to de-energize the emergency bus. The loss of offsite power was simulated by tripping the emergency bus feeder breakers. One function of the undervoltage logic circuitry is to open the feeder automatically during an undervoltage condition to ensure that the emergency diesel generator is not connected to a degraded offsite power source. Manually tripping the feeder breaker to initiate the test did not permit the testing of this function.

NRC Information Notice 91-13, "Inadequate Testing of Emergency Diesel Generators," discusses problems associated with EDG testing, including the failure to perform adequate diesel generator load tests and emergency bus load shed tests.

The RG&E evaluation of Information Notice 92-40 indicated that Surveillance Procedure RSSP 2.2, "Diesel Generator Load and Safeguard Sequence Test," performed a test of the capability of the undervoltage relays to trip the emergency bus feeder breakers. The inspector reviewed this procedure along with the emergency diesel generator startup logic as described in Figure 8.3-5 of the R.E. Ginna Updated Final Safety Analysis Report (UFSAR).

There are four emergency buses at the Ginna plant, two associated with the A train (buses 14 and 18) and two associated with the B train (buses 16 and 17). The trip logic for the emergency bus feeder breakers is such that the breakers will trip as the result of the existence of one of two following conditions:

- 1) Direct trip on an undervoltage condition on the emergency bus, or
- 2) An undervoltage condition on the other emergency bus in the same train, coincident with a safety injection (SI) signal.

The inspector found that the testing of the B train emergency buses, in accordance with Procedure RSSP 2.2, initiated a trip of the feeder breaker for emergency bus 17 by inserting an undervoltage signal in the logic for bus 16 and then initiating a SI signal (condition 2 above). The trip of the feeder breaker for bus 17 de-energizes the bus, thereby initiating the undervoltage logic for bus 17. The bus 17 undervoltage condition, coincident with the SI signal then trips the bus 16 feeder breaker (condition 2 above). This test method does not test the direct trip of the feeder breakers due to an undervoltage signal (condition 1 above).

The inspector asked the licensee if other tests existed that would test the undervoltage trips of the feeder breakers. RG&E identified Procedure PR-21.1, "Protective Relay Trip Test - 480V Undervoltage for Buses 14 or 16." The inspector reviewed this procedure and verified that it performed trip tests of the bus 14 and bus 16 feeder breakers; however, it was also found that a similar procedure for buses 17 and 18 did not exist.

As a result of this discrepancy, and after reviewing additional surveillance tests, the inspector then requested to review the procedures that performed the testing of the load shedding depicted on the UFSAR logic diagram and required by plant technical specification (TS) 4.6.1.e.3.a. RG&E performed a review of the existing surveillance procedures and on October 11, 1993, concluded that procedures were not in place to perform the load shed testing for the safeguards loads on the emergency buses. The emergency diesel generators were then declared inoperable until additional testing was performed on October 13, 1993. The results of this testing verified that the undervoltage trip of the bus 17 and 18 feeder breakers and the load shedding circuits functioned properly.

The inspector concluded that the plant procedures did not adequately test the bus undervoltage logic and the failure to perform the load shed testing is a violation of TS 4.6.1.e.3.a (50-244/93-21-01).

### 2.6 Emergency Diesel Generator Rate of Loading (IN 92-53)

The NRC found at the Calvert Cliffs Nuclear Power Plant that under certain conditions loads could be sequenced onto the emergency bus more rapidly than the design capability of the emergency diesel generator.

RG&E has developed an emergency diesel generator dynamic load analysis to assess the capabilities of the emergency diesel generators to start and accelerate the safety loads during an accident. These analyses; DA-EE-92-111-01, "Diesel Generator A Dynamic Loading Analysis," and DA-EE-112-01, "Diesel Generator B Dynamic Loading Analysis," were reviewed in their draft form during the EDSFI inspection and since have been finalized. The inspector noted that the dynamic load analysis computer model is being used to assess the effects of various factors on the EDG operation, including items such a time delay relay set point drift.

The inspector found the development of this computer model to be a good initiative on the part of RG&E and noted that the engineering staff continues to employ it as a tool to resolve operational questions with the EDGs.

### 3.0 CONCLUSIONS

The inspector concluded that, with the exception of the testing of the emergency bus undervoltage logic, BG&E was adequately evaluating and implementing corrective actions based on industry findings related to the electrical distribution system. Actions necessary to resolve issues identified by the EDSFI inspection team have been completed in a timely manner.

#### 4.0 EXIT MEETING

At the conclusion of the inspection on October 8, 1993, the inspector met with licensee representatives listed in Attachment 1. The inspector summarized the scope and results of the inspection at that time. Followup discussions were conducted on October 12 and 13, 1993, with Mr. Wrobel and Mr. Miller to review the results of your additional testing of the EDG logic circuitry.

The licensee acknowledged the inspection findings as detailed in this report and had no additional comments regarding the inspection results.

ATTACHMENT 1

Persons Contacted

Rochester Gas and Electric Corporation

- \* C. Forkell, Electrical Engineering Manager
- \* T. Miller, Lead Electrical Engineer
- \* J. Sargent, Electrical Engineer
- L. Sucheski, Structural Engineering Manager
- \* G. Wrobel, Licensing Manager
- C. Vitali, Lead Mechanical Engineer

\* Indicates those who attended the exit meeting on October 8, 1993.