U.S. NUCLEAR REGULATORY COMMISSION
REGION I

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| REPORT NO. | 50-244/93-09 |
| DOCKET NO. | 50-244 |
| LICENSE NO. | DPR-18 |
| LICENSEE: | Rochester Gas and Electric Corporation<br>89 East Avenue<br>Rochester, New York 14649 |
| FACILTY NAME: | R. E. Ginna Nuclear Power Plant |
| INSPECTION AT: | Corporate Office |
| INSPECTION CONDUCTED: | April 26-30, 1993 |
| CONTRIBUTING INSPECTORS: | J. Calvert, Reactor Engineer, DRS<br>B. Marcus, Electrical Engineer - HQ/NRR |

INSPECTOR: R. J. Paolino, Senior Reactor Engineer, DRS — 5-27-93 Date

APPROVED BY: William H. Ruland, Chief, ES, DRS — 6/2/93 Date

INSPECTION SUMMARY: Inspection of April 26-30, 1993 (Inspection Report No. 50-244/93-09)

AREAS INSPECTED: Announced inspection to review and verify licensee's implementation of the post-accident monitoring instrumentation approved by the NRC.

RESULTS: Based on this inspection, which included the review of applicable documents, instructions, commitments, drawings and procedures, the NRC found the Rochester Gas and Electric Corporation post-accident monitoring instrumentation conforms to the configuration approved by the NRC in SER dated February 24, 1993.

Licensee knowledge and familiarity with post-accident monitoring instrumentation was demonstrated through exceptional support by the licensee in providing detailed, accurate and timely responses to NRC questions/concerns.

DETAILS

## 1.0 INTRODUCTION

Rochester Gas and Electric Corporation (RG&E), licensee for R. E. Ginna Nuclear Power Plant, responded to item 6.2 of NUREG 0737, Supplement 1 with letters dated January 31, 1984, and February 28, 1985. Additional information was submitted on June 16, 1986, and July 13, 1990, and used in preparing the Technical Evaluation Report issued September 1990. The Technical Evaluation Report compares information provided for post-accident monitoring instrumentation and recommendations of Regulatory Guide 1.97, Revision 3. Information provided on May 6, 1991, and May 16, 1991, was superseded with the comprehensive submittal of March 13, 1992, and detailed submittal of October 14, 1992. The March submittal combines and clarifies the previous responses and describes the position taken by RG&E on instrumentation used for post-accident management. The October 14, 1992 submittal adds further detail and clarification.

RG&E provided justification where there were deviations from or exceptions to the recommendations of the Regulatory Guide and a discussion of the design criteria involved. RG&E made no commitment, explicit or otherwise, to the guidance of the Regulatory Guide. Exceptions to and deviations from the recommendations of the Regulatory Guide are noted in this report and have been approved by the NRC in an SER dated February 24, 1993.

## 2.0 BACKGROUND

Regulatory Guide 1.97, identifies the plant variables to be measured and the instrumentation criteria for assuring acceptable emergency response capabilities during and following the course of an accident. Regulatory Guide 1.97 divides post-accident instrumentation into three categories and five types. The three design categories are noted as 1, 2, & 3. Category 1 variables require the most stringent design requirements and category 3 the least stringent. The five types of instrumentation identified in the Regulatory Guide are Types A, B, C, D, & E. Type A variables are plant specific and classified by the licensee. Type B variables provide information to indicate that plant safety functions are being accomplished. Type C variables provide information regarding the breach of barriers for fission product release. Type D variables indicate the operation of individual safety systems. Type E variables are those that indicate and determine the magnitude of the release of radioactive materials. Each variable type can be any design category; however, Type A variables can only be design Category 1.

REFERENCES

The specific references used to assess the licensee's response to Regulatory Guide 1.97, Revision 3 are:

- Regulatory Guide 1.97, Revision 3, "Instrumentation For Light Water-Cooled Nuclear Power Plants To Assess Plant And Environs Conditions During And Following An Accident."
- Safety Evaluation Report, Conformance to Regulatory Guide 1.97, Revision 3, dated February 24, 1993.
- R. E. Ginna Nuclear Power Plant, Final Safety Analysis Report (FSAR).
- Licensee procedures and applicable electrical and P&ID drawings.
- Supplement 1 to NUREG-0737, "Requirements For Emergency Response Capability (Generic Letter No. 82-33)," dated December 17, 1982.

## 3.0 INSPECTION SCOPE

The NRC inspection scope included equipment qualification (seismic and environmental), redundancy of power supplies, measured variables, display and recording methods used, independence and separation of electrical circuits, range and overlapping features of multiple instrument indicators, test and surveillance frequencies, direct and indirect measurements of parameters of interest.

Systems inspected were selected from the list of Type A variables identified by the licensee, that is, those variables that provide information required to permit the control room operator to take specific action for the proper operation of a safety system. Licensee identified Type A variables include:

- auxiliary feedwater flow
- core exit temperature
- containment pressure
- condensate storage tank level
- pressurizer pressure (1700 psig- 2500 psig)
- pressurizer level
- reactor coolant system (RCS) cold leg water temperature
- RCS pressure (zero - 3000 psig)
- residual heat removal (low pressure injection) flow
- reactor vessel level indication system
- refueling water storage tank level

- steam generator level - wide range
- steam generator level - narrow range
- steam generator pressure
- RCS subcooling margin monitor
- containment sump level - wide range

These variables, with the exceptions as noted in this report either meet or the licensee will modify the instrument to meet the Category 1 recommendation, consistent with the type A requirement.

## 4.0 INSPECTION DETAILS

The NRC inspectors met with the licensee staff, reviewed applicable drawings and procedures and performed a walkdown of specific post-accident instrumentation systems in the plant as well as control room indication methods. Type A variables examined are listed in Section 5.0.

## 5.0 REGULATORY GUIDE 1.97 LICENSEE TYPE A VARIABLES

### 5.1 Reactor Coolant Pressure

The licensee determined reactor coolant pressure to be a Type A, Category 1, variable. Two reactor coolant pressure signals, 0 to 3000 psig, are transmitted from two independent pressure transmitters, indicated on two indicators, and recorded via the computer. The range of the indicators is 0 to 3000 psig. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room. The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate that the instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

## 5.2 Steam Generator Pressure

The licensee determined steam generator pressure to be a Type.A, Category 1, variable. Six steam generator pressure signals, 0 to 1400 psig, are transmitted from six independent pressure transmitters, indicated on six indicators, and recorded via the computer. The range of the indicators is 0 to 1400 psig. Electrical power for the instrumentation system is derived from three (1A, 1B, & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

The inspectors noted a discrepancy between the instrumentation tag numbers on the drawing and on the instruments in the control room. The licensee has taken immediate action to correct the control room markings. No further actions were necessary.

## 5.3 Pressurizer Pressure

The licensee determined pressurizer pressure to be a Type A, Category 1, variable. Four pressurizer pressure signals, 1700 to 2500 psig, are transmitted from four independent pressure transmitters, indicated on four indicators, and recorded on four dedicated recorders and via the computer. The range of the indicators is 1700 to 2500 psig. Electrical power for the instrumentation system is derived from three (1A, 1B, & 1C) independent Class 1E power sources and one (1D) non-Class 1E power source. The indicators are located in the main control room. RG 1.97 recommends two channels of instrumentation to monitor pressurizer pressure. The licensee's use of an additional channel, with non-Class 1E power source for the fourth channel is acceptable.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments are in calibration and that surveillance is performed at the specified frequency.

No deficiencies were identified.

## 5.4 Containment Pressure

The licensee determined containment pressure to be a Type A, Category 1, variable. Three wide range containment pressure signals, 10 to 200 psia, are transmitted from three independent pressure transmitters,indicated on three indicators, and recorded via the computer. The range of the indicators is 10 to 200 psia. Electrical power for the instrumentation system is derived from three (1B, 1C, & MQ-483) independent Class 1E power sources. The indicators are located in the main control room.

Three narrow range containment pressure signals, 0 to 60 psia, are transmitted from three independent pressure transmitters, indicated on three indicators, and recorded via the computer. The range of the indicators is 0 to 60 psia. Electrical power for the instrumentation system is derived from three (1A, 1B, & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments are in calibration and that surveillance is performed at the specified frequency.

No deficiencies were identified.

### 5.5 Reactor Coolant System Cold Leg Water Temperature

The licensee determined reactor coolant system cold leg water temperature to be a Type A, Category 1, variable. Two reactor coolant system cold leg water temperature signals, 0 to 700°F, are transmitted from two independent temperature sensors, indicated on two indicators. Currently two unqualified channels are recorded in the main control room. The range of the indicators is 0 to 700°F. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments are in calibration and that surveillance is performed at the specified frequency.

The licensee has committed to provide recording capability for the two qualified channels. This modification is planned for the 1994 refueling outage. The licensee also committed to resolve, by the 1994 refueling outage, any labeling conflict that may result from the use of both qualified and unqualified channels. This is an open item to be reviewed by the NRC upon acceptable completion of both commitments (IFI 50-244/93-09-01).

### 5.6 Reactor Coolant System Hot Leg Water Temperature

The reactor coolant system hot leg water temperature monitoring instrumentation is classified as a Type B, Category 1, variable. Two reactor coolant system hot leg water temperature signals, 0 to 700°F, are transmitted from two independent temperature sensors, indicated on two indicators, and recorded via the computer. The range of the indicators is 0 to 700°F. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments are in calibration and that surveillance is performed at the specified frequency.

No deficiencies were identified.

## 5.7 Reactor Coolant System Subcooling Monitor

The licensee determined reactor coolant system subcooling monitor instrumentation to be Type A, Category 1, variable. Two reactor coolant system subcooling signals, 0 to 100°F subcooled, are transmitted from two independent temperature sensors, indicated on two indicators, and recorded on two recorders and via the computer. The range of the indicators is 0 to 100°F subcooled as approved in the SER. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

## 5.8 Core Exit Temperature

The licensee determined core exit temperature to be a Type A, Category 1, variable. Thirty nine core exit temperature signals, 0 to 2300°F, are transmitted from 39 independent temperature sensors,indicated on two indicators, and recorded via the computer. The indicators display 19 channels on one indicator and 20 channels on the other indicator. The operator has the ability to select a single signal on each channel. The range of the indicators is 0 to 2300°F. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

## 5.9 Auxiliary Feedwater Flow

The licensee determined auxiliary feedwater flow to be a Type A, Category 1, variable. Two wide range auxiliary feedwater flow signals, 0 to 500 gpm, are transmitted from two independent flow transmitters, indicated on two indicators, and recorded via the computer. The range of the indicators is 0 to 500 gpm. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room.

Four narrow range auxiliary feedwater flow signals, 0 to 275 gpm, are transmitted from four independent flow transmitters, indicated on four indicators, and recorded via the computer. The range of the indicators is 0 to 275 gpm. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The indicators are located in the main control room. Each narrow range indicators provide information about the auxiliary feedwater flow to one steam generator. The transmitters that provide the signals to each indicator are fed from redundant power sources. The indicators are isolated from the transmitters.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance were performed at the specified frequency.

The inspectors noted that the tag numbers of two of the narrow range indicators were shown differently on some of the documentation. The licensee has written a drawing change request to review the documentation and ensure that they reflect the correct information. No further actions are necessary.

## 5.10 Residual Heat Removal Flow

The licensee determined residual heat removal (RHR) flow to be a Type A, Category 1, variable. One wide range RHR flow signal, 0 to 4000 gpm, is transmitted from one flow transmitter, indicated on one indicator and recorded via the computer. The range of the indicator is 0 to 4000 gpm. Electrical power for the instrumentation system is derived from one (1C) Class 1E power source. The indicator is located in the main control room.

Two narrow range RHR flow signals, 0 to 2200 gpm, are transmitted from two independent flow transmitters, indicated on two indicators, and recorded via the computer. The range of the indicators is 0 to 2200 gpm. Electrical power for the instrumentation system is derived from two (1B & 1C) independent Class 1E power sources. The indicators are located in the main control room.

The transmitters were identified on the EQ master list and safety-related Q-list indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

The licensee has committed to provide a redundant wide range channel. This modification is planned for the 1994 refueling outage. This is an open item to be reviewed by the NRC upon acceptable completion of this commitment (IFI 50-244/93-09-02).

### 5.11 Condensate Storage Tank Level

The licensee determined condensate storage tank level to be a Type A, Category 1, variable. Two condensate storage tank level signals, one from each tank, are transmitted from independent level transmitters and indicated on the main control board. The two tanks function as a single tank because they are connected by a ten-inch pipe. The situation with each tank having a single measurement channel was approved in the SER (paragraph 3.3.24).

Neither tank A or tank B level signal is recorded on a strip chart recorder; however the tank A level signal is sent to the plant process computer for display on demand, trending and historical logging purposes. The range of the indicators is from 0 to 24 feet tank level. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources.

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

### 5.12 Pressurizer Level

The licensee determined pressurizer level to be a Type A, Category 1, variable. Three signals are transmitted from independent level transmitters and indicated on the main control board. The three signals are individually isolated and sent to a recorder through a selector switch which allows one of the three signals to be trended on the recorder. The range of the indicators is from 0 to 100% of the cylindrical volume, which corresponds to a 17.5 foot span. The hemispherical ends are not included; this deviation was approved in the SER (paragraph 3.3.20). The three independent signals are also sent to the plant computer for display on demand, trending and historical logging. Electrical power for the instrumentation system is derived from three (1A, 1B & 1C) independent Class 1E power sources.

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

### 5.13 Reactor Vessel Level

The licensee determined reactor vessel level to be a Type A, Category 1, variable. Two independent analog compensated measurement trains are employed. The actual reactor level is from two independent transmitters which measure level from the bottom of the vessel to the top of the head, for a span of 441.5 inches. The compensated level is indicated as 0 to 100% on two indicators on the main control board. The compensated levels are not recorded on a strip chart recorder, but they are independently sent to the plant computer for display on demand, trending and historical logging purposes. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources.

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

### 5.14 Refueling Water Storage Tank Level

The licensee determined refueling water storage tank level to be a Type A, Category 1, variable. Two level signals from independent transmitters are indicated on the main control board. The range of the indicators is 0 to 100%, which corresponds to a 79.25 feet span (from 1.5 feet above the base of the tank to 0.25 feet below the cylindrical top of the tank.) The tank levels are not recorded on a strip chart recorder, but are independently sent to the plant process computer for display on demand, trending and historical logging purposes.

Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. The power for one computer point is not the same as the power for the corresponding loop. The electrical power for the corresponding loop is from bus 1C, but the computer point for this loop is powered from bus 1A. The computer input is isolated from the transmitter and indicator. This situation was approved by the SER (paragraph 3.3.17.)

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

### 5.15 Steam Generator Wide Range Level

The licensee determined steam generator wide range level to be a Type A, Category 1, variable. There are two wide range level signals from independent transmitters for each of the two steam generators. The signals from the transmitters are indicated as 0 to 520 inches (0 to 100%) on four independent main control board indicators and strip chart recorders. The indications are also sent to the plant process computer for display on demand, trending and historical logging purposes. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources. Bus 1A powers one train; bus 1C powers the other train.

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

### 5.16 Steam Generator Narrow Range Level

The licensee determined steam generator narrow range level to be a Type A, Category 1, variable. There are three narrow range level signals from independent transmitters for each steam generator. The signals from the transmitters are independently indicated on the main control board as 0 to 100%, which corresponds to approximately above the top of the bundles to the top of the swirl vane separators (span of 143 inches).

Electrical power for the instrumentation system is derived from three (1A, 1B & 1C) independent Class 1E power sources and one (1D) independent non-1E source. The Class 1E sources are connected to the channels such that a single source failure will not cause a failure of all indication for each steam generator. The non-1E source is connected to one channel in each steam generator indication channel. This arrangement of sources was approved by the SER (paragraph 3.3.39).

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified.

### 5.17 Containment Sump Wide Range Level

The licensee determined containment sump wide range level to be a Type A, Category 1, variable. Two independent trains, each with 5 float type switches positioned at 5 discrete levels, measure the sump B level. The discrete levels are at 8, 78, 113, 180, and 214

inches. The highest level, 214 inches, is equivalent to approximately 500,000 gallons in the B sump available for recirculation. The two trains of discrete levels are indicated on the main control board, and sent to the plant process computer for display on demand, trending and historical logging purposes. Electrical power for the instrumentation system is derived from two (1A & 1C) independent Class 1E power sources.

The transmitters were identified on the EQ master list and safety-related Q-List indicating seismic qualification. Calibration and surveillance records indicate instruments were in calibration and that surveillance was performed at the specified frequency.

No deficiencies were identified. The wide range instrumentation for sump B was approved in the SER (paragraph 3.3.5) as meeting the recommendations of the regulatory guide.

### 5.18 Isolation Devices

Where a category 1 signal is used as input to a non-category 1 system, Regulatory Guide 1.97 specifies the use of isolation devices which are fully qualified for use in category 1 circuits. An audit of eight category 1 variables was performed to determine the extent of compliance for fully qualified isolators.

The isolator audit showed that in five cases, the circuits were isolated with fully qualified isolators. These cases are: condensate storage tank level channel A; refueling water storage tank level channel LT-921; sump B level; reactor water level indicating system; and steam generator wide range level.

The isolator audit showed that in three cases, the circuits were isolated by the use of Foxboro Model 66 current repeater, which is not qualified for Category 1 use. The use of the repeater as an isolator was approved in the SER for the ESF control logic (paragraph 4.3, letter dated July 30, 1981). These cases are: pressurizer level; refueling water tank level LT-920 channel; and steam generator narrow range level.

The isolator audit showed that in five cases, the circuits were not isolated. However, these cases are acceptable since they meet the SER guidance for existing non-isolated circuits used in pre-existing control grade circuitry as discussed in the SER, paragraph 3.3.4.1. These cases are: condensate storage tank level channel A; refueling water storage tank channel LT-920 and LT-921; pressurizer level; and steam generator narrow range level.

Loop circuits provide input to the nonsafety-related plant computer. Isolation for class 1E signals is provided by using optical isolation on all digital signal inputs, transformer isolation on all analog signal inputs, with the isolation between cabinets provided by the optical link between remotes and the associated data concentrators.

No deficiencies were identified.

## 6.0 UNRESOLVED ITEMS

Unresolved items are matters about which more information is needed to determine whether the item is acceptable or a violation. There were no unresolved items; however, two open items involving licensee commitments are being tracked to completion (paragraph 5.5 & 5.10).

## 7.0 EXIT MEETING

The inspector met with licensee representatives (denoted in the attached list) at the conclusion of the inspection on April 30, 1993. The inspector summarized the scope of the inspection, the inspection findings, and confirmation by the licensee of commitments, as addressed in the February 24, 1993, SER, scheduled for completion during the 1994 refueling outage. The licensee agreed that, barring any unforeseen incident, the SER commitments would be completed during the 1994 refueling outage. The licensee made no substantive comments regarding the information presented during the exit meeting.

## PERSONS CONTACTED

Rochester Gas and Electric Corporation

R. Baker, Electrical Engineer
B. Flynn, Nuclear Safety & Licensing
C. Forkell,Jr., Manager - Electrical Engineering
N. Love, Electrical Engineer
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J. St.Martin, Corrective Action Coordinator
P. Wilkens, Department Manager - Nuclear Engineering Services
D. Wilson, Nuclear Safety & Licensing
G. Wrobel, Manager - Nuclear Safety & Licensing

U.S. Nuclear Regulatory Commission

T. Moslak, Senior Resident Inspector

Note: Personnel listed above were present at the exit Meeting of April 30, 1993.