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 FACIL: 50-244 Robert Emmet Ginna Nuclear Plant, Unit 1, Rochester G 05000244
 AUTH. NAME AUTHOR AFFILIATION
 BACKUS, W.H. Rochester Gas & Electric Corp.
 MECREDY, R.C. Rochester Gas & Electric Corp.
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-001-00: on 930312, both source range detectors found inoperable during energization. Caused by center electrode degradation due to gamma corrosion. Failed detectors replaced w/qualified spares. W/930412 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 12
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: License Exp date in accordance with 10CFR2, 2.109(9/19/72). 05000244

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April 12, 1993

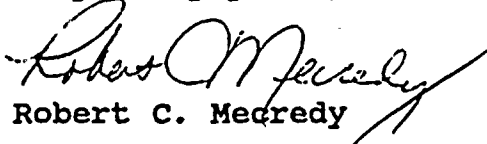
U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: LER 93-001, Loss of Source Range Detector Indication
During Energization, Due to Faulty Detectors, Causes
a Condition Prohibited by Plant Technical Specifications.
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

In accordance with 10 CFR 50.73, Licensee Event Report
System, item (a)(2)(i)(B), which requires a report of, "any
operation prohibited by the plant's Technical Specifications",
the attached Licensee Event Report LER 93-001 is hereby submitted.

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

Very truly yours,


Robert C. Mecredy

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

Ginna USNRC Senior Resident Inspector

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) R. E. Ginna Nuclear Power Plant										DOCKET NUMBER (2) 0 5 0 0 0 2 4 4 1				PAGE (3) 1 OF 1	
TITLE (4) Loss of Source Range Detector Indication During Energization, Due to Faulty Detectors Causes a Condition Prohibited by Plant Technical Specifications															
EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)					
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES				DOCKET NUMBER(S)		
0	3	12	93	001	00	0	4	12	93					0 5 0 0 0	
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)													
N		20.402(b)				20.405(e)				50.73(a)(2)(iv)				73.71(b)	
POWER LEVEL (10)		20.406(a)(1)(i)				50.36(c)(1)				50.73(a)(2)(v)				73.71(c)	
0 0 0		20.406(a)(1)(ii)				50.36(c)(2)				50.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
		20.406(a)(1)(iii)				50.73(a)(2)(i)				50.73(a)(2)(vii)(A)					
		20.406(a)(1)(iv)				50.73(a)(2)(ii)				50.73(a)(2)(vii)(B)					
		20.406(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(ix)					
LICENSEE CONTACT FOR THIS LER (12)															
NAME Wesley H. Backus Technical Assistant to the Operations Manager										TELEPHONE NUMBER AREA CODE 3 1 5 5 2 4 - 4 4 6					
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)															
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS					
B	I G	D E T	W 1 2 0	Y											
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR	
YES (If yes, complete EXPECTED SUBMISSION DATE)										X NO					

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On March 12, 1993, at 1425 EST, with the reactor subcritical during a planned shutdown, both source range detectors were found inoperable with the reactor trip breakers closed.

The Control Room operators immediately entered and performed the applicable actions of equipment restoration procedure ER-NIS.1 (SR Malfunction). The reactor trip breakers were opened within five (5) minutes of the event.

The most likely cause of the source range detector failures was center electrode degradation due to gamma corrosion of the bare tungsten center electrode (center wire). (This event is NUREG-1022 (B) cause code).

Corrective action was to replace the failed detectors with qualified spares. Corrective action to prevent recurrence is outlined in section V(B).

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

I. PRE-EVENT PLANT CONDITIONS

A plant shutdown was in progress per operating procedure O-2.1 (Normal Shutdown to Hot Shutdown) for the annual refueling and maintenance outage. The turbine generator had just been taken off the line and Control Room operators were in the process of shutting the reactor down and inserting all control and shutdown rods.

II. DESCRIPTION OF EVENT

A. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:

- o March 12, 1993, 1425 EST: Event date and time
- o March 12, 1993, 1425 EST: Event discovery date and time
- o March 12, 1993, 1430 EST: Control Room operators complete inserting all control and shutdown rods and open the reactor trip breakers.
- o March 12, 1993, 1435 EST: Plant stabilized at hot shutdown.
- o March 12, 1993, 1501 EST: Source Range NIS N-31 and NIS N-32 declared inoperable.
- o March 12, 1993, 1730 EST: Source Range NIS N-32 declared operable using the installed spare source range detector.
- o March 16, 1993, 1747 EST: Source Range NIS N-31 declared operable.
- o March 17, 1993, 2040 EST: Source Range NIS N-32 declared operable, using its normal source range detector.

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B. EVENT:

On March 12, 1993 at approximately 1425 EST with the reactor subcritical during a planned shutdown, source range (SR) Nuclear Instrumentation System (NIS) Channel N-31 and Channel N-32 automatically energized at the normal setpoint of $\leq 5E-11$ amps on the two intermediate range (IR) NIS channels. The Control Room operators were closely monitoring the decay of the intermediate range currents, and were anticipating the reset level for the source ranges. At the time of automatic energization of the source range detectors, there was no count rate indication on Channel N-31 or Channel N-32. Seeing no indication of count rate, the Control Room operators, in accordance with plant procedures and training guidance, immediately attempted to manually energize the source range detectors using the P-6 defeat pushbuttons. The source range detectors still did not indicate counts. The Control Room operators continued to expeditiously insert control and shutdown rods per O-2.1 and at approximately 1430 EST the reactor trip breakers were opened. The plant was subsequently stabilized in hot shutdown at approximately 1435 EST.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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Subsequently the Control Room operators notified higher supervision and the Instrument & Control (I&C) Department of the event and at approximately 1501 EST declared source range NIS N-31 and N-32 inoperable.

The Plant Operation Review Committee (PORC) was convened to review the actions taken, conformance to Technical Specifications, event classification and reportability. PORC directed that access to the Containment Building (CNMT) be prohibited until one source range channel was restored to operable status. In addition PORC confirmed that actions were taken to ensure plant cooldown would not occur, and that dilution of boron concentration would not occur. The Control Room operators entered and performed the applicable actions of equipment restoration procedure ER-NIS.1 (SR Malfunction) including continued boration to greater than 5% shutdown margin and sampling the Reactor Coolant System (RCS) for boron concentration on a periodic basis during the boration.

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

None.

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None.

E. METHOD OF DISCOVERY:

The event was immediately apparent due to indications in the Control Room.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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F. OPERATOR ACTION:

The Control Room operators, after recognizing that there were no indicated count rates on either of the source range detectors, immediately attempted to manually energize the source range detectors using the P-6 defeat pushbuttons. The operators entered ER-NIS.1 and performed the applicable actions, including pulling the fuses for Instrument Power, in another attempt to reinstate the source ranges.

Subsequently, the Control Room operators notified higher supervision and the I&C Department and declared source range NIS N-31 and N-32 inoperable.

G. SAFETY SYSTEM RESPONSES:

None.

III. CAUSE OF EVENT**A. IMMEDIATE CAUSE:**

The cause of the failure of source range detectors N-31 and N-32 to indicate counts was detector failure due to center electrode degradation. Specific measurements indicate that the center electrode to shield had become short circuited on source range detector N-31, most likely due to the electrode breaking at the bottom of the detector. Source range detector N-32 was found to be open circuited, possibly due to the electrode breaking at the top of the detector.

LICENSEE EVENT REPORT (LER)
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B. ROOT CAUSE:

After consulting with Westinghouse Electric Corporation (the manufacturer and vendor for these detectors), it was concluded that the underlying cause of the center electrode degradation of source range detectors N-31 and N-32 is most likely due to gamma corrosion of the bare tungsten center electrode (center wire). This effect occurs whenever the source range detector is energized.

IV. ANALYSIS OF EVENT

The event is reportable in accordance with 10 CFR 50.73, Licensee Event Report System, item (a)(2)(i)(B), which requires a report of, "any operation prohibited by the plant's Technical Specification", in that the failure of source range detectors N-31 and N-32 to indicate counts at $\leq 1\text{E}-10$ amps on the two intermediate range NIS channels was an operation prohibited by the plant Technical Specifications as follows:

- o Specification 3.5.1.1 states, "The Protection System Instrumentation shown on Table 3.5-1 shall be operable whenever the conditions specified in Column 6 are exceeded". For the source range instruments, column 6 refers to Note 2, which states, "Channels should be operable at all modes below the bypass condition with the reactor trip system breakers in the closed position and control rod drive system capable of rod withdrawal". Contrary to the above, source range channels N-31 and N-32 were inoperable below the bypass condition of $\leq 1\text{E}-10$ on both IR NIS channels with the reactor trip breakers closed and the control rod drive system capable of rod withdrawal. This condition existed for approximately five (5) minutes until the reactor trip breakers were opened. While an Action Statement exists for one source detector inoperable, there is no stated action requirement for two detectors inoperable with the Reactor Trip breakers closed. Therefore, a condition prohibited by the plant's Technical Specifications existed.

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Once the trip breakers are open, the minimum operable channels required reduces to one (1) instead of two (2) and the action statement states in part as follows:

With the number of operable channels one less than the minimum operable channels requirement, suspend all operations involving positive reactivity changes.

An assessment was performed considering both the safety consequences and implications of this event with the following results and conclusions:

The safety significance of the failure of both source range channels is the loss of detection of subcritical neutron flux in the core and the function those channels provide for both automatic actuation of the reactor protection system and the prompting of operator action to protect shutdown margin. However, this significance is minimized in this instance for the following reasons:

- o The failure occurred completely within the sequence of shutting down the reactor in accordance with plant procedure O-2.1 in that the operators were closely monitoring the decay of the intermediate range currents and were anticipating the reset level for the source ranges.
- o In accordance with O-2.1 the operators were expeditiously inserting the control and shutdown rods to five steps prior to manually opening the reactor trip breakers. This sequence, simultaneous with injecting boric acid to achieve the required RCS cold shutdown boron concentration insured that shutdown margin was maintained greater than the requirements of Technical Specifications, and that shutdown margin did not decrease during this event.

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- o After immediately recognizing that the source range channels did not indicate counts at the intermediate range reset point, the operators took appropriate actions in attempting to reinstate source range detectors. They continued to expeditiously insert control and shutdown rods, and within five minutes, opened the reactor trip breakers. The operator continued boration to the cold shutdown, xenon free concentration required by procedure for RCS cooldown below 500 degrees. There was no decrease in shutdown margin, from the time of failure of both source range channels until the time the spare source range detector was used to declare Channel N-32 operable. All operations involving positive reactivity changes were suspended until after the spare source range detector was declared operable.

Based on the above, it can be concluded that the public's health and safety was assured at all times.

V. CORRECTIVE ACTION

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

- o The detector installed in source range channel N-32 was disconnected and the previously installed spare source range detector was connected to source range channel N-32. NIS N-32 high voltage setting and the pulse height discriminator (PHD) bias setting were adjusted to conform to the data for the spare detector. At approximately 1730 EST on March 12, 1993, source range Channel N-32 was declared operable.

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- o The detector installed in source range channel N-31 was replaced with a detector withdrawn from stock. Subsequently, for source range channel N-31 the high voltage power supply was replaced. The detector anode voltage curve (also referred to as the plateau curve) was obtained, and the PHD bias setting was adjusted. At approximately 1747 EST on March 16, 1993, source range Channel N-31 was declared operable.
- o The detector installed in source range channel N-32 was replaced with a detector withdrawn from stock. For this newly installed detector, the plateau curve was obtained and the PHD bias setting was adjusted. The installed spare source range detector was then disconnected from source range channel N-32 and this newly installed source range detector was connected to source range channel N-32. The channel operability test was completed, and at approximately 2040 EST on March 17, 1993 source range Channel N-32 was declared operable, using its normal source range detector.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

To minimize future source range detector failures, the following actions are being planned:

- o A periodic replacement interval for BF₃ filled source range detectors will be established, based upon time in service or number of energizations of the detectors.

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- o A new Westinghouse design for these BF₃ filled source range detectors incorporates low voltage source range detectors with gold-plated tungsten center wire conductor material. Detectors of this new design will be procured. When detectors of this new design are installed, as part of a planned detector upgrade schedule, as replacements for existing detectors, the periodic replacement interval will be re-evaluated.
- o Existing calibration procedures will be revised, or new procedures developed, to include steps to perform time domain reflectometry (TDR) measurements on N-31, N-32 and spare detector, prior to scheduled refueling outages. (TDR measurements can determine if the detector center electrode wire is broken, shorted out or if it has high or low resistance).
- o A trending program to detect potential degradation of source range detectors will be established, for the following data:
 - 1) Detector plateau curve data will be trended. As the BF₃ gas in the detector dissociates over time, the high voltage will be adjusted higher each time until it can no longer be set on the plateau.
 - 2) PHD bias curves will be trended.

VI. ADDITIONAL INFORMATIONA. FAILED COMPONENTS:

The faulty detectors were BF₃ filled, source range detector proportional counters, Part No. WL-24182 manufactured by Westinghouse Electric Corporation.

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B. PREVIOUS LERS ON SIMILAR EVENTS:

A similar LER event historical search was conducted with the following results: LER 90-003 (Higher Than Normal Count Rate on Source Range NIS, Due to a Faulty Detector, Causes a Reactor Trip During Source Range Re-energization) was a similar event with the same root cause. The corrective action to prevent recurrence, of the event described in LER 90-003, was to initiate a evaluation which will ultimately result in procurement and installation of detectors, of a new Westinghouse design. It should be noted that even if the evaluation had been completed, and detectors of a new design had been procured and were in stock, these detectors would not have been installed prior to the 1993 outage.

C. SPECIAL COMMENTS:

None.

