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BACKUS,W.H. Rochester Gas & Electric Corp.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 88-004-00:on 880314,steam generator tube B leak due to miscall of eddy current data during refueling outage.
W/8 ltr.

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TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4) "B" Steam Generator Tube Leak Due To, Miscall Of Eddy Current Data During Recent Refueling and Maintenance Outage Causes a Plant Shutdown

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 5 0 0 0
0 3	1 4	8 8	8 8	0 0 4	0 0	0 4	1 2	8 8		0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 8 5	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(a)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Wesley H. Backus Technical Assistant to the Operations Manager	AREA CODE 3 1 1 5 5 2 4 -1 4 1 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
A	A B	T B G	H 3 1 4	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 14, 1988 at 1409 EST with reactor power at approximately 85% of full power a tube leak was detected in the "B" Steam Generator. Subsequently the plant was shutdown to inspect and repair the leaky tube.

Because the Steam Generator tube leak was greater than .1 gpm (i.e. approximately .14 gpm) an Unusual Event was declared.

The underlying cause of the event was a missed call from the recent Steam Generator Eddy Current Inspection Program, (i.e. correct interpretation would have had the leaky tube repaired).

Corrective action taken was to re-review pertinent inspection data from the recent Eddy Current examination, re-examine an appropriate sampling of tubes and perform a pressure test on the "B" Steam Generator. Based on the results from these actions, 9 tubes were plugged including the leaking tube.

Corrective action planned to prevent recurrence includes updating the Eddy Current Data analysis procedures to assure that independent reviews are conducted for all steam generator eddy current inspection data.

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

I. PRE-EVENT PLANT CONDITIONS

Unit was increasing power towards 100% of full power following the Annual Refueling and Maintenance Outage. During this outage an extensive examination was performed on the "A" and "B" Steam Generator (SG) tubes.

II. DESCRIPTION OF EVENT

A. EVENT:

On March 14, 1988 at 1409 EST with reactor power at approximately 85% of full power a SG tube leak was indicated by the alarming of R-15 (Condenser Air Ejector Radiation Monitor).

The Control Room operators performed the required actions of alarm response procedure AR-RMS-15 (Air Ejector Gas). This included requesting the Health Physics (HP) Department to sample the SGs for a tube leak and to also sample the air ejector gas.

Subsequently, the results of the air ejector sample and SG blowdown samples indicated an approximately 60 cc/min primary to secondary leak in the "B" SG.

After the primary to secondary leak was verified the Control Room operators started performing the actions of O-6.10 (Plant Operations With Steam Generator Tube Leak Indication).

As the primary to secondary indicated tube leakage at that time was less than the Technical Specification (TS) limit (i.e. .016 gpm versus .1 gpm) the plant continued power operation with air ejector and SG blowdown sampling in accordance with revised procedure developed in accordance with IE Bulletin 88-02.

Subsequently the above sampling indicated that the primary to secondary leak was slowly increasing in magnitude and at 1845 EST, March 14, 1988 the plant management ordered the plant shutdown to cold shutdown to investigate and repair the leak. This decision was based on limiting the offsite and onsite consequences of the event to a minimum.

At 2130 EST, March 14, 1988 with the plant in the hot shutdown condition, the Control Room was notified by the HP Department that the recent "B" SG blowdown sample indicated the primary to secondary leak was approximately .14 gpm. At this time the Operations Shift Supervisor declared an Unusual Event in accordance with SC-100 (Ginna Station Event Evaluation and Classification), Emergency Action Level: Reactor Coolant Leakage; Steam Generator Tube Leakage > .1 gpm as identified by sampling, and made all required notifications.

At 0159 EST, March 15, 1988 the plant reached an RCS temperature of < 350°F. This completed the TS action statement for a SG Tube Leak of > .1 gpm in one SG when averaged over 24 hours. The plant was adhering to this specification even though the 24 hour average of > .1 gpm had not been exceeded.

With the RCS temperature less than 350°F and all TS action statements met, the Operating Shift Supervisor, with approval of the Superintendent-Ginna Station declared the Unusual Event terminated at 0213 EST, March 15, 1988 in accordance with SC-110, "Ginna Station Event Evaluation For Reducing The Classification", and made all required notifications.

The RCS cooldown was continued and at 0700 EST, March 15, 1988 the plant entered the cold shutdown mode of operation, (i.e. RCS average temperature ≤ 200°F).

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

None.

C. DATES AND APPROXIMATE TIMES FOR MAJOR OCCURRENCES:

- o March 14, 1988, 1409 EST: Event date and time
- o March 14, 1988, 1409 EST: Discovery date and time
- o March 14, 1988, 1515 EST: Samples confirm a SG tube leak in the "B" SG of approximately .016 gpm
- o March 14, 1988, 1845 EST: Plant Superintendent orders plant shutdown
- o March 14, 1988, 2130 EST: "B" SG sample calculations indicate primary to secondary tube leak of approximately .14 gpm
- o March 14, 1988, 2130 EST: An Unusual Event is declared
- o March 15, 1988, 0213 EST: Unusual Event is terminated
- o March 15, 1988, 0700 EST: Plant enters cold shutdown

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None

E. METHOD OF DISCOVERY:

The event was immediately apparent due to alarms and indications in the Control Room and sample analysis by the HP Department.

F. OPERATOR ACTION:

The Control Room operators performed the required actions of Alarm Response Procedure AR-RMS-15 (Air Ejector Gas). This included requesting samples of the SGs for a primary to secondary tube leak and to also sample the air ejector gas.

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After the primary to secondary tube leak was verified the Control Room operators started performing the actions of O-6.10 (Plant Operations With Steam Generator Tube Leak Indication).

G. SAFETY SYSTEMS RESPONSES:

None.

III. CAUSE OF EVENT

A. IMMEDIATE CAUSE:

The plant shutdown was caused by a Tube Leak in the "B" SG.

B. INTERMEDIATE CAUSE:

The leak in the "B" SG was in a tube inspected in February 1988 and designated as, free of defects requiring repair. A review of the Eddy Current data indicated the tube should have been designated as containing a defect requiring repair.

C. THE APPARENT ROOT CAUSES FOR THE MISSED CALL ARE:

- o A brief lapse in performance by a well qualified Level II Inspector.
- o The Eddy Current data analysis process provided for an independent review in some, but not all, situations. (i.e. a single inspector could designate a tube as free of defects requiring repair).
- o The role of the Computerized Data Screening (CDS) system as a check on inspector calls was generally not well understood by the inspectors.

IV. ANALYSIS OF EVENT

This event is being reported in accordance with 10 CFR 50.73, Licensee Event Reporting System, item (a)(2)(i)(A) which requires a report of, "the completion of any nuclear plant shutdown required by the Plant's Technical Specifications".

TS 3.1.5.2.1d states, "with the RCS temperature at or above 350°F, RCS leakage shall be limited to .1 gpm tube leakage in one steam generator when averaged over 24 hours".

TS 3.1.5.2.2c states, "with steam generator tube leakage in excess of 3.1.5.2.1d above, be at hot shutdown within 6 hours and at an RCS temperature less than 350°F within the following 6 hours".

This report is being submitted under the above specifications even though the plant was shutdown and less than 350°F RCS temperature prior to reaching the TS leakage limit for the steam generators requiring a plant shutdown.

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

There were no safety consequences or implications attributed to the "B" SG tube leak because:

- The plant was shutdown and cooled down using normal operating procedures prior to reaching the TS leakage limits for the SG.
- The "B" SG was isolated soon after the Turbine Generator was taken off the line.
- The tube leak was in the crevice area of the tube sheet thus limiting the consequences of a large tube rupture.

The TS basis for the SG tube leak limit states, "should a postulated transient or accident occur, (such as a rod ejection or steam break accident), then, if the primary to secondary leak rate is limited to 0.1 gpm per steam generator, the site boundary dose would be maintained well within the guidelines and all steam generator tubes would maintain their integrity".

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

V. CORRECTIVE ACTION

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

- The plant was brought to cold shutdown and tube R30C34 was confirmed by visual examination to be leaking under a static head of water of approximately 18-20 psig. R30C34 was Eddy Current examined which confirmed the location of the leak to be within the tube sheet approximately 17 inches down from the top of the secondary side of the tube sheet.

  The Steam Generator data management system was queried to review the inspection history for this tube including the inspection results for the February 1988 examination. The data management system identified that the Computer Data Screening (CDS) system had identified two indications within the tube sheet approximately 17 inches down from the top of the secondary side of the tube sheet and that the manual examination had identified a (NDD) "no detectable defect", and copper deposits. A reinterpretation of the data revealed that there was indeed an approximately 90% through-wall defect at the location during the February 1988 inspection which had been missed.

Based on the above results, a decision was made by Rochester Gas and Electric Corporation (RG&E), to re-review all the hot leg tube sheet crevice eddy current discrepancies between the CDS system and the manual interpretation. The data management system was queried which identified 238 tubes in the "A" SG and 504 tubes in the "B" SG where there was a discrepancy between the two interpretations.

Results of the manual reinterpretation of the 238 discrepancies for the crevice region from the "A" SG resulted in no changes being made from the original analysis and interpretation performed during the February, 1988 inspection. However, results of the manual reinterpretation of the 504 discrepancies for the crevice region from the "B" SG did lead to the plugging of six tubes for the following reasons:

R30C34 Leaker - this tube had a prominent eddy current indication of approximately 90% through-wall located approximately 17 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube was plugged.

R41C47 - This tube had a prominent eddy current indication of approximately 87% through-wall located approximately 18 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. The inspector who missed the indication of the leaker (R30C34) also missed this call. This tube was plugged.

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R20C59 - The tube had a weak eddy current indication of approximately 87% through-wall located approximately 13 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube had a potential defect at the edge of the judgmental criteria for calling the defect to be of sufficient prominence to warrant plugging. (The differential voltage signal was .63v. The criteria for differential voltage is .50v, with 2.0v typical of the differential voltage for the tubes recommended for plugging in February). Other factors, such as low signal-to-noise ratio, suggested a pluggable defect was not present. However, a more conservative view of the data was taken in March with the judgment that this tube should be recommended for plugging. This tube was plugged.

R28C36 - The eddy current indication for this tube was similar to the indication for R20C59, only with a .65v differential signal, and the tube was recommended for plugging for the same reason. This tube had a weak eddy current indication of approximately 86% through-wall located approximately 15 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube was plugged.

R25C59 - This tube has had a high background noise level since it was first eddy current examined. The eddy current signals in February, 1988 were virtually unchanged from February, 1987. Because of this background noise level it was very hard to verify a potential 66% through-wall indication located approximately 18 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube was plugged.

R40C60 - This tube is similar to R25C59 and has a high background noise level. Therefore, it was hard to verify the validity of an absolute drift signal approximately 18 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube was plugged.

o After reviewing the eddy current data from the re-inspection of five tubes around the leaking R30C34 tube, R31C35 was identified as having a crevice copper signal that had changed since the February 1988 inspection. Based upon this change RG&E decided to perform an examination of a 3% sample of tubes around the leaker R30C34.

After the first 3% sample was analyzed, one tube, R28C30, was identified with an indication that had seen some change since the February inspection. Based upon this, another 3% sample was inspected. The results of this inspection revealed no other tubes with signal changes. Because the eddy current signal indicating potential defects in the two tubes (R31C35 and R28C30) were potentially masked by copper deposits/plating at the location of the potential defects, a supplemental examination using a more sensitive pancake probe was performed to assist in the analysis of the potential defects. An analysis and disposition of these tubes is as follows:

R31C35 - This tube was analyzed as having an approximate 70% through-wall defect located approximately 18 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube was plugged.

R28C30 - This tube was analyzed as having an approximate 89% through-wall defect located approximately 17 inches down in the tube sheet crevice from the top of the secondary face of the tube sheet. This tube was plugged.

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- o A secondary side hydrostatic pressure test of the "B" SG indicated a small leak in the tube R30C53, which had been sleeved with a 20 inch Babcock and Wilcox tube sheet sleeve in 1985. No defects were observed when this sleeve was last inspected in 1986, but it is widely recognized that eddy current techniques are not sufficiently sensitive to pick up small defects in the tubing behind certain areas of the inserted sleeve, particularly the explosively welded regions. No defects in this tube were readily observable from an eddy current re-inspection following the hydrostatic test. This tube was plugged.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

- o Revise the eddy current data analysis procedure to provide for two independent analyses of the data.
- o Revise the eddy current data analysis procedure to delineate the role of the computer data screening system in the eddy current analysis process.
- o Verify that the February 1988 eddy current inspection data outside the hot leg tubesheet had a second independent analysis and perform such an analysis for portions of the inspection analyzed by only one inspector.
- o The Ginna Steam Generator Reliability Committee will review any major changes in policy for the steam generator inspection program.
- o Review the missed call experience and analysis of causes in a presentation to the NDE Guidelines Committee, EPRI Steam Generator Reliability Project.

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- o Quality Assurance will independently verify the actions being taken to revise the procedures and related data analysis.

VI. ADDITIONAL INFORMATION

A. FAILED COMPONENTS:

The faulty components were: Inconel Grade 600 tubes having an outside diameter of 0.875 inches and a nominal wall thickness of 0.050 inches.

B. PREVIOUS LERs ON SIMILAR EVENTS:

A similar LER event historical search was conducted with the following results: No documentation of similar LER events with the same root cause at Ginna Station could be identified.

C. SPECIAL COMMENTS:

The February 1988 Steam Generator examination is documented in the, "Summary Examination Report for the 1988 Steam Generator Eddy Current Inspection at R.E. Ginna Nuclear Power Plant", dated February 29, 1988.

April 12, 1988

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

Subject: LER 88-004, "B" Steam Generator Tube Leak Due To Miscall Of Eddy Current Data During Recent Refueling and Maintenance Outage Causes a Plant Shutdown
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)(A) which requires a report of, "the completion of any nuclear plant shutdown required by the Plant's Technical Specifications", the attached Licensee Event Report LER 88-004 is hereby submitted.

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

Very truly yours,

Bruce A. Snow
Superintendent of
Nuclear Production

xc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
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Ginna USNRC Resident Inspector

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