U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-244/91-18

Docket No. 50-244

License No. DPR-18

Licensee: Rochester Gas and Electric Corporation
49 East Avenue
Rochester, New York 14649

Facility Name: Ginna Nuclear Power Plant

Inspection At: Ontario, New York

Inspection Conducted: August 12-16, 1991

Inspector: D. T. Moy, Reactor Engineer
Systems Section, EB, DRS — Nov. 4, 1991 date

Approved by: Dr. P. K. Eapen, Chief.
Systems Section, EB, DRS — 11/4/91 date

Inspection Summary: Routine announced safety inspection on August 12-16, 1991. (Inspection Report No. 50-244/91-18).

Areas Inspected: Licensee actions in response to Generic Letter 88-17, "Loss of Decay Heat Removal" during non-power operation. The inspector reviewed mid-loop operating procedures, instrumentation, plant hardware modification and thermal hydraulic analysis as related to reduced reactor coolant system inventory operation.

Inspection Results: The Generic Letter 88-17 recommendations as described in the licensee's response were adequately implemented.

No violations or additional unresolved items were identified.

1.0 Long Term Programmed Enhancement for Generic Letter 88-17, "Loss of Decay Heat Removal" Non-Power Operation

Loss of Decay Heat Removal (DHR) during non-power operation and the consequences of such a loss are of significant safety concern. Many events of loss of DHR have occurred at nuclear power plants while the RCS has been drained down for such a mid-loop activities as steam generator inspection and repair of a reactor coolant pump. These activities are often in progress when both the reactor coolant system and the containment are less than adequately secured.

GL 87-12, "Loss of Residual Heat Removal (RHR) while the Reactor Coolant System (RCS) is Partially Filled," was issued to all licensees of operating PWRs and holders of construction permits on July 9, 1987. Responses to the NRC indicated that some licensees did not understand the identified problems, and the problems have continued, as evidenced by occurrence of events since the generic letter was issued.

The seriousness and continuation of these problems resulted in issuance of GL 88-17. It requires the recipients to respond with two plans of actions:

a. A short-term program entitled "expeditious actions" that was essentially limited to reduced inventory conditions.

b. A longer-term program entitled programmed enhancements.

The Generic Letter stated that the programmed enhancements consisting of hardware installation and/or modification, and programmed enhancements that depend upon hardware installation and modification, should be implemented:

a. by the end of the first refueling outage that is initiated 18 months or later following receipt of the GL, or

b. by the end of the second refueling outage following the receipt of the GL, which ever occurs first. If a shutdown for refueling has been initiated as of the date of receipt of this letter, that is to be counted as the first refueling outage.

Programmed enhancements that do not depend upon hardware changes were to be implemented within 18 months of receipt of the GL.

The licensee provided the responses for "expeditious actions" and "programmed enhancements" respectively in letters dated January 4, 1989 and February 1, 1989. NRC reviewed the above expeditious actions response and documented the conclusion in NRC letter dated February 22, 1989. The licensee's short term or expeditious actions program was previously reviewed as detailed in Inspection Report 50-244/89-05.

The purpose of this inspection was to assess the adequacy of the licensee's long term program for Generic Letter 88-17 as detailed below:

1.1 Instrumentation for Mid Loop Operation

Generic Letter 88-17 provided the following recommendations for instrumentation for Mid Loop operation:

Provide reliable indications of parameters that describe the state of the RCS and the performance of systems normally used to cool the RCS for both normal and accident conditions. At a minimum, provide the following in the Control Room:

a. two independent RCS level indications

b. at least two independent temperatures measurements representative of the core exit whenever the Reactor Vessel (RV) head is located on top of the RV

c. the capability of continuously monitoring DHR system performance whenever a DHR system is being used for cooling the RCS.

d. visible and audible indications of abnormal conditions in temperature, level, and DHR system performance.

Inspection Finding

(a) Reactor Coolant System Water Level Indications

As stated in the response to Generic Letter 88-17, the Licensee upgraded and installed two reactor water level indications in the control room. Engineering Work Request (EWR) 4671, (Rev. 0, December 19, 1989) Reactor Loop Level Upgrade replaced the present reactor coolant system (RCS) "B" loop level indication hardware including pressure transmitter, local level indicator and the control board indicator with modern equipment. A functionally independent and reliable level indication instrument system was also installed on the RCS "A" loop.

The inspector reviewed "Calibration and Uncertainly Analysis" of Loop Level Upgrade Modification Package (EWR 4671), Rev 1, April 18, 1990. This Calculation was based on Westinghouse's report "Report on Calculation of Instrument Uncertainties for the R. E. Ginna dated November 1983. The calculated instrument uncertainties for the upgraded level indication system were 2.31 inches and 1.73 inches for loops A and B respectively. Both are within their respective maximums of 3.0 inches and 2.5 inches specified in the Design Criteria Section of "Loop Level Upgrade" package EWR-4671. These uncertainties are based on the assumption

that the transmitters were calibrated to a 0.5% accuracy and Main Control board was calibrated to a 1.50% accuracy. The inspector reviewed this calculation and found it to be technically adequate.

The inspector concluded that the level instrument uncertainties are appropriate for use during mid-loop operation. The inspector reviewed the "Level Correction for LIT-432A due to RHR Flow," EWR 4671-ME-001, Rev. 0, February 8, 1990. The licensee incorporated corrections to account for the location of the sensing line tap and the pressure loss due to the Flow in the RHR suction line. The inspector verified that the flow correction factors were incorporated in the plant process computer system. The inspector had no further concerns in this regard.

(b) Core Exit Thermocouples Temperature Indications

The licensee assures the availability of two core exit thermocouples during reduced inventory operations (Operating procedures No. 0-2.3.1, Rev. 43, Step 3.14.1 to 3.14.3.2). The thermocouples are digitally displayed in the control room. The range of this indication is from 0 to 2300°F. The temperature indications are fed to the Plant Process Computer System (PPSC) to monitor and alarm as necessary. The temperatures are required to be manually logged once per hour when the PPCS is operating; otherwise, these temperatures are required to be logged at 15 minute intervals.

(c) Monitoring Decay Heat Removal System Performance

The licensee monitors pump motor current to detect RHR pump vortexing. The PPCS continually monitors the following parameters in the control room:

Point ID	Description of Parameter
F0626	RHR loop flow
L0432A/B	Reactor Coolant loop A/B level
L0432ACF	Level correction for RHR flow
L0432ACL	Corrected level
I0685A/B	RHR pump A/B motor current
P0682A/B	RHR pump A/B suction pressure
F0683A/B	RHR discharge flow loop A/B flow
T0684A/B	RHR pump A/B suction temperature
NPSHRHRA/B	RHR pump A/B margin to NPSH loss

The inspector reviewed each of the above parameters & alarm setpoint against the "Analog Input Point Data Base Values" and verified that the alarm setpoints were adequately established for mid-loop operation.

The inspector also noted that, the RHR system is routinely monitored in the main control room utilizing RHR system flow (FT 626), system pressure (PT 420 & PT 420A), system temperature (FT-630) and loop level (PT 432A & B).

Based on the above, the inspector concluded that the licensee implemented visible and audible indications of temperature, level and RHR system performance per Generic Letter 88-17.

1.2 Review of Mid Loop Operating Procedures

Generic Letter 88-17 recommended the development and implementation of the following to cover reduced inventory operation.

(a) procedures that cover normal operation of the NSSS, containment, and supporting systems under conditions for which cooling would normally be provided by DHR systems.

(b) procedures that cover emergency, abnormal, off-normal, or the equivalent operation of the NSSS, the containment, and supporting systems if an off-normal condition occurs while operating under conditions for which cooling would normally be provided by DHR systems.

(c) administrative controls that support and supplement the procedures in items above, and all other actions identified in this communication, as appropriate.

The inspector selected the following mid-loop operating procedures for review to determine whether the Licensee has completed the Generic Letter 88-17 recommendations:

- Operating procedure No. 0-2.3.1. Rev. 43, June 18, 1991, "Draining and Operation at Reduced Inventory of the reactor coolant system".

- Operating procedure No. 0-2.3.1A, Rev. 9, May 3, 1991, "Containment closure capabilities in two hours during RCS Reduced Inventory Operation".

- Operating procedure No. RHR.2, Rev. 3, April 20, 1990, "Loss of RHR while operating at RCS reduced inventory conditions.

These procedures provide instructions for operation and surveillance whenever there is fuel in the reactor vessel and the reactor coolant system is in a reduced inventory condition (3 feet below the top of the reactor flange or RCS less than 64 inches on the level B indicator in the control room).

A majority of the licensee's mid loop operating procedures were developed using the plant and utility experience. For each of the above procedures, the inspector verified that the precautions, limitation and entry conditions to mid-loop operation were technically adequate. The inspector found that the licensee's actions were consistent with the GL recommendation in this regard.

1.3 Review of RCS Inventory Addition

In this area, the Generic Letter 88-17 recommended to:

(a) Provide adequate operating, operable, and/or available equipment of high reliability for cooling the RCS and for avoiding a loss of RCS cooling.

(b) Maintain sufficient existing equipment in an operable or available status so as to mitigate loss of DHR or loss of RCS inventory should they occur. This should include at least one high pressure injection pump and one other system. The water addition rate provided by each equipment should be at least sufficient to keep the core covered.

(c) Provide adequate equipment for personnel communications that involve activities related to the RCS of systems necessary to maintain the RCS in a stable and controlled condition.

The inspector verified that the Licensee has procedures and administrative control (Operating procedure No. 0-2.3.1, Rev. 43, steps 3.17 to 3.19) to provide at least two adequate means of adding inventory to the RCS, in addition to the pumps of the normal DHR systems. One source of inventory makeup is the gravity flow from refueling water storage tank (RWST) (DWG. 33013-1261, Rev. 19 and -1247, Rev. 16). (The injection flow into RCS via the gravity feed system is approximately 2500 GPM.) The second source of the makeup is the High Pressure charging system path from the RWST through the charging pump and heat exchangers. (The injection flow into RCS via this high pressure system is approximately 60 GPM) (DWG 33013-1265 sheets 1 & 2, Rev. 4). The third source of the makeup is from RWST through the safety injection pumps. (The safety injection rate is approximately 500 GPM) (DWG. 33013-1262 sheet 1&2 Rev. 7 & 3 respectively). The inspector verified that these flow paths are available as stated in the licensee's response letter to GL.

Inspector further verified that injection flow is higher than the core boil off rate (51 GPM) and sufficient to keep the core covered during mid-loop operation. The inspector concluded that the licensee's actions were acceptable as they were consistent with the licensee's commitments in this regard.

1.4 Review of Thermal Hydraulic Analysis

The Generic letter recommended that licensees conduct analyses to supplement existing information and develop a bases for procedures, instrumentation installation and response, and equipment NSSS interactions and response.

The inspector reviewed Westinghouse's Mid Loop Calculation Report NS-OPLS-OPL-I-89-111, dated February 20, 1989. This report provides best estimate calculations of the time to reach saturation, the boil off rate, the minimum vent size required to prevent pressurization and the estimated time to core uncovery as a function of time after shutdown.

The inspector reviewed the following sections of the report:

* Time for RCS in the core to reach saturation temperature

* Time to core uncovery with a large vent area

* Makeup flow rate for boil off

* Vent area required to reduce RCS pressurization

The inspector verified that the results of the above calculations were incorporated in the mid loop operating procedures. For example, the time to core uncovery (hrs) vs. time after shutdown curve is used in Operating procedure 0.2.3.1:18 step 5.14.2.1 to 5.14.3.4. For another example, core boiling vs. time after shutdown data were used in drain down operating procedure 0.2.3.1:5, steps 3.17 to 3.19. The inspector found that the licensee's actions were acceptable as they were consistent with the licensee's commitments in this regard.

1.5 Technical Specification

The Generic letter recommended that Technical specifications that restrict or limit the safety benefit of the actions identified in the GL should be identified and appropriate changes should be submitted to the NRC.

The inspector verified that the facility has no technical specification that would limit the safety benefits of the action in the GL, as stated in the licensee response.

1.6 Reactor Coolant System perturbation

Generic Letter 88-17 has recommended that the licensee should consider training, procedures, and controls that reasonably avoid perturbing activities when RCS inventory is low and decay heat is high.

The inspector verified that the Licensee has implemented procedures and administrative controls to preclude operations that would lead to perturbations in the RCS. Operating procedure No. O-2.3.1, for draining down in the notice after step 5.0, establishes administrative control for requesting, reviewing, working or authorizing activities that may affect or perturb the RCS water level while the RCS is operating at reduced inventory mid-loop conditions. This procedure also provides a detail list of components which may perturb the RCS level during the low loop level operation.

The inspector concluded that the procedures and administrative controls established to minimize reactor perturbation during mid-loop operation were consistent with the programmed enhancements described in GL 88-17.

2.0 QA/QC Involvement in Mid Loop Operation

The inspector reviewed the licensee's Quality Assurance Surveillance Report 91-024. The purpose of the licensee's audit was to provide an assessment of control room activities for entering, maintaining and leaving the reduced inventory condition.

The highlights of this assessment were:

- Operator performance during low level operation was appropriate and timely.

- The responses to unanticipated annunciators were good.

- Conditions such as the adverse weather alert and the ongoing Control Board modification were addressed in a safe manner.

The inspector concluded that the licensee's QA surveillance effectively addressed the technical adequacy of the mid-loop operation.

3.0 Conclusion

Management support was evident for the activities related to mid loop operation. The evaluations were detailed and technically sound. The line supervisor and cognizant engineer were knowledgeable in the safety concerns and the regulatory positions discussed in GL 88-17. The engineer recommendations were adequately implemented. QA surveillance for mid-loop operation was technical and thorough.

4.0 Plant Tours

The inspector made tours of the Ginna plant including the control room, charging and RHR pump rooms to observe any work in progress, housekeeping and cleanliness. No unacceptable conditions were found.

5.0 Exit Interview

On August 16, 1991, an exit interview was conducted with the licensee's senior site representative (denoted in attachment) to summarize the observations and conclusions of this inspection.

ATTACHMENT

Mid Loop Operation Inspection

Person contacted

Rochester Gas and Electric Company

*	W. Backus	Operation Engineer
*	J. Bitter	Electrical Engineer
*	R. Eliaz	Nuclear Safety & Licensing Engineer
*	T. Kaza	Computer System Engineer
	F. Maciuska	Supervisor-Licensee Training
	R. Marchionda	Superintendant Support Svc.
*	T. Marlow	Superintendant Ginna production
*	D. Markowski	Mechanical Engineer
*	J. St. Martin	Corrective Action Engineer
*	C. Rioch	Liaison Engineer
*	T. Schuler	Operation Engineer
*	W. Stiewe	Electrical QC Engineer
	J. Widay	Plant Manager

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*	T. Moslak	Senior Resident Inspector