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FACIL:50-244 ROBERT EMMET GINNA NUCLEAR PLANT, UNIT 1, ROCHESTER G 05000244

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ZIEMANN,D.L.	OPERATING REACTORS BRANCH 2

SUBJECT: RESPONSE TO 790125 LTR RE ANALYSIS OF BORON DILUTION MECHANISMS.SUMMARIZES RESULTS OF RESIDUAL HEAT REMOVAL SYS & DETERMINES NO SINGLE FAILURE COULD RESULT IN BORON DILUTION.

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LEON D. WHITE, JR.
VICE PRESIDENT

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April 30, 1979

Director of Nuclear Reactor Regulation
Attention: Mr. Dennis L. Ziemann, Chief
Operating Reactor Branch #2
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Postulated Boron Dilution
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Ziemann:

This letter is in response to your letter dated January 25, 1979 which requested that we supplement our analysis, which was submitted on January 10, 1978, of the potential for inadvertent dilution incidents at R.E. Ginna Nuclear Power Plant.

An analysis has been made of all known boron dilution mechanisms that could occur at Ginna in accordance with the guidelines provided in your letter. The following summarizes the results of that analysis.

When the reactor coolant system (RCS) is at normal pressure, i.e. during operation or hot shutdown, the only way to get water into the RCS is by using the charging pumps. The Ginna FSAR contains an analysis of boron dilution due to a malfunction in the charging system.

When the RCS is being cooled down, the pressure will be decreased from normal operating pressure to approximately 350 psi. At this pressure the residual heat removal system (RHR) will be aligned and used to reduce the RCS temperature to cold shutdown conditions. In this pressure range the only source of water is from the charging system and from the high head safety injection pumps (SI) when the system pressure is below the shutoff head of the SI pumps. An analysis of boron dilution due to a malfunction in the charging system is presented in the FSAR. A review of the high head SI system indicates that no single failure will result in boron dilution.

When the RCS is in the refueling mode with the reactor vessel head removed and the reactor cavity flooded our review indicates the volume of water that must be diluted is so large

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and the boron concentration so high (greater than 2000 ppm) that sufficient time is available for the operator to take proper action to terminate a dilution event prior to reactor criticality. For this reason, a single failure boron dilution event analysis was not done for the RCS in this mode.

The only mode of RCS operation that has been addressed in detail is cooling the RCS with the RHR system. An analysis of single failure events that could result in a boron dilution while operating on the RHR system is presented in Appendix A. In all events analyzed the operator has sufficient indication and sufficient time to terminate the boron dilution prior to reactor criticality.

Very truly yours,

Leon D. White, Jr.

Leon D. White, Jr.

LDW:np

Appendix A

Postulated Boron Dilution

The following summarizes the results of a review of the residual heat removal system (RHR). The purpose of the review is to determine if any single failure could result in a boron dilution. To the best of our knowledge this review includes all possible single failure paths.

1. Boron Dilution Through Inadvertent Draining of the Spray Additive Tank

   This analysis was presented in a Rochester Gas and Electric Corp. letter from L.D. White Jr. to D.L. Ziemann of the NRC dated January 10, 1978. The conclusion of the analysis was that no single failure would result in introducing NaOH into the RHR system; therefore, a boron dilution event was not possible.

2. Boron Dilution From Reactor Coolant Drain Tank

   The contents of the reactor coolant drain tank are normally pumped to the waste holdup tank or the chemical & volume control system holdup tanks for processing. One manual valve on the outlet side of each reactor coolant drain pump separates the pump discharge from the RHR system. If one of these valves is inadvertently opened (single failure) the flow from the reactor coolant drain tank would be split between the normal flow path and the RHR system depending on the head difference between the two discharge points.

   This analysis assumes that the entire contents of the reactor coolant drain tank is pumped into the RHR system and the boron concentration of the drain tank is 0 ppm. The RCS is on RHR with the water level in the RCS drained down to above the nozzles, as stated in the FSAR. The boron concentration is consistent with Technical Specifications for cold shutdown.

   The results of the dilution analysis indicate that the resulting dilution is small because the volume of the reactor coolant drain tank is small compared to the volume of water in the reactor vessel. This dilution event results is less than 1/2% ΔK being inserted into the RCS.

3. Boron Dilution Due to Resin Changing in Purification System

   A postulated boron dilution could occur during the changing of resins in the RCS purification system as follows:

   The "B" deborating demineralizer is lined up for normal operation with the inlet valve closed. The "A" deborating demineralizer is being lined up to flush its resins. The

resin outlet valve on the "B" deborating DI is inadvertently opened (single failure). When the "A" deborating DI resin outlet valve is opened a flow path is then made from the reactor make-up water system to the "A" deborating DI through the "B" to the normal low pressure letdown system to the RHR.

The resin flush procedure requires the operator to monitor the radioactivity through the "A" deborating DI resin outlet valve and secure the reactor make-up water when the activity reduces to near background. Therefore, the dilution event would be terminated when the resin is flushed from the "A" deborating DI. Failure to secure the reactor make-up water would be a second failure which is beyond the scope of this analysis. Nonetheless, this dilution incident has been analyzed to determine the margins available.

The analysis assumes that the RCS is on RHR with the water level in the RCS drained down to above the nozzles as stated in the FSAR. The boron concentration is consistent with Technical Specifications for cold shutdown. The design flow of one reactor make-up water pump was used.

After 10 minutes of flushing less than 1/2% ΔK has been added through dilution and the "A" deborating DI volume has been changed approximately 3 times. Therefore, by 10 minutes the activity in the resin outlet valve has returned to near background and the source of dilution water secured. If the source of dilution was not secured it would take at least 23 minutes of dilution before the reactor could go critical. This is ample time for the operator to recognize the change in the audible source range count rate signal and the increase in the RCS loop level, which is indicated by a temporary loop level indicator which is installed in the control room whenever the RCS is operating on RHR with the loops partially drained, and isolate the source of dilution.

4. Boron Dilution From Reactor Coolant Drain Tank Following Refueling

A postulated boron dilution could occur following a refueling when the fuel transfer canal is being washed down. This scenario is similar to #2 except the reactor coolant drain tank is being refilled with DI water that is being used to wash down the fuel transfer canal.

This analysis assumes the RCS is on RHR with the water level in the RCS drained down to above the nozzles as stated in the FSAR. The boron concentration is consistent with Technical Specifications for refueling shutdown.

The fuel transfer canal is washed down with a hose using DI water. If a valve on the outlet side of the reactor coolant drain pump had inadvertently been left open, the flow would

split (depending on head difference) between the waste holdup tank and the RHR system. For this analysis the entire flow will be assumed to go into the RHR system.

The results of an analysis using the above assumptions indicate that approximately 1.3 hours of continuous dilution would be required before the reactor could go critical. In addition, the RCS volume would be increased by about 70%. This is ample time for the operator to recognize the change in the audible source range count rate signal or the increase in the RCS loop level.