



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ROCHESTER GAS AND ELECTRIC CORPORATION

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO. 50-244

1.0 INTRODUCTION

The Safety Evaluation Report (NUREG-0916) related to the restart of Ginna after the steam generator tube rupture (SGTR) incident on January 25, 1982 and specifically license conditions 2.C(9)1 through 20 required that Rochester Gas and Electric Corporation (RG&E) address 20 long-term items. This Safety Evaluation addresses two of the license conditions regarding procedures [2.C(9)6 and 2.C(9)10]. Item 6 requires that within 6 months, [the licensee] review the requirement for a safety injection signal to be present for automatic transfer of safety injection pump suction from the boric acid storage tanks to the refueling water storage tank; item 10 requires that within 6 months, [the licensee] review plant procedures to provide any additional guidance required for operator actions to be taken in response to real or suspected reactor vessel upper head voiding.

By letter dated November 22, 1982, RG&E provided sufficient information to the staff to evaluate the licensee's response to the staff's concerns.

2.0 BACKGROUND

2.1 Automatic Transfer of Safety Injection Pump Suction

In the event of a large steam line break accident rapid addition of concentrated boric acid solution is required to maintain the reactivity and consequent power level within acceptable limits. Therefore, the Ginna safety injection (SI) pumps take suction from the boric acid tanks (BATs), which contain concentrated boric acid (21,000 ppm boron). However, the BATs only contain 7200 gallons and are thus quickly depleted in the event of rapid depressurization of the reactor coolant system (RCS). The SI pump suction is therefore automatically switched to the refueling water storage tank (RWST) on low BAT level. The plant design previously required that the SI signals be present for the switchover to occur. The licensee therefore revised the emergency procedures to specify that the SI signal be reset only after the SI suction valves from the RWST were open. The SI signal could not be reset until the switchover from RWST to BAT was made.

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Actuation of the SI signal also automatically isolated the containment resulting in isolation of letdown and interruption of the reactor coolant pump (RCP) seal water return flow and instrument air supply. Reset of the SI signal would permit reestablishment of normal RCP seal flow, normal letdown and charging and allow operation of the pressurizer spray. The limitations imposed by the transfer logic circuitry and the emergency procedures could cause delay in the utilization of equipment which can mitigate the consequences of an SGTR event. The staff determined that the licensee should perform a review of the need for a coincident SI signal for automatic transfer of SI pump suction from the BATs to the RWST on BAT low level.

2.2 Actions on Response to Suspected Upper Head Voiding

Following the plant depressurization due to the stuck open PORV during the SGTR event and the development of the steam bubble in the reactor vessel (RV) head, plant procedure E-1.5 "Void Formation in the RCS" was utilized by the operators. The procedure called for determining core exit thermocouple temperature readings, which was done regularly to confirm an adequate margin to saturation. Although adequate core cooling existed, the operators continued to supply high pressure SI water and started an RCP to collapse the steam bubble that had formed above the core under the RV head. The licensee revised procedure E-1.4 and included instructions for the operator to actuate the control rod drive mechanism and reactor compartment cooling fans in order to help cool the RV head region and minimize vessel head-to-reactor loop temperature difference, thus reducing the potential for bubble formation. However, the licensee agreed to a further review of the plant procedures to provide any additional guidance for operator actions that might be required.

3.0 EVALUATION

3.1 Automatic Transfer of Safety Injection Pump Suction

The licensee stated that the requirement for an SI signal to be present for the automatic transfer to take place was reviewed. The results of the review indicated that it is acceptable to remove this dependency. A modification was made to the automatic switchover logic that will cause the switchover to occur on boric acid storage tank level only. The presence of an SI signal will not be required for the automatic switchover to occur. The modification was implemented prior to startup from the 1983 refueling outage.

The staff reviewed the licensee's response; the results of this review indicate that it is acceptable and desirable to remove this dependency. This is because SI reset and reestablishment of necessary systems could be accomplished quicker without defeating the SI switchover requirement. The staff concludes that the licensee has adequately responded to this requirement.

3.2 Actions in Response to Suspected Upper Head Voiding

The licensee has stated that additional guidance beyond that present in the Ginna procedures on January 25, 1982, regarding real or suspected reactor vessel upper head voiding has been found necessary in two areas, SI termination and RCP restart. Additional guidance has been added to the S/G tube rupture and loss of secondary coolant procedures to permit SI termination with an upper RV head void as long as natural circulation and other SI termination criteria are met.

Guidance has also been added to the "E" series procedures (major accident procedures) concerning upper RV head void collapse during RCP start. The procedures permit RCP start with an upper head void as long as adequate pressurizer level and RCS subcooling are present.

The licensee has stated that the sequence of recovery actions (including SI termination) follow the Westinghouse Owners Group (WOG) Emergency Response Guidelines (ERGs). The staff has reviewed the WOG ERGs and concluded that the actions prescribed for the SGTR are generally acceptable. There is however a question remaining regarding SI termination criteria. The SI termination criteria require that once the primary system and ruptured steam generator pressures are equalized, primary system pressure must again be increased by 200 psi by SI flow. This action would reestablish leak flow from the RCS. The staff position is that the criteria of pressurizer level and RCS subcooling also prescribed in the ERGs are adequate to protect the core without the additional requirement of RCS repressurization. This issue will be addressed in future ERG revisions. It is expected that final resolution of this question will be incorporated in the Ginna procedures through the WOG ERGs. The staff considers the Ginna response acceptable. Deviations from the accepted WOG ERGs should be sent to the NRC for staff review.

The licensee's evaluation of RCP restart requirements following an SGTR event was provided as an attachment to the licensee's letter to Dennis M. Crutchfield dated November 22, 1983. This evaluation assesses the potential for coolant flashing and loss of pressurizer pressure control during pump startup. Depressurization of the RCS following an SGTR may generate a steam bubble in the RV upper head region if the RCPs are not operating. This bubble could rapidly condense on RCP restart, drawing liquid from the pressurizer and reducing RCS subcooling. This could result in loss of level indication and pressurizer heater unavailability, thus losing the ability for pressure control and direct indication of coolant inventory. In addition, local flashing in the RCS could result in erratic system response. These conditions would make plant control more difficult and may confuse the operator.

The licensee has performed calculations to determine RCS pressure response to collapse of an upper head void and thus provide the basis for the change to the procedures. Minimum indicated levels of pressurizer levels were calculated that would assure: (1) no heater uncover; and (2) no loss of level indication. Emergency operating procedures for Ginna establish a minimum level of 80 percent before restarting an RCP. This criterion assures that an indicated level will be maintained for initial RCS pressure greater than 620 psia. For large voids, pressurizer heaters may not remain available, but guidance is provided to restore level using the charging pumps, and if necessary, reinitiate safety injection.

Minimum reactor subcooling requirements, consistent with an initial pressurizer level of 80 percent, were calculated for different RCS pressures. For RCS pressures less than 1100 psia, the required subcooling is less than 49°F. These results include instrument uncertainties. SGTR emergency procedures require a minimum of 50°F subcooling. RCP restart is only permitted after the primary and secondary pressures are equalized. The maximum secondary pressure would be 1100 psia (approximate safety valve set point). Therefore, the RCS would remain subcooled following RCP restart with the Ginna subcooling criteria. This is acceptable.

4.0 CONCLUSION

The staff has reviewed the responses submitted by the licensee concerning automatic transfer of SI pump suction from the BAT to RWST, and additional guidance required for operator action to be taken in response to suspected RV upper head voiding. The staff finds the responses acceptable and concludes that the commitments of 2.C(9)6 and 2.C(9)10 have been adequately fulfilled.

5.0 ACKNOWLEDGEMENT

B. Mann and G. Dick prepared this evaluation.

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