



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555  
December 31, 1981

Docket No. 50-244  
LS05-81-12-112

Mr. John E. Maier  
Vice President  
Electric and Steam Production  
Rochester Gas & Electric Corporation  
89 East Avenue  
Rochester, New York 14649

Dear Mr. Maier:

SUBJECT: SEP TOPIC VI-7.B: ESF (ENGINEERED SAFETY FEATURES) SWITCHOVER  
FROM INJECTION TO RECIRCULATION MODE, AUTOMATIC ECCS REALIGNMENT,  
GINNA

The draft staff safety evaluation report for the systems review of SEP Topic VI-7.B, is enclosed. We have concluded that the procedures do not allow adequate time for operator action and have suggested methods for improving the procedures.

You are requested to examine the facts upon which the staff has based its evaluation and respond either by confirming that the facts are correct, or by identifying any errors. If in error, please supply corrected information for the docket. We encourage you to supply for the docket any other material related to this topic that might affect the staff's evaluation. This assessment may be revised in the future if your facility design is changed or if the NRC criteria relating to this subject is modified before the integrated assessment is completed.

Your response within 30 days of the date you receive this letter is requested. If no response is received within that time, we will assume that you have no comments or corrections.

Sincerely,

*Walter A. Paulm*

*for* Dennis M. Crutchfield, Chief  
Operating Reactors Branch No. 5  
Division of Licensing..

Enclosure:  
As stated

cc w/enclosure:  
See next page

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Mr. John E. Maier

cc

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TOPIC VI-7.B: ESF (ENGINEERED SAFETY FEATURES) SWITCHOVER FROM INJECTION TO RECIRCULATION MODE, AUTOMATIC ECCS REALIGNMENT

I. INTRODUCTION

Most Pressurized Water Reactors (PWRs) require operator action to realign the ECCS for the recirculation mode following a LOCA. The NRC staff has been requiring, on a case-by-case basis, some automatic features to assist in the realignment of the ECCS from the injection to the recirculation mode of operation. The safety objective of this requirement is to increase the reliability of long-term cooling by reducing the number of operator actions required to change system realignment to the recirculation mode.

The scope of this topic requires a review of the ECCS control system and the operator action required to realign the ECCS from injection to recirculation mode following a LOCA. The sequence of events from initiation of the injection mode to completion of the recirculation mode, the systems/components and instrumentation/controls utilized in the injection to recirculation process, and the automatic and/or manual process required to complete the switchover process are to be reviewed. The objective of this review is to determine if automatic switchover is necessary to protect public health and safety.

II. REVIEW CRITERIA

The plant design was reviewed with regard to Appendix A, 10 CFR 50, General Design Criteria - 35, "Emergency Core Cooling", which requires that a system to supply abundant emergency core cooling be provided.

III. RELATED SAFETY TOPICS AND INTERFACES

The scope of review for this topic was limited to avoid duplication of effort since some aspects of the review were performed under related topics. The related topics and the subject matter are identified below.

III-6	Seismic Design Considerations
III-10.A	Thermal-overload protection for motor operated valves
III-11	Component Integrity
III-12	Environmental Qualification
IV-1.A	Operation with less than all reactor coolant loops in service
V-10.B	RHR Reliability
V-11	High Pressure/Low Pressure Interface
VI-10.A	Testing of ESF System

#### IV. REVIEW GUIDELINES

Item 19 of the review procedures in SRP Section 6.3 states that the complete sequence of ECCS operation from injection to long term core cooling (recirculation) is examined to see that a minimum of manual action is required and that where manual action is needed, a sufficient time (greater than 20 minutes) is available for the operator to respond. Further guidance on timing of operator actions is provided by draft ANSI Standard 660.

#### V. EVALUATION

The first required operator actions in the Ginna emergency procedures follow receipt of the 31% low RWST level alarm. The operator then shuts off one ECCS train consisting of one Residual Heat Removal (RHR) pump, one Containment Spray (CS) pump, and at least one Safety Injection (SI) pump. Assuming that the RWST level is initially at the minimum technical specification value and all ECCS pumps operate at maximum capacity, the 31% low RWST level alarm is reached 12.7 minutes following a LOCA. While this is an exception to the current SRP, historically the Reactor Systems Branch has allowed operator actions between 10 and 20 minutes provided that the actions are simple. (If no action is taken at the 31% low RWST level, the 10% low level alarm will annunciate 7.3 minutes later and the RWST will empty 9.8 minutes after the 31% low level alarm). The operator must initiate action by 4.7 minutes after the 31% low level alarm in order to complete this part of switchover before the 10% low low level alarm rings, assuming 1 minute per operator action as specified in ANSI N660.

At the 10% low low RWST level alarm, the operator must shut off operating ECCS pumps, align the pump suction lines to draw from the sump, and re-start the pumps needed for recirculation. The timing of the pump shutoff sequence is critical since inaction or delayed action could cause the pumps to drain the RWST, cavitate and damage themselves. Assuming that one ECCS train of pumps is operating when the 10% level alarm is received, the RWST will be drained in 4.7 minutes without any operator action. The operator may delay action 1.5 minutes and complete pump shutoff procedures without damage to the pumps assuming one operator action per minute. Once the pumps are shut off, the concern of draining the RWST and damaging pumps is eliminated, and replaced with a concern that valve alignments to the sump must be completed before ECCS flow can be resumed. The emergency procedures state that the valve re-alignment steps should be completed within 5 minutes so that interruption of core flow will not exceed 5 minutes. Since a total of 10 actions are needed to complete switchover (which requires 10 minutes assuming one action per minute), this part of the switchover cannot be assumed to be completed in the allotted time. It should also be noted that two pairs of valves that must be actuated for switchover are 2 minute valves that must be operated sequentially. This uses up 4 of the 5 minutes allowed for switchover.

CONCLUSION

The current Ginna procedures for switchover from injection do not meet current NRC criteria for operator actions. The switchover procedures could meet NRC criteria if fewer operator actions were required, and if the timing of operator actions was not as critical. The following suggestions are potential methods for an acceptable switchover procedure:

- 1) Automatic trip of ECCS pumps on low RWST level;
- 2) Start switchover procedure on inactive ECCS train at 31% RWST level to avoid loss of ECCS flow to core during switchover;
- 3) Automatic valve realignment following pump shutoff;

Other potential solutions will be considered and may be acceptable.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

DEC 18 1981

MEMORANDUM FOR: W. Russell, Chief  
Systematic Evaluation Program Branch, DL

FROM: G. Mazetis, Acting Chief  
Reactor Systems Branch, DSI

SUBJECT: REVIEW OF SEP TOPIC VI-7.B

The Reactor Systems Branch review of SEP Topic VI-7.B, Switchover From Injection to Recirculation, for the RE Ginna Nuclear Power Station has been completed and is contained in the attached enclosure. We have concluded that the procedures do not allow adequate time for operator action and have suggested methods for improving the procedures. The Human Factors Engineering Branch has been included in the distribution list and should be consulted if SEPB wishes to further pursue the area of operator actions.

Please call G. Alberthal of my staff if you need to discuss our findings further.

A handwritten signature in black ink, appearing to read "G. Mazetis".

Gerald R. Mazetis, Acting Chief  
Reactor Systems Branch  
Division of Systems Integration

Enclosure:  
As Stated

cc:   
R. Snaider  
E. McKenna  
E. Marinos  
T. Speis  
R. Mattson  
B. Sheron  
W. Hodges  
V. Moore  
D. Tondi  
S. Weiss

CONTACT: G. Alberthal  
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## ENCLOSURE

### GINNA SEP TOPIC VI-7.B

#### SWITCHOVER FROM INJECTION TO RECIRCULATION

##### INTRODUCTION

Following a Loss of Coolant Accident borated water is injected from the Refueling Water Storage Tank (RWST) into the reactor vessel by the ECCS pumps. To avoid damage to ECCS pumps and assure abundant cooling water supply to the core, ECCS pump suction must be switched to the containment building sump before the RWST is emptied. The switchover procedure is examined to evaluate the time available to complete needed operator actions and to assure that a single failure will not prevent switchover.

##### EVALUATION

The R.E. Ginna procedure for switchover from injection to recirculation requires manual operator action for all steps. The evaluation of this procedure is based upon Item 19 of the review procedures in SRP Section 6.3. This item in the SRP states that the complete sequence of ECCS operation from injection to long term core cooling (recirculation) is examined to see that a minimum of manual action is required, and that where manual action is needed, a sufficient time (greater than 20 minutes) is available for the operator to respond. Further guidance on timing of operator actions is provided by ANSI standard N660, which is currently in draft form.

The first required operator actions in the Ginna emergency procedures follow receipt of the 31% low RWST level alarm. The operator then shuts off one ECCS train consisting of one Residual Heat Removal (RHR) pump, one Containment Spray (CS) pump, and at least one Safety Injection (SI) pump. Assuming that the RWST level is initially at the minimum technical specification value and all ECCS pumps operate at

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- 3) Automatic valve realignment following pump shutoff;

Other potential solutions will be considered and may be acceptable.

