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Docket No. 50-312

Mr. J. J. Mattimoe
Assistant General Manager and
Chief Engineer
Sacramento Municipal Utility
District
6201 S Street
P. O. Box 15830
Sacramento, California 95813

Dear Mr. Mattimoe:

SUBJECT: RANCHO SECO SAFETY GRADE ANTICIPATORY REACTOR TRIPS (ARTs)
NUREG-0737, ITEM II.K.2.10

Your September 8 and October 19, 1981 letters submitted to us your design of the safety grade ARTs for the Rancho Seco facility. The purpose of the ARTs is to trip the reactor upon loss of main feedwater and/or main turbine trip.

Based upon our review of your preliminary and final design submittals, we conclude that your proposed modifications are acceptable, provided acceptable seismic and environmental qualifications results are obtained for the new pressure sensors that monitor hydraulic fluid pressure for the main turbine and each of the two main feedwater pumps.

As indicated in our enclosed Safety Evaluation, Technical Specifications will be required. Within 30 days of receipt of this letter, please submit proposed Technical Specifications (SRs, LCOs and Basis) for 1) reactor trip upon loss of main feedwater and 2) reactor trip upon main turbine trip.

OMB clearance is not required for this request since it is being transmitted to nine or fewer addresses.

Sincerely,

*ORIGINAL SIGNED BY
JOHN F. STOLZ*

John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

Enclosure:
SER

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SAFETY EVALUATION REPORT (SER)

FINAL DESIGN AND IMPLEMENTATION OF SAFETY-GRADE ANTICIPATORY REACTOR TRIP (ARTs) ON TURBINE TRIP OR LOSS OF MAIN FEEDWATER

RANCHO SECO NUCLEAR STATION UNIT 1

DOCKET NO. 50-312

I. INTRODUCTION

The licensee, Sacramento Municipal Utility District, in its submittals of September 8, 1981 and October 19, 1981, forwarded the information necessary to complete our safety evaluation of their final design and implementation of the safety-grade anticipatory reactor trips (ARTs) on turbine trip or loss of main feedwater. These ARTs are intended to provide additional protection and conservatism beyond that provided by the existing Reactor Protection System (RPS). We previously approved the licensee's preliminary design for upgrading this system in our SER of December 20, 1979. We also requested additional information on the final design.

II. EVALUATION

In performing our evaluation, we reviewed the information in the recent licensee submittals of September 8, 1981 and October 19, 1981 and their previous submittals of May 21 and October 5, 1979 relating to this system.

Our review of the preliminary design and the final design drawings for installation of the safety-grade anticipatory reactor trips indicates that the licensee has incorporated the previously approved logic design concept

into the ARTs design for Rancho Seco Unit 1. For the most probable causes of turbine trip or loss of main feedwater, these anticipatory trips will operate in advance of the reactor coolant system (RCS) high pressure reactor trip to reduce the peak RCS pressure and thus reduce challenges to the power operated relief valve (PORV). This will alleviate these concerns as reported in NUREG-0560.

The ARTs design utilizes four redundant and independent channels to monitor the main feedwater pumps (MFWP) and the main turbine for trip conditions. This safety-grade ART equipment initiates a reactor trip when both MFWPs trip or the main turbine trips. The cabinet mounted equipment is installed in and is an integral part of the existing four channel RPS and interfaces as new trips in the bistable trip string. As such, this additional cabinet-mounted equipment was designed in accordance with the design bases of the RPS and conforms with the acceptance criteria and design requirements of the RPS as described in Section 7 of the Rancho Seco Nuclear Station FSAR. The added modules contain contact buffers, bistables and auxiliary relays, which have been tested and qualified for use in a safety system. Thus, the previous conclusion of the RPS failure analysis, performed by the licensee, that any single failure in the RPS will not prevent performance of its protection action when required, is still valid.

Our review included the final drawings which include the inputs, outputs and logic of the new trip functions, and their integration into the existing RPS. Each channel of the RPS accepts three new pressure switch inputs. The sensors monitor hydraulic fluid pressure for the main turbine and each of the two MFWP turbines. The RPS logic is designed such that a channel trip

will occur due to low hydraulic fluid pressure for the main turbine or low hydraulic fluid pressure for both MFWPs. Upon a trip of any two of the four channel inputs, the RPS will initiate a reactor trip. An automatic inhibit is included in the logic circuitry to prevent tripping of the reactor when the unit is operated at power levels below 20% since the main turbine and both feedwater pumps are not required to be operating at these power levels. The redundant sensors are separated both electrically and physically for independent operation. Individual termination enclosures are provided to protect against grounding, shorting and environmental conditions. The cables, which transmit the sensor signals to the control room, are qualified to IEEE Standard 383 and will be routed in separate, channelized, rigid steel conduit systems. The sensor inputs are provided with a 600 volt isolation buffer. Thus, the effects of credible faults on the sensor circuit will not propagate back to the RPS. Further, a single failure will not prevent the sensors from performing their intended function. We, therefore, find that the ART system satisfies the RPS criteria for redundancy, independence and single failure.

The licensee's October 5, 1979 submittal also included seismic and environmental qualification summary reports. Qualification data on the new pressure switches will be available in the future. The Equipment Qualification Branch will evaluate this material.

The licensee states that the monthly surveillance tests will only include the electronics portion of ARTs and that the new pressure switches will be functionally checked yearly. We find that this periodic test scheme for ARTs while the reactor is in operation is unacceptable. The Technical

Specifications should be modified to cover channel functional checks (including sensors) for ARTs with a frequency commensurate with existing RPS channel functional checks.

III. CONCLUSION

Based on our review of the design of anticipatory reactor trips on main turbine trip or loss of main feedwater, we conclude that the proposed design modifications satisfy the RPS safety requirements and criteria for redundancy, independence, and single failures. We also conclude that the upgraded RPS will provide a greater degree of protection and conservatism beyond that provided by the existing RPS. We find that the design is acceptable except for surveillance checks of the entire ARTs system which should be required as discussed herein.