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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 22 TO PROVISIONAL OPERATING LICENSE NO. DPR-45

DAIRYLAND POWER COOPERATIVE

LACROSSE BOILING WATER REACTOR (LACBWR)

DOCKET NO. 50-409

1.0 INTRODUCTION

By letter dated September 12, 1980 (LAC-7138) Dairyland Power Cooperative (DPC) requested a change to the Technical Specifications for the LaCrosse Boiling Water Reactor (LACBWR) which would incorporate Recirculation Pump Trip System (RPTS) requirements.

2.0 DISCUSSION

In September 1973, our predecessor, the Atomic Energy Commission (AEC), published the "Technical Report on Anticipated Transients Without Scram for Water-Cooled Power Reactors," (WASH-1270), which established acceptance criteria for Anticipated Transients Without Scram (ATWS). Subsequent to the publication of WASH-1270, the AEC requested DPC to address certain sections of WASH-1270, as applied to LACBWR.

DPC's response (Reference 1) was incorporated into the full-term operating license application for LACBWR. Based on its ATWS analysis for LACBWR, DPC concluded that LACBWR can presently, with no modifications, withstand all ATWS events except those that result in a loss of the main condenser as a heat sink. DPC also concluded if the plant were modified to include a recirculation pump trip at high reactor pressure, no damage to the reactor would occur for all ATWS events.

Based on its review of Reference 1 and the generic analysis of General Electric for all boiling water reactors, we stated in Reference 2 that the addition of a recirculation pump trip would significantly limit the consequences of an ATWS event.

A trip of the recirculation pumps in the event of high reactor vessel pressure has the effect of causing an increase in the moderator voids in the reactor core. A substantial negative reactivity results, and the power and pressure surges that might otherwise occur in the most limiting transient (MSIV closure) are substantially reduced. With the recirculation pumps shut down, the reactor power will be reduced to a steady-state power level of less than 20% (based on natural circulation through the core).

In Reference 2, we also requested DPC to make a commitment to modify LACBWR to provide a recirculation pump trip. DPC committed to the design of a recirculation pump trip system in Reference 3. Subsequently in Reference 4, NRC requested additional information (logic and schematic diagrams, description of conformance to IEEE-279, Technical Specification changes, and implementation schedule) which was provided by DPC. This information is reflected on the enclosed Figure 1.

3.0 BACKGROUND

The following information describes how LACBWR's proposed RPTS meets the NRC/IEEE Criteria requested in Reference 4.

3.1 General Functional Requirements

The RPTS automatically shuts down both reactor recirculation pumps whenever reactor steam pressure or reactor water level reach the preset trip levels.

3.2 Independency and Integrity

The primary protection from an ATWS is independent and separate from components and/or systems that initiate MSIV closure which in turn creates the postulated high pressure condition if a reactor scram does not occur. The backup reactor level RPT protection does share common current loops which may initiate an MSIV closure. These current loops have demonstrated a high degree of operational reliability during the life of the plant. The RPT signal would be sensed external to and independent from the drawers which may initiate the ATWS.

The RPTS and its components are diverse from the normal scram system to the extent feasible to minimize the probability of the high pressure ATWS disabling the operation of the mitigating system (RPTS). Diversity is achieved by the following differences between the RPTS and the scram system:

(1) The use of relays not typically used in the normal scram system.

(2) The relays will trip the recirculation pumps by energizing rather than de-energizing.

(3) The RPTS logic will use AC power.

(4) The sensing device uses an independent power supply.

3.3 RPTS Interaction with Control Systems and Scram Systems

One of the reactor pressure channels provides an input signal to the Main Steam Turbine Bypass Valve Controller. This channel is isolated from the remainder of the control circuit by the controller. Any malfunction downstream of the controller will not prevent the RPT circuit from functioning, if required. All associated components in this current loop will be considered part of the RPTS.

4.0 EVALUATION

4.1 Recirculation Pump Trip System Description

The Recirculation Pump Trip System (RPTS) has been designed to be independent and separate from components and/or systems that initiate the anticipated transient of main steam isolation valve closure. In addition, the RPTS is independent, separate and diverse to the extent feasible from the normal scram system, to minimize the probability of any detrimental interaction between the two reactor shutdown systems.

Referring to Figure 1, the LACBWR RPTS will perform the function of disconnecting the main power to both reactor recirculation pump circuit breakers in the event of RPT conditions in either of the redundant logic trains.

A RPTS trip signal consists of high reactor pressure (> 1350 psig) or low reactor water level (-30 inches). A high pressure signal upstream of the MSIV's provides an indication that either MSIV has closed. Should the pressure sensors fail to trip the pumps, the pressure will continue to increase causing the safety valves to lift, thus, blowing down the reactor. The water level will continue to decrease below the reactor low water level scram setpoint (-12 inches). At a reactor water level of -30 inches, the RPT level backup system will actuate.

The components to be added are manufactured by Foxboro Company and are designed for use in the Consoltrol equipment line presently in service at LACBWR. The pressure and level relays are arranged in a two out of three logic to energize the recirculation pump trip relays (TR1 and TR2). A signal from any one of the four logic trains will trip both pumps. The bypass switch will permit pump operation should the RPTS control circuit fail in the shutdown mode and recirculation pump operation is required. This logic system is not vulnerable to any single failure either preventing a pump trip when required or causing a pump trip when not required.

Siemens-Allis, manufacturer of the recirculation pump breakers, does not recommend the addition of a second trip coil. Breakers with dual coils were not designed until 1968. The breakers provided for LACBWR are of a 1963 vintage.

The three level channels and two of the pressure channels will share common current loops with the scram system. The current loops have independent power supplies separate from the safety drawers. The safety system scram actuations are initiated through a power supply, amplifier, comparators and relays in the safety drawers. Any failure of these components would not effect the signal to the RPT circuits and, therefore, would not disable the mitigating system.

4.2 Equipment Qualification

Since no additional equipment is to be added to the containment, environmental equipment qualification is not required.

However, components added externally to the containment will be equal to or superior to the originally supplied equipment.

4.3 Periodic Surveillance and Preventive Maintenance Testing and Calibration

RPT system testing and calibration will be performed annually during refueling outages. These operations will be conducted as part of the routine sensor calibrations.

Due to the relative simplicity of the RPTS activation system and the high reliability of its components, and since the recirculation pump circuit breakers cannot be tripped for testing purposes during power operation, no scheduled periodic testing will be performed.

4.4 Quality Assurance

A Quality Assurance Program in conformance with the requirements of 10CFR50, Appendix B, will be applied to the RPTS design and installation. Since the components required for the RPTS are generally commercial, off the shelf items, it may not be possible to certify manufacturing compliance to 10CFR50, Appendix B. DPC, however, will only use high quality components in the LACBWR RPTS equal to or better than existing plant equipment.

4.5 Administrative Controls

Administrative controls shall be established to control access to all RPTS set point adjustments and bypasses.

4.6 Information Readout

The RPTS is designed to provide the operator with: (a) an annunciator alarm if a RPTS trip signal to the recirculation pumps is generated, and (b) an annunciator alarm if one or both key switches are in the bypass position.

Any changes of the pressure and level contacts from normal operating state will be annunciated by a combination of active monitoring and by a bypass switch test circuit to be used prior to required periodic testing of the level and pressure circuits.

4.7 Maintainability

Maintainability is an inherent feature of the RPTS due to the relatively small number of components, high reliability and information readout (described in Section 4.6 above). The above features in addition to the two out of three trip system logic facilitates the recognition, location, replacement, repair and/or adjustment of malfunctioning components.

4.8 Single Failure Criterion

No single failure within the RPTS can prevent the recirculation pumps from shutting down when required. Additionally, since the RPTS is a backup to the normal reactor scram system, it would be required to operate only if the scram system failed to operate when required. Because of the independence and diversity between the RPTS relays and the scram system drawers, there is no single failure which could prevent both reactor shutdown systems from operating when required.

We, therefore, find the proposed modification and the related technical specification changes to be acceptable.

5.0 SUMMARY

Based on our review of DPC's proposed ATWS RPT modifications, we conclude that they are in conformance with the requirements of NUREG-0460. The RPTS is a diverse and independent backup to the normal scram system and will protect the primary reactor coolant system from an ATWS event in which either MSIV closes at power, thus, eliminating the main condenser as a heat sink. As such, we find the proposed design and technical specification changes to be acceptable.

6.0 ENVIRONMENTAL CONSIDERATIONS

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

7.0 CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

8.0 REFERENCES

1. DPC letter, LAC-2788, Madgett to NRC, A. Giambusso, dated October 9, 1974.

2. NRC letter, V. Stello to Madgett, dated August 31, 1976.

3. DPC letter, LAC-4270, Madgett to NRC, V. Stello, dated October 13, 1976.

4. NRC letter, D. Ziemann to Madgett, dated May 15, 1978.

5. DPC letter, LAC-7138, Linder to D. Crutchfield, NRC, dated September 12, 1980.

Enclosure: Figure 1

Dated: January 16, 1981

RECIRCULATION PUMP TRIP SYSTEM - LOGIC DIAGRAM

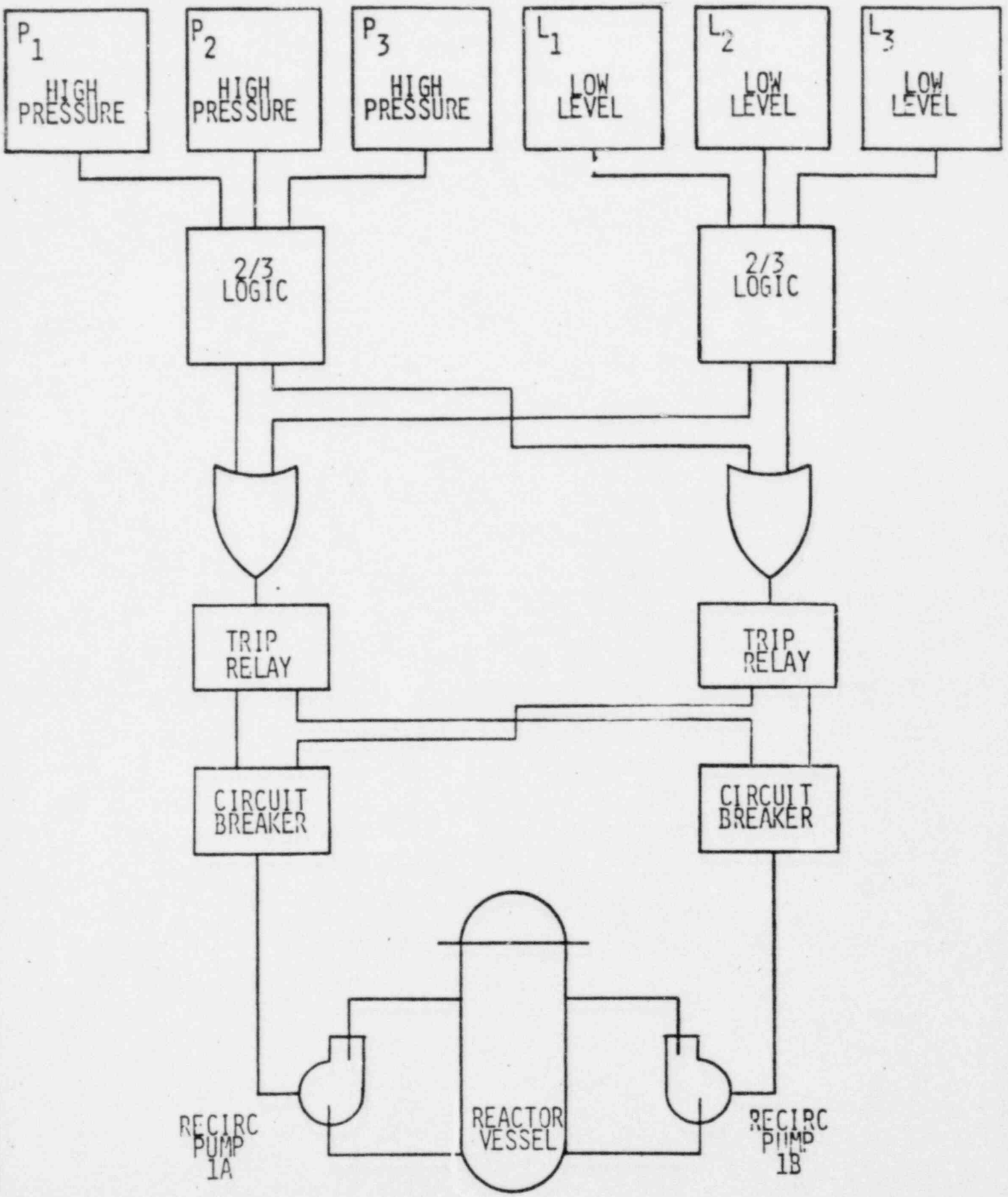

FIGURE 1