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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 121 TO FACILITY OPERATING LICENSE NO. DPR-29

AND AMENDMENT NO. 117 TO FACILITY OPERATING LICENSE NO. DPR-30

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-254/265

1.0 INTRODUCTION

In the past, spurious isolations of the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems at the Quad Cities Nuclear Power Station (QCNPS) have occurred from minor steam leaks during system startups due to the proximity of room area temperature switches. Commonwealth Edison Company (CECo) plans to modify the location and number of temperature switch groups in the HPCI and RCIC rooms at QCNPS to maximize system reliability (i.e. minimize probability of spurious isolations) and yet still maintain the capability to adequately sense bulk room temperature during an actual main steam (MS) supply line break. The purpose of high area temperature switches in the HPCI and RCIC rooms is to isolate the MS supply from containment for these systems in the event of a steamline break. Revised QCNPS Technical Specifications (TS) are necessary to reflect planned system modifications.

Currently TS Table 3.2-1, "Instrumentation That Initiates Primary Containment Isolation Functions," requires a minimum of sixteen (16) operable or tripped instrument channels for the HPCI and RCIC high area temperature isolation functions. The trip level setting of these systems is less than or equal to 200°F. By letter dated August 3, 1989, CECo proposed to amend the QCNPS TS to reduce the required number of operable temperature switches for primary containment isolation of the HPCI and RCIC systems from sixteen channels to four, and to lower the high area temperature trip setpoint from 200°F to 170°F. The temperature trip setpoint for MS supply line containment isolation also needs to be lowered in order to compensate for the reduced number of temperature switches so that HPCI/RCIC system isolation response time is not adversely effected.

2.0 EVALUATION

Commonwealth Edison Company proposed to amend applicable TS to support the upcoming modification of the HPCI and RCIC room area temperature monitoring systems. The HPCI and RCIC systems have two (2) diverse containment isolation design features. Containment isolation is actuated on high flow or high area temperature. The high flow isolation was designed to assure system isolation in the event of a large steamline break. The high area temperature isolation is designed to assure isolation occurs for smaller steamline breaks. Modification of the room area temperature switches is necessary to preclude spurious isolation actuations occurring from minor steam leaks at the inboard and outboard turbine gland seals on both the HPCI and RCIC systems.

The existing room temperature monitoring system for each of the HPCI and RCIC rooms consists of sixteen (16) temperature switches configured in four groups of four. The location of the temperature switch groups for the HPCI system is above the HPCI steam inlet line, above the turbine rupture disk, and one group at each end of the turbine near the bearings. The RCIC system temperature switches are located at the rupture disk, near the steam supply to the turbine and at both ends of the turbine at the shaft. Actuation of any two switches at any one location would isolate the system. In the past, this resulted in spurious system isolations from minor steam leaks at the turbine gland seals. These kind of expected leaks are negligible when compared to the steam leakage anticipated for actual steamline breaks. Consequently, the current temperature monitoring configuration seems to provide excessive sensitivity to local room hot spots which are not necessarily indicative of a steamline break.

Modification of the Unit 1 temperature switches in the HPCI and RCIC rooms is being accomplished during the Unit 1 refueling outage from September to December 1989. This same modification for Unit 2 is planned for its refueling outage scheduled to begin February 1990. Revised TS are necessary to support restart of both units.

The modified configuration of HPCI/RCIC room area temperature switches will consist of a total of four switches with two switches installed at the steam inlet piping and two switches installed at the turbine exhaust rupture diaphragm for each system. The locations of the switches are intended to maximize system reliability and reduce the probability of spurious isolations. Calculations performed to justify reducing the number of temperature switches are based on bulk room temperature; therefore, these switches will be centrally located in both rooms for sensing temperatures related to steamline breaks. The four switches will retain the one-out-of-two taken twice trip logic and will maintain divisional power supplies. In addition, the requirement that all instruments be operable or in the tripped conditions has been retained. The two locations will minimize the potential for spurious isolations due to minor steam leakage at the turbine gland seals yet adequately sense changes in bulk room temperature associated with an actual steamline break. The modification should increase the reliability of

the HPCI and RCIC systems by eliminating spurious isolations due to minor steam leaks. HPCI/RCIC Room Leak Detection Analyses conducted and by the General Electric (GE) Company (enclosed in the CECo submittal) recommended reducing the number of temperature switches.

The trip level setpoint will be lowered to ensure adequate system response time and to ensure radiation releases are maintained within 10 CFR Part 100 limits. The new trip level setting for high room area temperature will be less than or equal to 170°F. This setting was verified to be conservative by calculations performed by Impell (enclosed in CECo submittal). The Impell calculations are based on the aforementioned analyses by General Electric which correlated the size of the steam leak to the change in bulk room temperature. The purpose of Impell's calculations was to justify the temperature switch setpoint for HPCI/RCIC room steamline isolation system. The reduction in the number of switches changes the function of the temperature measurement from localized to bulk room temperature determination. This change in parameter measurement creates a need for a temperature setpoint change to ensure adequate system time response to steam leaks. These calculations confirmed that a trip level setting of less than or equal to 170°F will ensure an adequate system response time while maintaining a low incidence of spurious isolation actuation.

The bounding event for a loss of primary coolant outside containment is the Main Steamline break, as discussed in the bases for Quad Cities Technical Specification 3.7/4.7. The Main Steamline Break is analyzed in section 14.2.3 of the Quad Cities Final Safety Analysis Report. The analysis indicates that 85,000 pounds of primary coolant inventory is lost during the Main Steamline break. The break does not result in core uncovery and the resulting offsite dose limits are well below 10 CFR Part 100 limits.

In order to assess the adequacy of the response time associated with the proposed setpoint, an analysis of the total mass loss for a spectrum of leak rates from 5 to 50 gallons per minute was performed. The HPCI system isolation was the more limiting case since the RCIC compartment is smaller in size, thereby, the temperature increases and associated isolation would occur faster. The largest mass loss calculated for a HPCI leak before the isolation was 2400 pounds of coolant inventory. Since the mass loss is significantly less than that lost during the bounding Main Steamline break, the resulting radiological dose will be a small fraction of 10 CFR Part 100 limits.

The purpose of the RCIC and HPCI system isolation is to assure system isolation in the event of a steamline break to prevent inventory loss and maintain radiation does to less than 10 CFR Part 100 limits. The modified system will maintain separation criteria for electric power supplies. The one-out-of-two taken twice trip logic will be retained so that the isolation capability is maintained in the event of single switch failure. A large steam leak resulting from the rupture of the RCIC and HPCI steam supply line would

cause the high flow instrumentation to provide a trip of the isolation logic. For smaller leaks, the bulk room temperature of the HPCI or RCIC rooms would increase thus resulting in the actuation of the temperature isolation feature. Reducing the number of temperature switches is compensated by lowering, in the conservative direction, the temperature isolation setpoint which will assure adequate system response. This modification remains consistent with the original General Electric Design Specifications. Furthermore, the current high flow isolation, accompanied by the modified temperature isolation, assures that only a minimal inventory loss occurs, thus preventing core uncovery and ensuring that 10 CFR Part 100 requirements are not exceeded. Consequently, the staff concludes that the planned modifications and proposed TS changes are acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

These amendments involve changes to requirements with respect to the installation and use of facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that these amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement nor environmental assessment need be prepared in connection with the issuance of these amendments.

4.0 CONCLUSION

The staff concluded, based on the considerations discussed above, that: (1) there is reasonable assurance the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of these amendments will not be inimical to the common defense and security nor to the health and safety of the public.

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Dated: November 15, 1989