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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 130 TO FACILITY OPERATING LICENSE NO. DPR-30

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

QUAD CITIES NUCLEAR POWER STATION, UNIT 2

DOCKET NO. 50-265

1.0 INTRODUCTION

By letter dated June 28, 1991, Commonwealth Edison Company (the licensee), proposed modifications to the High Pressure Coolant Injection (HPCI) turbine steam exhaust line for Quad Cities Nuclear Power Station, Unit 2. The licensee indicated that the modifications will create a new containment boundary such that the steam exhaust line check valve 2301-45 can be removed from the 10 CFR 50 Appendix J leak rate testing program. The above valve has experienced repeated local leak rate (LLRT) failures due to deterioration caused by the unstable steam condensation during HPCI low steam flow conditions. The proposed modifications add the ability to isolate the vacuum breaker line through the use of two new motor-operated isolation valves which are being added to Technical Specification (TS) Table 3.7-1. The proposed modifications will also improve the reliability of the vacuum breaker with a "one-out-of-two twice" check valve configuration, improve access for maintenance due to relocation, and improve the steam condensation stability through the use of a sparger to minimize the cyclical "chugging" load on the 2301-45 valve.

The licensee also proposed to add requirements for the HPCI low steam pressure isolation setpoint signal for Group IV valves isolation to TS Table 3.2-1 and associated changes to the TS Bases.

2.0 EVALUATION

The licensee indicated that the existing HPCI turbine steam exhaust line contains two large check valves, 2301-45 and 2301-74. Inside the torus, a vacuum breaker line equipped with two small check valves ties into the steam line downstream of the exhaust steam check valves. During normal HPCI operation, the vacuum breaker relieves the vacuum which is created by steam condensation in the exhaust line downstream of large check valves. The vacuum breaker line provides a path for communication between the inside containment atmosphere and the outside. The HPCI steam exhaust check valves are designed to prevent post-accident containment atmosphere from escaping to the outside and the water from backing up into the turbine.

The licensee proposed to replace the existing vacuum breaker line with a new vacuum breaker line that will contain two motor-operated isolation valves, four check valves in "one-out-of-two twice" arrangement, two blocking gate valves and tap lines for Appendix J, Type C leak testing. The two isolation valves will be safety-related and powered from 250V DC and 480V AC Division II power sources. The licensee indicated that the logic for the vacuum breaker isolation valves has been developed according to the recommendations in General Electric Service Information Letter (SIL) No. 30 and is consistent with that of later designed operating plants. The vacuum line isolation valves will normally be open to assure the operational readiness of HPCI. These valves are designed to close automatically during high drywell pressure, indicative of a large break inside the drywell, concurrent with low reactor pressure conditions such as when HPCI can no longer perform its design function. The logic for the closure of each valve is "one-out-of-two taken twice" arrangement. The isolation signal is featured with a signal seal-in such that the signal must be reset and manual action implemented to open the valves following isolation. The isolation signal to each valve is from a separate control division such that no single physical failure could prevent isolation. Based on the above discussion, the staff finds the new vacuum line configuration and logic for relief valves isolation acceptable as it is designed to meet current safety standards. The licensee has proposed a maximum of 50 seconds closure time for new vacuum breaker isolation valves to close under low reactor pressure conditions, concurrent with high drywell pressure for closure, prior to fuel damage. The above closure time is based on the ability of the valves to close and assure that any radiological release is below the regulatory and technical specification limits. The staff finds the 50 seconds closure time for 4-inch isolation valves, as discussed above, acceptable.

The licensee also proposed to install, during the twelth refueling outage, a sparger at the end of the HPCI turbine exhaust line inside the torus to promote more stable steam condensation. The first row of holes on the sparger will be located at or below the current HPCI exhaust line. The suppression pool inventory will provide an effective water seal for the exhaust line during the post-accident period. Containment isolation for the exhaust line will be provided by the stop check isolation valve 2301-74 with effective water seal which will be tested per Appendix J. The staff considers that due to radioactivity in the torus water, the second check valve 2301-45 should be tested for water leaks during inservice inspection and testing according to ASME Codes Section XI per 10 CFR 50.55(g). The licensee agreed to include the check valve 2301-45 for water leak testing according to above requirements in a letter dated November 15, 1991. The staff finds this acceptable.

The licensee indicated that TS Table 4.2-1 requires that the HPCI isolation instruments be periodically calibrated and tested. TS Table 3.2-1, "Instrumentation That Initiates Primary Containment Isolation Functions," does not contain any requirements for the HPCI low reactor pressure setpoint. To correct the omission, the licensee proposed to add this requirement to Table 3.2-1. The basis for the HPCI turbine steam line low pressure isolation is to assure that steam and radioactive gases will not escape from the HPCI turbine shaft seals into the reactor building after steam pressure has decreased to such a low value that the turbine cannot be operated.

The licensee stated that the instruments are currently set so that the isolation does not occur before reactor pressure decreases to 90 psig. Prior to TS Amendment Nos. 130 and 124, for Units 1 and 2, respectively, HPCI was required to be operable at a reactor pressure greater than 90 psig. The current SAFER/GESTR analysis for Quad Cities credits HPCI operation at pressures as low as 150 psig. To calculate a new isolation setpoint, General Electric performed an analysis according to NEDC-31336, "General Electric Instrument Setpoint Methodology" dated October 1986. The upper bounding limit for the isolation was chosen at 150 psig based on the SAFER/GESTR analysis inputs and a lower bounding limit of 95 psig was chosen based on GE experience to assure equipment protection. The GE recommended value for the isolation setpoint is 100 psig. Based on the above discussion, the staff finds that the proposed HPCI low steam pressure isolation setpoint at a pressure of greater than or equal to 100 psig to be added to TS Table 3.2-1 for isolation of Group IV valves acceptable. The addition of the above setpoint does not increase the probability or consequences of an accident as the isolation feature of HPCI is part of the original design basis. The isolation setpoint assures that the isolation function is initiated at an appropriate pressure and that HPCI will remain operable as assumed in the accident analysis.

Based on the above evaluation, the staff considers that the proposed modification to the HPCI turbine steam exhaust line vacuum breaker configuration, the proposed TS changes to add HPCI low pressure isolation setpoint to Table 3.2-1, to add two new vacuum line primary containment isolation valves to Table 3.7-1, and the associated changes to the Bases, are acceptable. Furthermore, the staff concludes the valve 2301-45 is no longer subject to Appendix J, Type C testing.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves 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 the amendment involves no significant hazards consideration, and there has been no public comment on such finding (56 FR 41576). Accordingly, the amendment meets 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 or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that 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 the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: R. Goel, SPLB

Date: February 21, 1992