SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ENVIRONMENTAL EFFECTS OF HIGH ENERGY LINE BREAKS IN
THE AUXILIARY STEAM OR STEAM GENERATOR BLOWDOWN SYSTEMS
BYRON STATION, UNITS 1 AND 2, BRAIDWOOD STATION, UNITS 1 AND 2
COMMONWEALTH EDISON CO.
DOCKET NOS. 50-454/455/456 AND 457

1. Background

By letter dated May 17, 1985, Commonwealth Edison Co. (CECO), the licensee for Byron 1 informed the staff of revised environmental parameters resulting from a high energy line break (HELB) in the Auxiliary Building, in either the Steam Generator Blowdown (SD) or Auxiliary Steam (AS) System. Postulated breaks in these systems were found to have a greater potential effect on environmental conditions than originally predicted. If a break is not isolated within thirty minutes, equipment qualification temperatures could be exceeded.

The licensee further advised in the May 17, 1985 letter, that modifications were in progress to install temperature sensors at strategic locations to detect a temperature rise due to the local effects of a HELB. A signal from the sensors would initiate automatic closure of an isolation valve in the affected line, thus terminating the break flow. Design, procurement, installation and testing of the modifications was to be completed by August 31, 1985. As an interim measure for continued plant operation, CECO committed to post a watch at locations where breaks could occur. In such an event, the watch personnel would communicate with the control room for operator action to immediately close either the SD containment isolation valves or isolate the AS supply line.

By letter dated May 20, 1985 the staff accepted the interim measures until August 31, 1985 (when the permanent modifications were to be completed). In addition it was requested that CECO submit the details of the modifications for staff review.

By letter dated August 2, 1985, CECO submitted a technical description of the permanent modifications at Byron 1 that would aid in isolating the HELB for the AS or SD systems in the Auxiliary Building. They also advised that similar modifications, dependent on break location, would be made on Byron Unit 2 and Braidwood, Units 1 and 2 prior to their fuel load dates.

By letter dated August 23, 1985, CECO advised of installation problems because of equipment interference and delays in delivery of temperature sensors. A completion date for the modifications was forecast to I&E to be no later then September 30, 1985. By letter dated August 27, 1985, the staff accepted the schedule, provided personnel were kept posted at locations where breaks could occur.

By letter dated December 11, 1985 CECO responded to a staff request for additional information and also advised of additional modifications that were included due to accommodate postulated single active failures. A rescheduled completion date for Byron, Unit 1 was set at February 28, 1986.

By letter dated April 29, 1986 CECO provided additional information with regard to the proposed modifications.

The licensee has also stated that the modifications had been completed on Byron, Unit 1, and would be completed prior to fuel load on Byron, Unit 2 and Braidwood, Units 1 and 2.

2. Evaluation

The staff evaluation of the adequacy of the modifications to isolate HELBs and prevent Auxiliary Building temperatures from exceeding equipment qualification temperatures is based on an audit review as prescribed in Standard Review Plan (SRP) 3.6.1. It includes a review of the design of the AS and SD systems to assure conformance with the requirements of GDC 4.

CECO has advised that a temperature of 140^{o}F is the minimum envelope temperature for equipment qualification in the Auxiliary Building. The modifications for isolating a high energy line break in the AS and SD systems to prevent environmental temperatures from exceeding 140^{o}F in the Auxiliary Building consist of: a) temperature sensors mounted in potentially affected areas (but not too close to the affected equipment), b) provisions for automatic isolation of the system isolation valves, c) control room alarms and d) appropriate procedures.

CECO has further advised that the temperature sensors and wiring locations in relationship to HELB locations will not be affected by jet impingement. In addition, only 1E instrumentation will be used. The staff finds this acceptable.

Details of the staff's evaluation of high energy line breaks in the Auxiliary Steam System and the Steam Generator Blowdown System are discussed below.

° Auxiliary Steam (AS) System

Auxiliary boiler steam or main turbine extraction steam are supplied to the AS system. The AS system provides low pressure steam to various Auxiliary Building loads which include the boric acid and radwaste systems. A tie line allows for the interconnection of Units 1 and 2.

In the vicinity of postulated break locations in the Auxiliary Building where break effects may not be confined to non-safety areas, the licensee has installed redundant temperature sensors. At a setpoint of 140°F the sensors will initiate a) an alarm in the control room and b) automatic isolation of the AS system from the Auxiliary Building by closure of the parallel, pressure regulating valves AS013 and AS167.

To assure that steam flow is isolated in the event of failure of either of these valves, the licensee stated in the August 2, 1985 letter, that procedures were being developed to require local manual closure of valve AS012 upon receipt of a control room alarm. This valve is positioned upstream and in series with valves AS013 and AS167. By letter of December 11, 1985, in response to a staff inquiry, CECO advised that sufficient time for manual operator action may not be available in the event of a single failure of either of valves AS013 or AS167, and stated that further modifications would be made. By letter dated April 29, 1986 the licensee committed to install a redundant automatic isolation valve (AS286) downstream, in series with valves

AS013 and AS167. The location of the isolation valves assures that upon a HELB, auxiliary steam from both the affected unit and unaffected unit (via the crosstie) is isolated.

The staff finds that the licensee has provided adequate, redundant isolation valves to assure isolation of the AS system in the event of a HELB. This will assure that the Auxiliary Building temperature will not exceed equipment qualification temperatures.

- Steam Generator Blowdown (SD) System.

The SD system contributes to maintaining proper water chemistry in the steam generators. Each unit's steam generators blowdown to a condenser located in the Auxiliary Building. A crosstie between Units 1 and 2 allows for the blowdown of all steam generators to one blowdown condenser. This may be desired during maintenance of a blowdown condenser.

In the vicinity of postulated break locations in the Auxiliary Building where the break may affect safety related equipment, the licensee has installed redundant temperature sensors. At a setpoint of 140^{o}F these sensors will initiate: a) an alarm in the control room and b) automatic isolation of the SD system of the Unit with the activated sensors. In

response to staff questions the licensee by letters dated December 11, 1985 and April 29, 1986 committed to install redundant automatic isolation valves in each steam generator blowdown line. This will assure that in the event of a HELB, concurrent with a single active failure, the SD system will be isolated, and prevent Auxiliary Building temperatures from exceeding equipment qualification temperatures.

Automatic isolation of the SD system may not occur, however, if the crosstie between units is being used. For example, in the event of a HELB in one unit, temperature sensors will only initiate isolation of the affected unit's SD system; the unaffected Unit's SD system could feed the break via the crosstie. In response to a staff inquiry regarding this, CECO by letter dated April 29, 1986, committed to revise HELB procedures involving the SD system. Now, upon control room annunciation of a 140°F condition, an operator of the affected unit will verify the crosstie valve positions. If open, operator action will be required at the main control board to close the automatic isolation valves of the unaffected unit's steam generator blowdown lines.

The staff finds that CECO has provided adequate redundant isolation valves and procedures to assure isolation of the SD system in the event of a HELB, thus preventing Auxiliary Building temperatures in excess of equipment qualification temperatures.

3. Conclusion

CECO provided for staff review, information concerning plant modifications and procedures to prevent the qualification temperatures of safety related equipment located in the Auxiliary Building from being exceeded, in the event of a high energy line break in either the SD or AS systems.

The staff concludes that the designs of the AS and SD systems for protection against postulated piping failures in the Auxiliary Building, are acceptable, and meet the requirements of GDC 4 with respect to accommodating the effects of postulated pipe ruptures.