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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING CONTROL ROOM HABITABILITY SYSTEM MODIFICATION

CAROLINA POWER & LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

1.0 INTRODUCTION

On July 30, 1985, the NRC issued an approval of the proposed control room habitability system design for the H. B. Robinson Steam Electric Plant, Unit No. 2 (HBR2), based on the system description provided by the Carolina Power & Light Company's (the licensee) letters dated June 2 and November 4, 1983, April 20, 1984, and June 7, 1985. Subsequent engineering evaluations identified the need for certain modifications of the previously described design. The licensee indicated in a June 2, 1983, letter that they would notify the NRC of more effective solutions or any design problems with the proposed modifications.

In the letters dated June 2 and November 4, 1983, the licensee provided information pertaining to the modification of the control room heating, ventilation and air conditioning (HVAC) system. In a letter dated February 29, 1984, the NRC requested that the licensee provide justification for all active components of the proposed control room emergency ventilation system (such as fans, isolation dampers, chillers, and radiation monitors) that will not be redundant and/or single failure proof following the proposed modifications. The licensee's response, dated April 20, 1984, stated that the planned modifications provide full redundancy to the currently installed system to preclude a loss of function due to a single failure. The planned modifications will add a new fan and a new condensing unit; a redundant damper will be added to the filter bypass duct; and power supplies for the motors and controls for the dampers are grouped so that a full complement of equipment consisting of fans, condensers, and dampers will be operable from separate electrical sources. In its letter to the licensee dated July 30, 1985, the NRC stated that it considered NUREG-0737, "Clarification of TMI Action Plan Requirements," Item III.D.3.4, Control Room Habitability Requirements, closed pending the implementation of the licensee's proposed modifications.

By letter dated July 26, 1988, as supplemented by letters dated May 21 and August 23, 1990, the licensee submitted a request for the NRC review and concurrence with the revised design of the HBR2 control room habitability system.

2.0 EVALUATION

The licensee's July 26, 1988, letter identified and described the following changes to the previous design of the control room habitability system. These changes are considered by the licensee to be improvements over the conceptual design provided by the previous submittals.

The control room habitability zone envelope will be limited to only the areas normally requiring access in the event of an accident (i.e., control room, kitchen, toilet, and shift foreman's office). Previously, the cable spreading room, HVAC equipment room, and relay room were included in the control room habitability envelope. The control room HVAC system will be designed as a filtered, pressurized and recirculation type for radiological emergencies, whereas the previous design provided only recirculation and filtration with no pressurization.

The existing control room air handler and air-cooled condensing units will be replaced and new redundant supply fans and cooling coils will be installed for control room ventilation and cooling. New redundant water-cooled condensing units will also be added. The existing air filtration unit will be replaced, and new redundant air cleaning unit fans will be installed. Gravity dampers and low leakage control dampers will be employed. The system design eliminates the need for bubble tight isolation dampers in the filter bypass duct.

The safety-related components of the HVAC system will be designed to remain functional following design basis events, as described in the Updated Final Safety Analysis Report. The HVAC components will remain functional considering the single failure of an active component. The air filtration unit and air handling unit, described in the previous submittals and considered in the staff's previous evaluation, are considered as passive components due to the absence of credible active failure mechanisms. Gravity dampers are not considered to be active components because their mechanical actuation due to gravity is highly reliable. Fire dampers to prevent the migration of a fire to the control room are also considered to be passive components because they are a fusible link type which actuate by melting of the link at high temperature.

Each train of HVAC equipment will be powered from separate safety-related power supplies. Control for each train of equipment will be independent.

The existing control room HVAC system duct which will now be located outside of the new habitability envelope, will be replaced with a new duct to minimize infiltration of potentially contaminated air.

In their August 20, 1990, submittal in response to NRC staff questions the licensee stated the following.

The current proposed system is fully redundant for active components which perform a safety function. Passive components include gravity dampers, the filter train, pressurization seals, and ductwork. All non-safety components are provided for monitoring functions for normal operation (with only a pressure boundary safety function) or are not required for the safety function of the system (dampers fail to the safe position on loss of non-safety instrument air). Non-safety-related control components which interface with the safety-related portion of the system are configured so that the failure of a non-safety-related component will have no effect on a safety system function. The exceptions to this are the seals for the control room pressurization envelope (door seals, penetration seals, domestic piping with loop seals) in that these seals are not seismically designed; and the control room radiation monitor, which is non-safety, has been accepted for its post-accident function under the licensee's commitments to Regulatory Guide (RG) 1.97. The licensee further stated, in a telephone conference with the NRC staff, that procedures will be established to provide for periodic inspection of the gravity dampers to verify that they are unimpeded and are able to fully open or close when required. The staff finds the above to be acceptable.

There are two of each active safety-related components, i.e., two trains of equipment. The control room dose calculation assumes that one out of two of each of these active components performs its safety function, that there are no failures of passive equipment, and that there are no pressurization seal failures. The staff finds the above to be acceptable.

In response to NUREG-0737, the initial control room ventilation system (CRVS) design submittal to the NRC calculated the control room operator dose based on an as-found emergency core cooling system (ECCS) leakage rate (2.63 gallons per hour) discovered during tests. The SER approving the initial CRVS design was for a design which could mitigate the effects of this leakage rate as the design basis ECCS leakage. The licensee has since determined that this basis is not appropriate and has chosen to use Standard Review Plan (SRP) Section 15.6.5, Appendix B, as the basis for the potential leakage. SRP Section 15.6.5, Appendix B, also provides that for a plant that does not provide an ESF filtration system the dose assessment should also include the leakage from a gross failure of a passive component (50 gallons per minute for 30 minutes, starting 24 hours after the accident). The HBR2 auxiliary building filtration system is not an ESF filtration system. However, at the time that the current proposed design was frozen, passive failures of seismically-designed piping systems were not assumed to be a licensing basis for HBR2 and, therefore, assuming a passive failure of ECCS piping as a design basis for the CRVS was not appropriate. The staff finds the above to be acceptable.

The licensee further stated that the existing technical specification with respect to the CRVS filter is to be changed. The design basis filter efficiency is in keeping with RG 1.52, Revision 2, March 1978, Position C.6.a, for the design of the filter (95 percent decontamination efficiencies for elemental iodine and organic iodide are assigned for a two-inch bed depth). However, to fully agree with the RG 1.52 position as it pertains to the filter efficiencies assigned in the control room operator dose calculations, the laboratory test of a representative sample of the carbon adsorbent should demonstrate a methyl iodide removal efficiency of greater than or equal to 99 percent, whereas the current HBR2 technical specification provides that the laboratory test demonstrates a methyl iodide removal efficiency of greater than or equal to 90 percent. The staff finds the licensee's assigned filter efficiencies to be acceptable due to the licensee's commitment to request this change in the technical specifications.

The licensee's calculations show that the 30-day post loss-of-coolant accident (LOCA) inhalation dose (iodine) to the control room personnel is less than the SRP Section 6.4 acceptance criterion of 30 rem to the thyroid. These calculations are described in the licensee's May 21, 1990, submittal. The staff has reviewed the description provided of the licensee's control room operator dose calculations and finds them to be acceptable.

The staff has reviewed the description of the revised design of the control room habitability system provided by the licensee, as described above, and finds the revised design to be acceptable.

By letter dated August 29, 1990, the licensee proposed comprehensive amendments to the technical specifications for the control room HVAC system based on the proposed modifications to the system. The staff's evaluation of the proposed amendments will be addressed in a separate safety evaluation.

3.0 CONCLUSION

Based on the above evaluation and the licensee's commitments to: (1) establish procedures to provide for periodic inspection of the gravity dampers to verify that they are unimpeded and are able to fully open or close when required; and (2) submit proposed changes to the technical specifications for laboratory testing of carbon adsorbent, as described in the above evaluation, the staff finds that the revised HBR2 control room habitability system design meets criterion 19 of 10 CFR Part 50, Appendix A. The staff, therefore, concludes that the revised design of the control room habitability system is acceptable.

Dated: October 26, 1990

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