DEC 5 1983

Docket No. 50-261

Mr. E. E. Utley, Executive Vice President
Power Supply and Engineering & Construction
Carolina Power and Light Company
Post Office Box 1551
Raleigh, North Carolina 27602

Dear Mr. Utley:

SUBJECT: COMPLETION OF GENERIC ITEM B-24, CONTAINMENT PURGING/VENTING DURING NORMAL OPERATIONS, H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

In our letter of November 28, 1978, we identified the generic concerns of purging and venting of containments to all operating reactor licensees and requested your response to these concerns. Our review of your response was interrupted by the TMI accident and its demands on staff resources. Consequently, as you know, an Interim Position on containment purging and venting was transmitted to you on October 23, 1979. You were requested to implement short-term corrective actions to remain in effect pending completion of our longer-term review of your response to our November 28, 1978 letter.

By letter dated December 21, 1981 (Reference 1), we transmitted the status of the containment vent and purge issue for H. B. Robinson 2 (HBR-2). Reference 1 identified the five components of our review and provided the review status. One item (5 - Containment Pressure Setpoints) was resolved by Reference 1. As discussed below we have now completed our review on each of the remaining four components. We consider that your response to the venting and purging issue meets our guidelines and is therefore acceptable. A detailed discussed of each component of our review follows:

1. <u>Conformance to Standard Review Plan Section 6.2.4 Revision 1 and Branch Technical Position CSB 6-4 Rev. 1</u>

   Reference 1 transmitted our Safety Evaluation Report (SER) on this item. This SER contained four recommendations including plant modifications that would assure compliance with the NRC positions stated in the SER. By letters dated January 29, 1982 (Reference 2) and November 18, 1983 (Reference 3) you addressed each of these recommendations. The following discusses each of these items:

A. Commit to a goal in representing a limit to the use of the purge/vent to a specified annual time that would be system commensurate with identified safety needs.

In Reference 2 you have committed to a goal of purging time HBR-2 of less than 90 hours per year and that purging will be used only for safety-related reasons during plant operations. It is the staff's position that purging be limited to safety-related purging only, for example for pressure control, to facilitate non-routine safety-related surveillance, or to facilitiate non-routine safety-related maintenance. Refer to Enclosure 3 of our letter dated December 21, 1981 for our guidance previously furnished. Therefore, your limits of less than 90 hours per year are acceptable as an interim goal at this time.

We have also determined that radiological consequences of a design basis loss of coolant accident (DBA/LOCA) during containment purge and/or venting would be less than the dose guidelines of 10 CFR Part 100. No further action on your part is required. The results of our generic evaluation are contained in Enclosure 1.

B. Provide debris screens for purge/vent systems as noted in the Reference 1 Safety Evaluation.

In Reference 3 you have committed to install debris screens, for the containment purge and vent systems, during the Steam Generator Replacement Outage scheduled for mid-1984. We find this commitment and schedule acceptable.

2. Valve Operability

Our review of this item is complete. We conclude that you have demonstrated the ability of the purge and vent valves at HBR-2 to close against the buildup of containment pressure in the event of a DBA/LOCA. See Enclosure 1 for our SER on this item. On this basis, your Technical Specifications should clearly state the limit on opening angle for these valves. The 42" valves are limited to an opening angle of 70° of less and the 6" valves may be fully opened for safety-related reasons. We consider your option to keep the 42" valves shut most of the time and to vent containment through the 6" valves to be most acceptable and in line with NRC guidance (Enclosure 3 to Reference 1).

3. Safety Actuation Signal Override

We have completed our review of this item and we find that the electrical, instrumentation and control design aspects of the override of containment pruge valves isolation and other engineered safety features (ESF) signals for HBR-2 to be acceptable with the following recommendation. There are certain valve control circuits in other EFS systems which do not satisfy our review Criteria 1, 2, 3, and 6. We recommend that the design of those valves identified in the Technical Evaluation Report, Enclosure 4, as well as other valves in the other ESF systems having the same control circuit features, be modified to satisfy review Criteria 1, 2, 3 and 6. Our Safety Evaluation for this item is included as Enclosure 3. Please advise us of your schedule for making these modifications.

4. <u>Containment Leakage Due to Seal Deterioration</u>

In Reference 1 we requested that you proposed a Technical Specification change that incorporates an acceptable valve surveillance program. Also, we recommended that you provide the details of your proposed test program for our information.

In your letter dated January 29, 1982, you stated that a Technical Specification change covering containment leakage due to seal deterioration is not needed at HBR-2 because the leak rate of the purge and vent valves is constantly monitored by the Penetration Pressurization System (PPS) during plant operation and would alarm in the control room in the event of a valve leak in excess of 0.5 scfm. This is not currently in HRB-2 Technical Specifications. Based on our review of your alternative seal deterioration detection method and its function as an on-line continuous monitoring system for detection of purge/vent isolation valve leakage with a control room alarm which alerts the operator to an incipient leak, we find your alternative seal deterioration detection method acceptable. However, your Technical Specifications do not meet the intent of the surveillance requirement 4.6.3.4 of Enclosure 7 to Reference 1.

We have completed our review of your Technical Specifications submitted by your June 20, 1981 letter in response to our letter (Reference 1). Our review indicates that your Technical Specifications do not contain the intent of the following sections of Enclosure 7 to Reference 1; LCO 3.6.1.7 and Action Statement; Surveillance Requirements (SR) 4.6.1.7.2; SR 4.6.3.1; SR 4.6.3.2; and SR 4.6.3.4.

In closing, note that the completion of generic item B-24 is subject to the resolution of the Technical Specification implementation. Therefore, you are requested to provide a Technical Specification change request and/or justification or commitment, as discussed above, within 60 days of receipt of this letter.

Sincerely,

Original signed by:
S. A. Varga

Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of LIcensing

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Mr. E. E. Utley
Carolina Power and Light Company

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DEC 5 1983

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2. <u>Valve Operability</u>

Our review of this item is complete. We conclude that you have demonstrated the ability of the purge and vent valves at HBR-2 to close against the buildup of containment pressure in the event of a DBA/LOCA. See Enclosure 1 for our SER on this item. On this basis, your Technical Specifications should clearly state the limit on opening angle for these valves. The 42" valves are limited to an opening angle of 70° of less and the 6" valves may be fully opened for safety-related reasons. We consider your option to keep the 42" valves shut most of the time and to vent containment through the 6" valves to be most acceptable and in line with NRC guidance (Enclosure 3 to Reference 1).

3. <u>Safety Actuation Signal Override</u>

We have completed our review of this item and we find that the electical, instrumentation and control design aspects of the override of containment pruge valves isolation and other engineered safety features (ESF) signals for HBR-2 to be acceptable with the following recommendation. There are certain valve control circuits in other EFS systems which do not satisfy our review Criteria 1, 2, 3, and 6. We recommend that the design of those valves identified in the Technical Evaluation Report, Enclosure 4, as well as other valves in the other ESF systems having the same control circuit features, be modified to satisfy review Criteria 1, 2, 3 and 6. Our Safety Evaluation for this item is included as Enclosure 3. Please advise us of your schedule for making these modifications.

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Sincerely,

Original signed by:
S. A. Varga

Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of LIcensing

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GENERIC EVALUATION OF THE RADIOLOGICAL CONSEQUENCES OF ACCIDENTS WHILE PURGING OR VENTING AT POWER MULTI PLANT ACTION ITEM B-24

The release of radioactivity through vent or purge valves from a potential large LOCA at power has been considered generically to assure that such events do not constitute an undue hazard to the people residing around operating reactor sites. To evaluate the radiological consequences of such accidents, the following assumptions have been made:

a. vent and purge valve isolation signals, circuitry and purge valve actuation are reliable;

b. purge system isolation valve closure times are generally sufficient to prevent the release of activity associated with fuel failures that could follow a large break (a total accident elapsed time of about 15 seconds or less);

c. maximum allowable coolant iodine equilibrium and spiking activity limits do not exceed those contained in Standard Technical Specifications (STS);

d. fission products generated by pipe breaks are reflective of coolant activity and fuel failures estimated using 10 CFR Part 50, Appendix K, analysis techniques; and

e. radiological consequences of accidents while purging or venting would be bounded by those produced by a large break.

A large number of staff evaluations of the radiological consequences of LOCA's have been performed for construction permit, operating license, operating license amendment, and Systematic Evaluation Program reviews. In addition, a generic assessment of the amount of radioactivity that could be released while venting and purging from a spectrum of pipe breaks through the range of purge valve sizes utilized by industry has been made. In virtually all cases, the contribution through vent or purge valves is estimated to be of the order of 2 percent, or less, of the Exclusion Area Boundary (EAB) and outer boundary of the Low Population Zone (LPZ) doses that would occur from a large break LOCA in which a source term indicative of a substantial melt of the core with subsequent release of appreciable quantities of fission products is assumed.* For dose assessments in which only activity in primary coolant systems would be released, or for events in which fuel failures indicative of 10 CFR Part 50, Appendix K, LOCA analyses are indicated, EAB and LPZ dose estimates are substantially less than dose estimates made for a large break LOCA assuming a substantial fuel melt. Since the magnitude of the vent or purge contribution to severe LOCA dose estimates is small compared to other LOCA scenarios within design bases, we conclude that the consequences of such accidents are within applicable dose guidelines.

A generic assessment of the radiological consequences of large break accidents, including a resulting severe LOCA of the type hypothesized for site suitability purposes, while venting or purging at power indicates that the dose contribution through open valves is small. Therefore, we find total accident radiological consequences of such accidents would be less than the dose guidelines of 10 CFR Part 100.

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*Estimates based upon SRP analysis techniques and 10 CFR Part 100.11.

H.B. ROBINSON
UNIT NO. 2
DOCKET NUMBER 50-261

DEMONSTRATION OF CONTAINMENT PURGE AND VENT VALVE OPERABILITY (B-24)

1.0 Requirement

Demonstration of operability of the containment purge and vent valves particularly the ability of these valves to close during a design basis accident is necessary to assure containment isolation. This demonstration of operbility is required by BTP CSB 6-4 and SRP 3.10 for containment purge and vent valves which are not sealed closed during operational conditions 1, 2, 3, and 4.

2.0 Description of Purge and Vent Valves

The valves identified as the containment isolation valves in the purge and vent system are as follows:

Valve Tag Number	Valve Size (Inches)	Function	Location
V12-6	42	Purge	Outside containment
V12-7	42	Purge	Inside containment
V12-8	42	Purge	Outside containment
V12-9	42	Purge	Inside containment
V12-10	6	Vent	Outside containment
V12-11	6	Vent	Inside containment
V12-12	6	Vent	Outside containment
V12-13	6	Vent	Inside containment

The 42-inch valves are butterfly-type Model 50 FR manufactured by Allis Chalmers. These valves are equipped with Parker-Hannifin series MTA, Style J air cylinder operators (air to open-spring to close). The valves are limited to a 70° opening angle (90° = full open) by means of a mechanical travel stop.

Carolina Power and Light operates the 42-inch purge valves with the 70° restriction during modes above cold shutdown to reduce containment radiation and temperature in order to perform necessary inspection and maintenance operations. The 42-inch valves are limited to the 70° opening angle for radiological reasons and not for valve structural limitations. The 6-inch valves are butterfly-type Model 150 FR manufactured by Allis Chalmers. These valves are equipped with Bettis Model 701-A-SR4 air-open, spring-close operators.

The 6-inch vent valves are operated from the full open (90°) position as required to control containment pressure during modes of operation above cold shutdown.

3.0 Demonstration of Operability

Carolina Power and Light Company (CP and L) has provided operability demonstration information for their containment purge and vent system isolation valves at their H.B. Robinson Unit 2 nuclear station in the following submittals.

Reference A - Carolina Power and Light Company letter, December 24, 1980, E. E. Hutler to S. A. Varga with enclosure 1.

Reference B - Carolina Power and Light Company letter, June 20, 1980, E. E. Hutten to S. A. Varga.

Reference C - Carolina Power and Light Company letter, January 29, 1982, S. R. Zimmerman to S. A. Varga.

3.1 Carolina Power and Light Company's approach to operability demonstration is based upon the Allis Chalmers test report provided in Reference A, enclosure 1. The test report includes a summary sheet for each tabulating valve closure position in 10° increments from full open (90°) to close (0°) versus inlet pressure (P_1), valve pressure drop ΔP, dynamic torque coefficient (C_T), dynamic torque (T_D), bearing torque (T_S), combined dynamic and bearing torque (T_O), and available operator torque (T). Dynamic torque coefficients are derived from test data resulting from bench tests on 6-inch butterfly valves. The bench tests were conducted with different valve disc designs, shaft orientations, flow directions, and upstream piping configurations to ensure that test data could be applied to a variety of actual valve designs and installation configurations. Inlet pressures were determined by using the ramp rise approach using the containment pressure rise curves for the DBA, a 2-second closure time and a 0-second delay.

3.2 The valves are designed and constructed to American Water Works Association Standard C504. All components are sized according to tabulated data requirements listed in C504. Enclosure 1 of Reference A includes Allis Chalmers stress analysis for the valve shafts which are considered the critical elements. Using the theory of combined stresses to combine the direct and torsional shear stresses in the shaft; the stress level was determined to be 7345 psi for 42-inch valves and 371 psi for the 6-inch valves. The allowable shear stress from the C504 standard is 9,000 psi.

3.3 The maximum allowable ΔP calculated in enclosure 1 of Reference A is 33.4 psi for the 42-inch valves and 497 psi for the 6-inch valves. Using the 2.0-second closure time and the LOCA containment pressure response profile (Reference A) the containment pressure at valve closure is expected to be 17 psig.

3.4 Curves for "Required Valve Operating Torque versus Disc Angle," and "Operator Output Torque versus Disc Angle" are provided for each valve in attachment 1 to Reference A. The curves show that at no time does the "Required Valve Operating Torque" exceed the "Operator Output Torque" during valve closures against the postulated LOCA conditions.

3.5 The valves are seismic Class I valves designed for a seismic loading of .24 g in any direction.

4.0 Evaluation

4.1 The licensee's selection of a 2-second closure time and the ramp pressure rise approach in determining dynamic torque coefficients represents an acceptable if not conservative approach in determining valve dynamic loads occurring during the Design Basis Accident (LOCA). In Reference B, the licensee presents a Technical Specification change stating that the containment purge and vent valves shall be capable of shutting in 2 seconds or less. Longer closure times would result in larger dynamic loads due to the increasing containment pressure so the staff agrees with the necessity for a change in the Technical Specifications (Reference C).

4.2 The curves for "Required Valve Operating Torque vs Disc Angle" and "Operator Torque vs Disc Angle" shown in attachment 1 to Reference A indicates that positive torque margin exists at all disc angles including the seating positions.

4.3 The stress analysis furnished in attachment 1 to Reference A indicates that the valve shafts are considered the critical elements. Maximum allowable ΔPs calculated in the stress analysis using a conservative 9,000 psi for allowable shear stress provided a good margin when compared to the anticipated maximum inlet pressure as shown below.

- o 42-inch valves, maximum ΔP allowable 33.4 psi
- o 6-inch valves, maximum ΔP allowable 497 psi
- o Anticipated maximum ΔP 17 psi.

As a check of valve stress at peak containment pressure (42 psi) the stress analysis indicated a factor of safety for the 42-inch valves of 1.52:1 using 15,000 psi as the yield stress in shear.

5.0 Summary

We have completed our review of information submitted to date concerning operability of containment purge and vent valves for H.B. Robinson, Unit 2. We find the information submitted demonstrates the ability of the purge and vent valves to close against the buildup of containment pressure in the event of a DBA/LOCA.

SAFETY EVALUATION REPORT

ROBINSON UNIT 2

OVERRIDE OF CONTAINMENT PURGE ISOLATION

Introduction

Instances have been reported at nuclear power plants where the intended automatic closure of the containment purge/ventilation valves during a postulated accident would not have occurred because the safety actuation signals were inadvertently overriden and/or blocked, due to design deficiencies. These instances were determined to constitute an Abnormal Occurrence (#78-5). As a follow-up action, NRR issued a generic letter requesting each licensee to take certain actions.

Evaluation

The enclosed report "Override and Reset of Control Circuitry in the Ventilation/Purge Isolation and Other Engineering Safety Features Systems," was prepared for us by the Franklin Research Center as part of our technical assistance contract program. The report provides their technical evaluation of the design compliance with NRC provided criteria. The following discussion addresses the concerns in the conclusion section of the contractor's report. We have no additional concerns.

The containment ventilation isolation circuit satisfies our criteria for containment ventilation and purge with the exception of the radiation monitors, which are not safety grade as required by Criterion 5. This item is presently being reviewed under NUREG-0737 Action Plan Item II.E.4.2.7 concerning the automatic isolation of the containment ventilation and purge systems on high containment radiation. Therefore, for the purposes of this report, our review of this item is complete.

The contractor's report indicates that certain valve control circuits in the other engineered safety feature (ESF) systems are in violation of review Criteria 1, 2, 3 and 6. We recommend that the licensee modify the design of those valves identified in the report as well as other valves in the other ESF systems having the same control circuit features to satisfy review Criteria 1, 2, 3 and 6.

Conclusion

Based on our review of the contractor's technical report, we conclude that the electrical, instrumentation and control design aspects of the override of containment purge valve isolation and other engineered safety features are acceptable pending satisfactory resolution of NUREG-0737 Action Plan Item II.E.4.2.7 and with the following exception;

> The contractor's report indicates that certain valve control circuits in the other engineered safety feature (ESF) systems are in violation of review Criteria 1, 2, 3 and 6. We recommend that the licensee modify the design of those valves identified in the report as well as other valves in the other ESF systems having the same control circuit features to satisfy review Criteria 1, 2, 3 and 6.

This safety evaluation was performed by T. Alexion and J. Calvo of the Operating Reactors Assessment Branch, Division of Licensing.