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DEC 23 1975

Docket No. 50-261

Carolina Power & Light Company
ATTN: J. A. Jones
Senior Vice President
336 Fayetteville Street
Raleigh, North Carolina 27602

Gentlemen:

We have reviewed your response of September 24, 1975 to our letter of August 22, 1975 concerning the Robinson-2 Industrial Security Plan. Your response and commitments to our concerns are acceptable. The means and implementation schedule for providing additional physical protection for equipment associated with the water intake structure are also approved.

Sincerely,

[signature]

Karl R. Goller, Assistant Director
Operating Reactors
Division of Reactor Licensing

cc: see next page

A3

OFFICE ➤	ORB 4	ORB 4	AD/RKRL			
SURNAME ➤	DBridges	RWReid	KRGoller			
DATE ➤	12/15/75	12/15/75	12/23/75			

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cc:

G. F. Trowbridge, Esquire
Shaw, Pittman, Potts, Trowbridge & Madden
Barr Building
910 17th Street, N. W.
Washington, D. C. 20006

Hartsville Memorial Library
Home and Fifth Avenue
Hartsville, South Carolina 29550

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Docket No. 50-261

Carolina Power & Light Company
ATTN: Mr. J. A. Jones
Senior Vice President
336 Fayetteville Street
Raleigh, North Carolina 27602

Gentlemen:

We have reviewed the operational Quality Assurance (QA) program for the H. B. Robinson Steam Electric Plant Unit No. 2 as described in your correspondence dated August 12, 1974 and September 9, 1975. Based on our review we conclude that your QA program has the necessary controls to comply with the requirements of Appendix B to 10 CFR 50 and is acceptable for use at the H. B. Robinson Unit 2.

Enclosed is a copy of our evaluation of your QA program.

Sincerely,

Robert W. Reid, Chief
Operating Reactors Branch 4
Division of Reactor Licensing

Enclosure:
As stated

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ENCLOSURE

REVIEW AND EVALUATION OF CAROLINA POWER AND LIGHT COMPANY'S (CP&L) REVISED QUALITY ASSURANCE PROGRAM FOR THE H. B. ROBINSON NUCLEAR POWER STATION, UNIT NO. 2

We have reviewed and evaluated the revised QA program for the H. B. Robinson Nuclear Power Station, Unit No. 2, submitted by CP&L in an amendment to the FSAR (Serial number NG-74-937 dated August 12, 1974) and in the docketed information contained in E. E. Utley's letter (Serial number NG-75-1337 dated September 9, 1975) to R. W. Reid. The quality assurance program for plant operation of Robinson Unit No. 2 Nuclear Station complies with the guidance contained in the WASH documents 1283 (5/24/74), "Guidance on Quality Assurance Requirements During Design and Procurement Phase of Nuclear Power Plants - Revision 1"; 1284 (10/26/73), Guidance on Quality Assurance Requirements During the Operations Phase of Nuclear Power Plants"; and 1309 (5/10/74), "Guidance on Quality Assurance Requirements During the Construction Phase of Nuclear Power Plants," with certain exceptions. The exceptions taken as described in the docketed September 9, 1975 letter (Serial: NG-75-1337) are considered as acceptable alternatives to the guidance contained in the WASH documents.

CP&L has provided a detailed organizational description of those individuals and groups involved in carrying out activities required by the QA program and a delineation of their duties, authority, and responsibilities. This organizational arrangement meets the required independence necessary to carry out the QA functions without undue influence from cost and scheduling. CP&L has also provided a description of the measures used to carry out the H. B. Robinson Unit No. 2 QA program activities and described how requirements of Appendix B will be satisified by the administration and implementation of these measures. These measures provide adequate controls which demonstrate a QA program meeting the requirements of Appendix B to 10 CFR 50.

Based on our review, we conclude that CP&L's quality assurance program has the necessary controls to comply with the requirements of Appendix B to 10 CFR 50 and is acceptable for the operations phase of H. B. Robinson, Unit No. 2 Nuclear Station.

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Docket No. 50-261

Carolina Power & Light Company
ATTN: Mr. J. A. Jones
Senior Vice President
336 Fayetteville Street
Raleigh, North Carolina 27602

Gentlemen:

Your letter dated December 21, 1973, submitted a report on pipe failures outside of containment of H. B. Robinson Steam Electric Plant, Unit 2 (Robinson-2) as requested by our letter of December 15, 1972. Our letter of December 15, 1972, and subsequent correspondence contained criteria by which a postulated rupture in any high energy fluid piping outside the primary containment was to be evaluated to assure safe plant shutdown. This matter was then addressed in a meeting between the Carolina Power and Light Company's staff and the NRC staff, and was the subject of considerable correspondence during our review of your studies in this area.

Based upon our review of your final report forwarded on November 1, 1974, and as supplemented on December 21, 1974, we have concluded that Robinson-2 would withstand the consequences of postulated ruptures in high energy fluid piping outside containment without loss of capability to initiate and maintain safe shutdown of the plant. Please amend the Robinson-2 FSAR to include the summary and conclusions from your report; submittal of this amendment is requested within 45 days following your receipt of this letter. A copy of our related Safety Evaluation is enclosed.

Sincerely,

/S/

Karl R. Goller, Assistant Director
for Operating Reactors
Division of Reactor Licensing

Enclosure:
Safety Evaluation

cc: See next page

[redacted]

OFFICE	ORB#4	ORB#4	OELD	AD:DRL/ORs	
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DATE	9/30/75 10/23/75	11/5/75	11/10/75	11/19/75	

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Office of Intergovernmental Relations
116 West Jones Street
Raleigh, North Carolina 27603

Mr. McCuen Morrell, Chairman
Darlington County Board of Supervisors
County Courthouse
Darlington, S. C. 29532

Mr. Dave Hopkins
Environmental Protection Agency
Region IV Office
1421 Peachtree Street, N. E.
Atlanta, Georgia 30309

Hartsville Memorial Library
Home and Fifth Avenues
Hartsville, South Carolina 29550

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING THE CONSEQUENCES OF HIGH ENERGY PIPING FAILURES OUTSIDE CONTAINMENT

CAROLINA POWER AND LIGHT COMPANY

OPERATING LICENSE DPR-23

H. B. ROBINSON UNIT NO. 2

DOCKET NO. 50-261

Introduction

On December 15, 1972, and January 16, 1973, the Commission sent letters to the Carolina Power & Light Company (licensee) requesting a detailed design evaluation to substantiate that the design of the H. B. Robinson Steam Electric Plant, Unit 2 (Robinson-2) is adequate to withstand the effects of a postulated rupture in any high energy fluid piping system located outside the primary containment, including the double-ended rupture of the largest line in the main steam and feedwater systems. The licensee was further advised that if the results of the design evaluation indicate that changes in the design are necessary to assure safe plant shutdown, information on these design changes and plant modifications would be required. Criteria for conducting this design evaluation were included in the above cited letters.

The licensee submitted a preliminary study addressing this subject on January 5, 1973, and met with the NRC staff on January 17, 1973, to further address the evaluation. The licensee subsequently provided supplementary information on his studies in this area in correspondence dated February 6, 1973, June 7, 1973, June 29, 1973, September 12, 1973, December 21, 1973, and November 1, 1974. The initial correspondence dealt with the licensee's preliminary studies relating to high energy piping breaks outside containment whereas, the correspondence dated December 21, 1973, and November 1, 1974, provided final results and conclusions. Moreover, in the latter correspondence CP&L identifies the high energy piping systems, describes design basis breaks and cracks, evaluates the effects of pipe whip and jet impingement, and assesses the resultant structural and environmental effects.

Discussion

A summary of the criteria and requirements that were used in our evaluation was included in our letter of December 15, 1972, and is presented below:

a. Protection of equipment and structures necessary to shutdown the reactor and maintain it in a safe shutdown condition (assuming a concurrent and unrelated single active failure of protected equipment) should be provided from all effects resulting from ruptures in pipes carrying high energy fluid, where the temperature and pressure conditions of the fluid exceed 200°F and 275 psig, respectively, up to and including a double-ended rupture of such pipes. Breaks should be assumed to occur in locations specified in the "pipe whip criteria". The rupture effects to be considered include pipe whip, structural (including the effects of jet impingement), and environmental.

b. In addition, protection of equipment and structures necessary to shutdown the reactor and maintain it in a safe shutdown condition (assuming a concurrent and unrelated single active failure of protected equipment) should be provided from the environmental and structural effects of a crack in the piping. The failure should be assumed to be a single open crack at the most adverse location in pipes carrying fluid routed in the vicinity of the equipment and structures. The size of the crack should be assumed to be one-half the pipe diameter in length and one-half the wall thickness in width.

Evaluation

A. High Energy Systems

The evaluation included the following piping systems containing high energy fluids: 1) Main Steam System; 2) Feedwater System; 3) Steam Generator Blowdown System; 4) Chemical and Volume Control System (CVCS); and 5) Steam Supply to Auxiliary Feedwater Pump Turbine.

B. Discussion of High Energy Piping Failure Analysis

The system analysis included postulated pipe breaks at all terminal ends of the piping and at high stress points in the piping system. The stress analysis considered both operational and seismic stresses and assumed break locations at high stress locations and at any point with a stress exceeding 80% of the allowable stress value. The system analysis also considered piping cracks could occur at any location along the piping.

The analysis of high energy piping failures on the plant addressed:

1. Susceptibility of equipment and structures to possible pipe whip and jet impingement.

2. The possible environmental effects of pressure, flooding and temperature on habitability, equipment, and structures.

An evaluation was made of the potential effects of high energy piping failures on the subsequent operability of the plant. Specifically considered were the capability to safely shutdown, cooldown, and maintain cold shutdown conditions. The following were assessed in the evaluation:

1. Habitability of the control room and capability of bringing the reactor to a cold shutdown condition from the control room.

2. Redundancy of equipment as required to mitigate the consequences of an accident and obtain a safe hot shutdown. In the event of induced failure of equipment designed to bring the plant to a safe cold shutdown, the operability of redundant equipment providing the same function was evaluated.

3. Potential loss of offsite power. In such an event, the capability to hold the plant in a safe hot shutdown condition until such time that offsite power could be restored and then to cool the plant to a safe, cold shutdown in a normal manner was evaluated.

4. Equipment and Structures. The evaluation assessed effects on the following types of required equipment:

   (1) Pumps
   (2) Tanks
   (3) Valves
   (4) Instrumentation(capability to perform safety function and provide needed information to the operator)
   (5) Electrical supplies, circuitry and controls
   (6) Ventilation system
   (7) Supporting structures
   (8) Containment integrity

C. Results From the Evaluation of High Energy Systems

The licensee has examined all potential safety-related high energy pipe break locations and evaluated their consequences. After completing the examination of postulated high energy fluid piping breaks outside of the primary containment, the licensee provided a jet impingement shield to protect the steam system pressure transmitters for fluid ejected from a potential crack in the feedwater line thereby assuring that the safe

shutdown capability will not be degraded. All other systems studied provided the necessary requirements for a safe shutdown.

A synopsis of the licensee's evaluation for each high energy fluid piping system is presented as follows.

1. Main Steam System

The main steam lines penetrate containment and run outdoors to a Class I support tower and from the tower, run parallel to the turbine-generator building. The main steamlines join at the steam header which then enters the turbine-generator building and is routed to the turbine. Pipe rupture restraints are provided and it has been determined that additional rupture restraints are not necessary in order to protect required equipment. Rupture of a main steamline at the header could result in the steamline striking containment if a plastic hinge were formed at the tower; however, the licensee's analysis demonstrated that failure of containment would not result.

The licensee described the routing of the steam header to the turbine and identified on layout drawings the location of safety related equipment. This equipment is located in either the auxiliary building or the containment. Because of the large distance between the turbine and the auxiliary building, and because of containment, failure of the main steam lines, the steam header, and auxiliary steam lines, including the lines for the turbine-driven auxiliary feedwater pump, would not affect safety related equipment.

2. Feedwater System

The main feedwater lines are routed through the same area as the main steam lines and therefore are not in proximity to safety-related equipment. Auxiliary feedwater lines are routed through a pipe gallery in the auxiliary building and are also not in proximity to safety-related equipment. Further, the floor drains in the pipe gallery and the adjacent sump preclude flooding in the event of rupture of a feedwater line.

Pipe rupture restraints are provided for the feedwater system and it has been determined that additional rupture restraints are not required. The analysis indicated the need for an additional jet impingement barrier to protect steam system transmitters; this system was installed. All other equipment was demonstrated to operate satisfactorily under the postulated accident conditions.

3. Steam Generator Blowdown System

Blowdown lines penetrate containment, run south, and enter the turbine building between the ground and mezzanine floors and are routed to the steam generator drain tank. Steam generator blowdown would be discharged to the pipe gallery as a result of the rupture of the two-inch blowdown line. The analysis indicated adequate protection presently exists for all required equipment for postulated pipe whip damage, jet impingement, and adverse enviromental conditions.

4. Chemical Volume and Control System (CVCS)

The regenerative heat exchanger, the letdown orifices, and the isolation valves for the CVCS are located inside containment. Temperature and pressure of the coolant flowing through the regenerative heat exchanger and letdown orifices, are reduced such that the CVCS, which is outside containment, contains low energy liquid. While the charging pumps are outside containment and their discharge lines are high energy lines, flow from ruptured discharge piping from the pump would be limited because the charging pumps are positive displacement (low flow) pumps; hence, the analysis indicates their failure has a relatively small impact. No additional restraints or impingement barriers were determined to be necessary.

5. Steam Supply to Auxiliary Feedwater Pump Turbine

The two inch steam supply lines to the auxiliary feedwater pump turbine originate from the steamline upstream of the main steam isolation valves. These lines run through the support tower to the turbine building and join at the auxiliary feedwater pump steam inlet. The analysis indicated no need for additional rupture restraints, impingement barriers, or additional protective measures from adverse environmental conditions.

Conclusions

Based upon our review of the information submitted to us and our discussions with the licensee, we find evidence of a thorough assessment of the matter of high-energy line failures outside containment. We concur with the licensee's evaluation that in plant areas where no modifications are proposed, the system is capable of safe cold shutdown conditions consistent with the requirements of Appendix A of 10 CFR Part 50. Moreover, we conclude that with the addition of a feedwater system jet impingement barrier, the licensee is in compliance with criterion number 4 of the Commission's General Design Criteria listed in Appendix a of 10 CFR Part 50. Aside from the FSAR amendment no further action need be taken by the licensee.

Dated:

Docket No. 50-261

Carolina Power & Light Company
ATTN: J. A. Jones, Senior Vice President
Bulk Power Supply Department
336 Fayetteville Street
Raleigh, North Carolina 27602

NOV 0 7 1975

Gentlemen:

Your letter of October 16, 1974 requested an amendment to the Technical Specification for the H. B. Robinson Unit 2 Plant relating to spent fuel handling. Specifically your request involved the allowance of spent fuel handling operation under certain conditions with the building open to the outside atmosphere. Your request also included the necessary supporting calculations to substantiate that the site boundary dose as the result of a postulated fuel assembly rupture would be acceptable under the guidelines of 10 CFR Part 100.

However, your request did not provide adequate bases upon which we could evaluate such an action from the "as low as practicable" criteria. It is our understanding, in view of discussions between our respective staffs, that you no longer plan to pursue this matter further. Therefore, no further action will be taken this request unless you advise us otherwise within 30 days.

Sincerely,

Robert W. Reid, Chief
Operating Reactors Branch 4
Division of Reactor Licensing

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

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Sincerely,

Robert W. Reid

Robert W. Reid, Chief
Operating Reactors Branch 4
Division of Reactor Licensing

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