Progress Energy

10 CFR 50.90

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United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

SUPPLEMENT TO AMENDMENT REQUEST REGARDING FULL IMPLEMENTATION OF THE ALTERNATIVE SOURCE TERM (TAC NO. MB5105);
RESULTS OF THE CONTROL ROOM ENVELOPE TRACER GAS INLEAKAGE TESTS

Ladies and Gentlemen:

By letter dated May 10, 2002, Carolina Power & Light (CP&L) Company, now doing business as Progress Energy Carolinas, Inc., submitted a request for Technical Specifications change regarding full implementation of the Alternative Source Term (AST) for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2. In that letter, CP&L committed to perform tracer gas inleakage tests of the control room envelope to support assumptions used in the AST radiological analyses. The purpose of this letter is to provide the results of these tracer gas inleakage tests.

By letter dated August 14, 2002, CP&L provided a response to a request for additional information on a Technical Specifications change regarding selective implementation of the AST related to the Fuel Handling Accident. In that letter, CP&L restated the May 10, 2002, commitment to perform tracer gas inleakage tests. In a letter dated October 4, 2002, the NRC issued the Technical Specifications change regarding selective implementation of the AST. In that letter, the NRC noted CP&L's commitment to perform a leak rate test of the control room envelope before the end of March 2003. The tracer gas test results, as submitted in this letter, complete these commitments.

Attachment I provides an Affirmation pursuant to 10 CFR 50.30(b).

Attachment II provides the results of the tracer gas inleakage tests, comparisons with analyses assumptions, and conclusions on the ability to maintain control room habitability.

In accordance with 10 CFR 50.91(b), Progress Energy Carolinas, Inc., is providing the State of South Carolina with a copy of this letter.

Progress Energy Carolinas, Inc.
3581 West Entrance Road
Hartsville, SC 29550

A001

If you have any questions concerning this matter, please contact Mr. C. T. Baucom.

Sincerely,

J. W. Moyer
Vice President, HBRSEP, Unit No. 2

Attachments:

I. Affirmation
II. Control Room Envelope Tracer Gas Inleakage Test Results

RAC/rac

c: Mr. T. P. O'Kelley, Director, Bureau of Radiological Health (SC)
Mr. H. J. Porter, Director, Division of Radioactive Waste Management (SC)
Mr. L. A. Reyes, NRC, Region II
Mr. C. P. Patel, NRC, NRR
NRC Resident Inspectors, HBRSEP
Attorney General (SC)

AFFIRMATION

The information contained in letter RNP-RA/03-0013 is true and correct to the best of my information, knowledge, and belief; and the sources of my information are officers, employees, contractors, and agents of Progress Energy Carolinas, Inc., also known as Carolina Power & Light Company. I declare under penalty of perjury that the foregoing is true and correct.

Executed On: 10 Apr. 2003

J. W. Moyer
Vice President, HBRSEP, Unit No. 2

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

CONTROL ROOM ENVELOPE TRACER GAS INLEAKAGE TEST RESULTS

Background

The current licensing basis for control room habitability for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, is based on radiological analyses that use the source term specified in Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors." The analyses are performed for the Loss of Coolant Accident (LOCA) as the bounding accident. These analyses are based on assumed inleakage rates of unfiltered air into the control room of 85 cfm during the first 60 minutes of the accident and 15 cfm from 60 minutes to 30 days. The higher inleakage rate for the first 60 minutes is based on an assumed conservative condition involving the failure of an exhaust fan with the corresponding supply fan remaining in service. This results in pressurization of an area adjacent to the control room (called the Hagan room) and an assumed additional 70 cfm of inleakage into the control room from this adjacent area. Plant procedures are in place to ensure that the supply fan is isolated within 60 minutes, thus resulting in the control room being at positive pressure relative to adjacent areas. Therefore, from 60 minutes until the end of the event (30 days), the lower inleakage value of 15 cfm is assumed in the analyses. These inleakage rates include an assumed 10 cfm of inleakage due to ingress and egress from the control room. Therefore, excluding the 10 cfm assumed for ingress and egress, the assumed unfiltered inleakage is 75 cfm during the first 60 minutes and 5 cfm thereafter.

The HBRSEP, Unit No. 2, Technical Specifications include a surveillance to demonstrate the ability of the Control Room Emergency Filtration System (CREFS) to maintain a positive pressure in the control room. The basis for this surveillance was the assumption that maintaining a positive pressure in the control room would prevent unfiltered inleakage, and hence validate the inleakage rate analysis assumptions.

Two significant changes have occurred within the industry in recent years in regard to control room habitability. First was the issuance of a new regulation, 10 CFR 50.67 (with corresponding changes to 10 CFR 50, Appendix A, GDC-19). This regulation allows the use of an Alternative Radiological Source Term (AST) for control room habitability analyses, and also provides revised acceptance criteria based on Total Effective Dose Equivalent (TEDE) limits. Second was the determination that the positive pressure surveillance, as discussed above, does not ensure that actual inleakage rates will be less than the inleakage rates assumed in the accident analyses.

HBRSEP, Unit No. 2, has requested Technical Specifications changes based on the application of 10 CFR 50.67, Accident Source Term. By letter dated March 13, 2002, as supplemented May 10, August 14, September 5, and October 4, 2002, HBRSEP, Unit No. 2,

requested a Technical Specifications change based on a selective implementation of the AST for the Fuel Handling Accident. This Technical Specifications change was issued by the NRC in a letter dated October 4, 2002. By letter dated May 10, 2002, HBRSEP, Unit No. 2, requested a Technical Specifications change based on a full implementation of the AST. This submittal is currently under review by the NRC.

These submittals presented the assumptions and results of the AST analyses for the applicable accidents. Increased inleakage rates were assumed, as compared to the assumptions in the current licensing basis. To provide technical justification of the assumed inleakage rates, and in recognition of the industry experience related to inleakage testing, HBRSEP, Unit No. 2, made the following commitment in the letter dated May 10, 2002 (this commitment was also repeated in the August 14, 2002 letter):

> "CP&L commits to perform a leak rate test on the HBRSEP, Unit No. 2, Control Room envelope prior to implementation of the changes requested in this submittal. Upon completion of this testing, CP&L will provide the results in a supplement to this submittal. In addition to the results of the testing, CP&L will also consider the following points in relation to this testing:
>
> - A single value for unfiltered Control Room air inleakage will be established with a basis (tracer gas testing)
> - In the event that the analyses contained in this submittal do not bound the new established value, the applicable analyses will be revised to bound the new established value
> - The testing and reanalysis, if required, is intended to demonstrate compliance with the Control Room dose acceptance criteria of 10 CFR 50, Appendix A, GDC-19. In the event compliance with the GDC-19 dose acceptance criteria can not be supported by the current licensing basis, a comprehensive corrective action plan to restore compliance with the GDC-19 dose acceptance criterion will be developed."

The control room envelope unfiltered inleakage rate assumptions in the AST analyses, provided in the May 10, 2002 letter, are as follows:

- LOCA (0 to 35 seconds): Ventilation in normal mode with an unfiltered makeup flow of 400 cfm and inleakage of 170 cfm for a total of 570 cfm.
- LOCA (35 seconds to 60 minutes): CREFS in the emergency pressurization mode and the adjacent Hagan room pressurized – 170 cfm.
- LOCA (60 minutes to 30 days): CREFS in the emergency pressurization mode and the adjacent Hagan room neutral compared to ambient – 100 cfm.
- Non-LOCA Accidents (Normal ventilation mode): A total of 700 cfm, which assumed 400 cfm normal unfiltered makeup via the ventilation system and 300 cfm inleakage from adjacent areas.

- Non-LOCA Accidents (End of normal mode to 60 minutes): CREFS in the emergency pressurization mode and the adjacent Hagan room pressurized – 300 cfm.
- Non-LOCA Accidents (60 minutes to 30 days): CREFS in the emergency pressurization mode and the adjacent Hagan room neutral compared to ambient – 230 cfm.

These values continue to include an assumed 10 cfm due to control room ingress and egress. Therefore, the assumed unfiltered inleakage is actually 10 cfm less than the values above.

Based on the above, the inleakage test acceptance criteria that would be within the assumptions and results of the AST analyses (LOCA being the limiting case) are:

- Mode 1 – Normal operating mode – less than 560 cfm total (400 cfm ventilation makeup flow and unfiltered inleakage less than 160 cfm).
- Mode 2 – CREFS in the emergency pressurization mode and the Hagan room pressurized – less than 160 cfm.
- Mode 3 – CREFS in the emergency pressurization mode and the Hagan room neutral compared to ambient – less than 90 cfm.

Tracer Gas Testing and Results

HBRSEP, Unit No. 2, with the support of NCS Corporation and Lagus Applied Technology, Inc. (LAT), performed control room envelope inleakage tests during the period January 21 through January 27, 2003. These tests were based on the methodology described in ASTM Standard E741-95, "Standard Test Method for Determining Air Change Rate in a Single Zone by Means of a Tracer Gas Dilution." A final report of the calculated inleakage rates was provided by NCS and LAT on April 7, 2003.

Concentration buildup/steady state tests were performed to determine inleakage rates into the control room envelope with the CREFS in the emergency pressurization mode. The test was performed with various fan configurations in order to determine the bounding case. The test was first performed in Mode 2, as noted above, with the Hagan room pressurized. This test was performed twice, once with the "A" train emergency filtration fan in service and once with the "B" train emergency filtration fan in service. Operation with the "A" train fan yielded the highest inleakage. Therefore, another concentration buildup/steady state test was performed with the Hagan room neutral to ambient (Mode 3) and the "A" train emergency filtration fan in service.

A concentration decay test was performed with the control room in the normal operating mode (Mode 1). This mode was expected to result in the highest measured inleakage of the tested modes, as it represents the mode with the largest portion of CREFS ductwork outside the control room envelope at negative pressure.

Finally, a concentration decay test was performed with the control room ventilation in the hazardous chemical recirculation mode.

The HBRSEP, Unit No. 2, hazardous chemical analyses, which were performed in response to NUREG-0737, assumed a very large total (makeup plus inleakage) intake flow of 1490 cfm for two minutes past human detection to demonstrate time for the operator to don self-contained breathing apparatus (SCBA) prior to reaching toxicity limits. The system was not assumed to be in recirculation at the time the SCBA is donned. Therefore, the hazardous chemical recirculation mode inleakage results are not applicable to current analyses. The results were obtained to support future analyses, if new hazardous chemical sources require control room ventilation isolation and recirculation.

The tracer gas inleakage measurements based on the January 2003 tests were:

Mode 1: 141 ± 5 cfm
Mode 2: 64 ± 15 cfm
Mode 3: 30 ± 14 cfm
Hazardous Chemical Recirculation Mode: 93 ± 3 cfm

Analysis

Mode 1 is not applicable to the current licensing basis LOCA dose analysis because the CREFS emergency pressurization mode initiates on Safety Injection signal, and hence is assumed to be operating at time zero of the analysis. For the AST LOCA analysis, the assumed 160 cfm for the initial 35 seconds bounds the measured inleakage of 141 cfm. For all other accidents, the measured 141 cfm inleakage is well within the inleakage of 290 cfm assumed in the AST analyses.

The measured Mode 2 inleakage of 64 cfm is within the current licensing basis of 75 cfm, and well within the AST assumed inleakage of 160 cfm.

The measured Mode 3 inleakage of 30 cfm exceeds the current licensing basis assumption of 5 cfm, but is well within the AST assumed inleakage of 90 cfm.

As noted above, the hazardous chemical recirculation mode results are not applicable to the current design or licensing bases.

As noted above, only the Mode 3 inleakage of 30 cfm exceeded the assumed value of 5 cfm in the current licensing basis analyses. Therefore, an operability determination was prepared in accordance with NRC Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability." This operability determination used the AST analyses, which were performed in accordance with the NRC-approved methodology of Regulatory Guide 1.183, as justification for system operability. The

AST analyses demonstrate that even with inleakage results in this mode as high as 90 cfm, the resulting dose to the operators for the bounding design basis LOCA event is acceptable. Therefore, the CREFS system (which includes the envelope integrity) remains capable of performing the required safety function of maintaining the control room habitable. No additional short term compensatory actions are required. The long term resolution is revision of the current licensing basis by NRC approval of the submitted license amendment request for full implementation of the AST.

Conclusion

The commitment to perform leak rate tests of the control room envelope has been completed. The results, which are included with this letter, provide justification for the AST analysis assumptions for the associated license amendment requests.

The commitment to consider a single value for unfiltered control room air inleakage based on the leak rate test results has been completed. HBRSEP, Unit No. 2, has decided not to establish a single licensing basis value for control room inleakage. The limiting values for inleakage are based on the LOCA dose analysis and were chosen such that the LOCA dose is close to the 5 REM Total Effective Dose Equivalent (TEDE) acceptance criterion. Therefore, increasing the assumed inleakage for the LOCA would yield unacceptable results. It is not desirable to lower the assumed value in the other accident analyses to match the LOCA, in case future testing identifies increased inleakage values. If that were the case, and the inleakage test results were still within the assumptions of the non-LOCA analyses, only the LOCA dose analysis would require modification.

The commitment to revise the AST analyses in the event that these analyses do not bound the inleakage rates determined by testing is not applicable, since the AST analyses bound the test results.

The commitment to develop a comprehensive corrective action plan to restore compliance with the GDC-19 dose acceptance criterion is not applicable, since the AST analyses have been demonstrated to be bounding and the control room dose results meet the dose acceptance criteria of GDC-19 for AST applications.

The CREFS has been determined to be operable based on the measured leak rate results and completed AST analyses. An operability determination will remain in effect until NRC approval of the AST license amendment request.