July 12, 2001

Mr. J. W. Moyer, Vice President
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT UNIT 2 - TECHNICAL EVALUATION OF A LARGE BREAK LOSS-OF-COOLANT ACCIDENT TRANSFER FROM INJECTION TO RECIRCULATION COOLING FOR H. B. ROBINSON (TAC NO. M98953)

Dear Mr. Moyer:

The NRC staff has evaluated the analysis of the transfer from injection cooling to recirculation cooling following a large break loss-of-coolant accident (LBLOCA) for H. B. Robinson, Unit 2, submitted by Carolina Power & Light Company in a letter dated April 23, 2001.

Based on the results of the review of the submittal, the staff concluded that the aspects of the transfer from injection cooling to recirculation cooling following an LBLOCA were adequately addressed. The staff found the analysis to be acceptable and also that H. B. Robinson met the requirement of 10 CFR 50.46 for long-term cooling to maintain the core at an acceptably low temperature. The review findings are summarize in the enclosure. Therefore, we consider TAC No. M98953 closed for your facility.

If you have any questions regarding this request, please do not hesitate to contact me at (301) 415-1478.

Sincerely,

/RA/
Ram Subbaratnam, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure:
Technical Evaluation Report

cc w/encl: See next page

July 12, 2001

Mr. J. W. Moyer, Vice President
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT UNIT 2 - TECHNICAL EVALUATION OF A LARGE BREAK LOSS-OF-COOLANT ACCIDENT TRANSFER FROM INJECTION TO RECIRCULATION COOLING FOR H. B. ROBINSON (TAC NO. M98953)

Dear Mr. Moyer:

The NRC staff has evaluated the analysis of the transfer from injection cooling to recirculation cooling following a large break loss-of-coolant accident (LBLOCA) for H. B. Robinson, Unit 2, submitted by Carolina Power & Light Company in a letter dated April 23, 2001.

Based on the results of the review of the submittal, the staff concluded that the aspects of the transfer from injection cooling to recirculation cooling following an LBLOCA were adequately addressed. The staff found the analysis to be acceptable and also that H. B. Robinson met the requirement of 10 CFR 50.46 for long-term cooling to maintain the core at an acceptably low temperature. The review findings are summarized in the enclosure. Therefore, we consider TAC No. M98953 closed for your facility.

If you have any questions regarding this request, please do not hesitate to contact me at (301) 415-1478.

Sincerely,
/RA/
Ram Subbaratnam, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure:
Technical Evaluation Report

cc w/encl: See next page

<u>DISTRIBUTION</u>:

PUBLIC	OGC
PDII Rdg.	ACRS
M. Akstulewicz, NRR	OPA
J. Staudenmeier, NRR	OC/LFDCB
P. Madden	B. Bonser, RII
R. Subbaratnam	
E. Dunnington	

Accession No. ML011930002
FILENAME - C:\Program Files\Adobe\Acrobat 4.0\PDF Output\M98953.clo.wpd

PM:PDII-S2	LA:PDII-S2	SC:PD II-S2
RSubbaratnam	EDunnington	R. Hernan for P. Madden
7/10/01	7/10/01	7/11/01
Yes/No	Yes/No	Yes/No

STAFF TECHNICAL EVALUATION REPORT

OF

LBLOCA SWITCHOVER ANALYSIS

ON

H B ROBINSON NUCLEAR PLANT 2

Enclosure

Technical Evaluation Report of the H. B. Robinson LBLOCA Switchover Analysis

Carolina Power & Light Company (CP&L) submitted a revised analysis of the transfer from injection mode to sump recirculation after a large-break loss-of-coolant accident (LBLOCA) in a letter dated April 23, 2001. The original analysis was submitted in a letter dated October 14, 1997, and showed a fuel uncovery and heatup to a peak cladding temperature of 2102°F during the transfer process. The total safety injection flow is reduced to the output from one high head safety injection pump for a period of time during the transfer operation. The start time of the transfer operation is determined by the amount of time it takes to reach the minimum allowed level in the reactor water storage tank and can start as early as 21 minutes after the initiation of the LBLOCA. The key assumption that caused the high temperature observed in the calculations during the transfer operation was that the operators needed 30.5 minutes during the reduced flow phase to complete the manual transfer process. In fact, the 30.5-minute transfer time was based on back calculating the maximum amount of time available for the transfer operation before the peak clad temperature exceeded 2200°F. The licensee position was that the 2200°F peak cladding temperature limit from the emergency core cooling system (ECCS) rule (10 CFR 50.46) applied to the time period of the transfer operation. The NRC staff took the regulatory position that since the fuel had already been recovered from an initial successful operation of the ECCS, the transfer phase was governed by the requirements for long-term cooling. The staff position on the original analysis was that allowing the core to heat back up to 2102°F did not meet the requirement to maintain the core at an acceptably low temperature.

A detailed report describing the analysis of the transfer process was attached to the April 23, 2001, letter from CP&L. The analysis was performed by Siemens Power Corporation and is documented in report EMF-2286(P) entitled "H. B. Robinson Unit 2 Extended Transfer to Cold Leg Recirculation Following a LBLOCA." The analysis was performed using the S-RELAP5. The containment conditions were predicted using the ICECON model, which has been integrated into the S-RELAP5 code. The analysis uses the 10 CFR 50.46 decay heat model based on an initial power level of 1.02 times the thermal power and adds additional conservative assumptions for the time to reach the refueling water storage tank low level setpoint, the 20-minute realignment time, the 6-minute no flow period used in the analysis, and the sump temperature. The revised analysis assumes that the time to accomplish the manual transfer to sump recirculation reduces the flow for 20 minutes based on time limitations reflected in the emergency operating procedures. The peak temperature from the revised transfer analysis is approximately 260°F, resulting from a double-ended hot leg guillotine break. Decreasing the time period of reduced flow during the transfer operation prevents the core uncovery and heatup that occurred in the previous analysis.

Although the S-RELAP5 code does not have generic approval for this specific type of analysis, the code contains appropriate models to analyze the conditions following an LBLOCA and is adequate to perform the analysis. The S-RELAP5 code was developed to analyze LBLOCA's and therefore has models that are appropriate and have been assessed for the low-pressure conditions encountered during the switchover analysis. The code conservatively predicts the entrainment of liquid from the core to the upper plenum. The code never predicts a core heatup during the switchover using the conservative analysis assumptions listed in the previous paragraph. The conservatism of the decay heat model alone provides at least a 13 percent margin to the time it would take to begin a core heatup. We do not grant the S-RELAP5 code a generic approval to perform transfer analyses following an LBLOCA, but we have determined that it is adequate for the H. B. Robinson submittal in the April 23, 2001, letter in light of the conservative assumptions used in the analysis.

The NRC staff finds the revised analysis of the transfer operation to be acceptable and finds that H. B. Robinson meets the 10 CFR 50.46 requirement of maintaining the core at an acceptably low temperature during long-term cooling after an initial successful operation of the ECCS.

Principal Contributor: J. Staudenmeier, NRR
Date: July 12, 2001

cc:

Mr. William D. Johnson
Vice President and Corporate Secretary
Carolina Power & Light Company
Post Office Box 1551
Raleigh, North Carolina 27602

Ms. Karen E. Long
Assistant Attorney General
State of North Carolina
Post Office Box 629
Raleigh, North Carolina 27602

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
H. B. Robinson Steam Electric Plant
2112 Old Camden Road
Hartsville, South Carolina 29550

Mr. T. P. Cleary
Plant General Manager
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant, Unit No. 2
3581 West Entrance Road
Hartsville, SC 29550

Mr. T. D. Walt
Director of Site Operations
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant, Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550

Public Service Commission
State of South Carolina
Post Office Drawer 11649
Columbia, South Carolina 29211

Mr. H. K. Chernoff
Supervisor, Licensing/Regulatory Programs
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550

Mr. Mel Fry, Director
N.C. Department of Environment
and Natural Resources
Division of Radiation Protection
3825 Barrett Dr.
Raleigh, North Carolina 27609-7721

Mr. Robert P. Gruber
Executive Director
Public Staff - NCUC
Post Office Box 29520
Raleigh, North Carolina 27626-0520

Mr. Virgil R. Autry, Director
South Carolina Department of Health
Bureau of Land & Waste Management
Division of Radioactive Waste Management
2600 Bull Street
Columbia, South Carolina 29201

Mr. Terry C. Morton
Manager
Performance Evaluation and
Regulatory Affairs CPB 7
Carolina Power & Light Company
Post Office Box 1551
Raleigh, North Carolina 27602-1551

Mr. John H. O'Neill, Jr.
Shaw, Pittman, Potts & Trowbridge
2300 N Street, NW.
Washington, DC 20037-1128

Mr. B. L. Fletcher III
Manager - Regulatory Affairs
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550-0790