CP&L

Carolina Power & Light Company
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William R. Campbell
Vice President
Brunswick Nuclear Plant

October 29, 1996

SERIAL: BSEP 96-0412
10 CFR 50.90
TSC 94TSB16

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR LICENSE AMENDMENTS — POWER UPRATE
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
(NRC TAC NOS. M90644/M90645)

Gentlemen:

By letter dated April 2, 1996 (Serial: BSEP 96-0123), Carolina Power & Light Company (CP&L) submitted a request for license amendments to revise the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, to allow uprate of the units to 105 percent of rated thermal power. Additional information regarding the power uprate license amendment application was submitted by CP&L's letters dated July 1, 1996 (Serial: BSEP 96-0242); July 30, 1996 (Serial: BSEP 96-0287); August 7, 1996 (Serial: BSEP 96-0300); September 13, 1996 (Serial: BSEP 96-0340); September 20, 1996 (Serial: BSEP 96-0348); October 1, 1996 (Serial: BSEP 96-0362), October 22, 1996 (Serial: BSEP 96-03[illegible]), and October 22, 1996 (Serial: BSEP 96-0403).

During telephone conversations on October 25 and October 28, 1996, the NRC staff requested additional information regarding (1) the applicability under power uprate of the existing Technical Specification pressure-temperature limit curves and the schedule shown in the Technical Specifications for removal of reactor material surveillance capsules, (2) the impact of power uprate on flow-accelerated corrosion (FAC) monitoring program, and (3) the motor-operated valve capability under accident conditions based on higher differential pressures resulting from power uprate. Carolina Power & Light Company is providing the information in Enclosure 1 in response to the Staff inquiries.

Carolina Power & Light Company is providing, in accordance with 10 CFR 50.91(b), Mr. Dayne H. Brown of the State of North Carolina with a copy of this submittal.

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Please refer any questions regarding this submittal to Mr. Mark A. Turkal at (910) 457-3066.

Sincerely,

William R Campbell

William R. Campbell

WRM/wrm

Enclosure:
1. Response To Request For Additional Information
2. List of New Regulatory Commitments

William R. Campbell, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, and agents of Carolina Power & Light Company.

Gwendolyn R. Milyth
Notary (Seal)

My commission expires: August 13, 2001

pc: U. S. Nuclear Regulatory Commission
ATTN.: Mr. Stewart D. Ebneter, Regional Administrator
101 Marietta Street, N.W., Suite 2900
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Mr. C. A. Patterson
NRC Senior Resident Inspector - Brunswick Units 1 and 2:

U.S. Nuclear Regulatory Commission
ATTN.: Mr. David C. Trimble, Jr. (Mail Stop OWFN 14H22)
11555 Rockville Pike
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The Honorable H. Wells
Chairman - North Carolina Utilities Commission
P.O. Box 29510
Raleigh, NC 27626-0510

Mr. Dayne H. Brown
Director - Division of Radiation Protection
North Carolina Department of Environment, Health, and Natural Resources
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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
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INTRODUCTION

During telephone conversations on October 25, 1996, the NRC staff requested additional information regarding (1) the applicability under power uprate of the existing Technical Specification pressure-temperature limit curves and the schedule shown in the Technical Specifications for removal of reactor material surveillance capsules, (2) the impact of power uprate on flow-accelerated corrosion (FAC), and (3) the capability of motor-operated valves to close under acccident conditions based on higher differential pressures resulting from power uprate. Carolina Power & Light Company is providing the information below in response to these Staff inquiries.

REACTOR PRESSURE VESSEL INTEGRITY

The NRC has asked that CP&L clarify (1) the potential impact of power uprate on ther reactor material surveillance schedule, (2) whether power uprate impacts the existing pressure-temperature limit curves found in the Technical Specifications, and (3) the potential impact of power uprate on compliance with 10 CFR 50, Appendices G and H with respect to upper shelf energy (USE).

Reactor Material Surveillance Schedule

10 CFR 50, Appendix H requires a material surveillance program to monitor changes in the fracture toughness of reactor pressure vessel ferritic materials. Reactor licensees are required to meet 10 CFR 50, Appendix H unless otherwise approved by the NRC staff. 10 CFR 50, Appendix H requires that reactor beltline materials surveillance programs must comply with ASTM E185-73, -79, or -82, as modified by Appendix H.

By letter dated July 6, 1992 (Serial: NLS-92-180), CP&L responded to NRC Generic Letter 92-01, Revision 1, "Reactor Vessel Structural Integrity." In response to an NRC question on actions being taken to comply with Appendix H of 10 CFR 50, CP&L stated that the ASTM E185-66 edition applied to the Brunswick Plant surveillance program conducted prior to removal of the first surveillance capsule. The CP&L response noted that a Technical Specification license amendment had been approved by the NRC staff to provide more useful neutron fluence data from the first surveillance capsule (Amendments 140 and 172 for Unit 1 and Unit 2, respectively), and that the removal schedule for the second and third surveillance capsules would be determined after removing the first capsules. In this respect, CP&L indicated that the revised schedule in the Technical Specifications met the intent of ASTM E185-82.

In a subsequent response dated November 16, 1995 (Serial: BSEP 95-0572) to NRC Generic Letter 92-01, Revision 1, Supplement 1, CP&L provided initial and adjusted RT_{NDT} information based on NRC-approved methodology (which was approved by the NRC on December 16, 1994). Enclosure 3 to CP&L's November 16, 1995 letter also provided end-of-life (EOL) effective full power year (EFPY) values for both Brunswick Unit 1 and Unit 2 that were best estimates based on 24 month operating cycles, power uprate, and a thermal load factor of 97 percent. The estimated Unit 1 EOL EFPY was 30.5; the estimated Unit 2 EFPY was 29.3. As indicated in the Power Uprate Safety Analysis Report, these values are bounded by the Updated FSAR analysis basis of 32 EFPY.

The Brunswick Plant has existing reactor vessel material surveillance processes that ensure the pressure-temperature limit curves in the Technical Specifications remain valid regardless of whether power uprate is or is not implemented. Brunswick Plant Technical Specification 3/4.4.6.1 provides the requirements for reactor coolant system pressure-temperature (P-T) limits as well as the surveillance schedule for reactor material irradiation specimens.

Brunswick Technical Specification 4.4.6.1.3 requires that the cumulative EFPY be determined at least once every 18 months. Brunswick Plant Technical Specification 4.4.6.1.3 also requires that reactor material irradiation specimens be removed and examined in accordance with the schedule specified in Table 4.4.6.1.3-1. To date, one Unit 1 specimen has been removed, examined, and the results documented in a report submitted to the NRC by letter dated August 17, 1994 (Serial: BSEP 94-0316). In addition, one Unit 2 specimen has been removed (during the February 1996 refueling outage) and evaluation is in progress.

The Unit 1 surveillance report describes the "remaining surveillance program" by stating that Unit 1 has two capsules remaining, that removal dates for the two remaining capsules have not yet been selected because of the desire to establish an integrated surveillance program for both Unit 1 and Unit 2, and that it is desirable to remove and examine the first Unit 2 surveillance specimen prior to proposing an integrated surveillance program. Technical Specification Table 4.4.6.1.3-1, note (b) also indicates that the withdrawal schedules for the second and third specimens will be established following examination of the first specimen. 10 CFR 50, Appendix H, Section IV (Report of Test Results) specifies that the results of surveillance capsule tests must be submitted to the NRC within one year of capsule withdrawal and that a schedule must be provided for the submittal of changes to the Technical Specification P-T curves, if required. Thus, based on this requirement, CP&L plans to submit the Unit 2 surveillance capsule test results within the required time frame along with a schedule for the submittal of any change(s) that may be needed to the Technical Specification P-T curves.

Pressure-Temperature Limit Curves

The existing Unit 1 and Unit 2 P-T curves for normal operations (shown in Figures 3.4.6.1-2 and 3.4.6.1-1) are based on Unit 2 reactor cavity neutron fluence dosimetry obtained prior to removal of the first reactor material specimen. For Unit 1, the fluence from the reactor cavity dosimetry has been shown to be approximately 34 percent higher than the fluence data obtained from the reactor material specimen. For Unit 2, preliminary data shows that the fluence from the reactor cavity dosimetry is approximately 24 percent higher than the fluence data obtained from the reactor material specimen. Therefore, even accounting for the slightly higher neutron fluence that may result from power uprate, the existing P-T curves are expected to remain conservative and valid through 16 EFPY and are applicable to operation both at the currently licensed power level and at the proposed power uprate level. As of September 1996, Unit 1 had accumulated approximately 10.95 EFPY, and Unit 2 had accumulated approximately 11.40 EFPY. Performance of the 18-month periodic review to determine the cumulative EFPY ensures that CP&L is aware of the current status of reactor vessel exposure relative to the 16 EFPY limit specified on the operating P-T curves in the Technical Specifications.

Upper Shelf Energy

10 CFR 50, Appendix G, Section IV, Item A.1.a states that reactor beltline materials must have Charpy upper-shelf energy (USE) in the transverse direction for the base material and along the weld for weld material of no less than 75 ft-lb initially and must maintain Charpy USE throughout the life of the vessel of no less than 50 ft-lb. This section also states that lower values of Charpy USE are acceptable if demonstrated to provide margins of safety against fracture equivalent to those required by the ASME Code, Appendix G.

The BWR Owners' Group has previously submitted and obtained NRC approval of a topical report entitled "10 CFR 50 Appendix G Equivalent Margin Analysis for Low Upper Shelf Energy In BWR/2 Through BWR/6 Vessels." This program is applicable to plate and weld material. By letter dated May 13, 1994 (Serial: BSEP 94-0179), CP&L documented the applicability of this methodology to the Brunswick reactor vessels. In applying the BWROG methodology, CP&L used estimated EOL fluence values that were based on preliminary Unit 1 surveillance specimen data. These fluence values bound the most recent EOL fluence projections provided in CP&L's letter responding to NRC Generic Letter 92-01, Revision 1, Supplement 1 dated November 16, 1995 (Serial: BSEP 95-0572), which include consideration of both power uprate and 24-month fuel cycles.

In the November 16, 1995 letter, CP&L indicated that the N16 nozzles were not expected to drop below 50 ft-lb due to the low expected EOL fluence. As discussed in CP&L's November 16, 1995 letter, a plant-specific USE equivalent margins analysis for these nozzles is being completed which will include estimated projections of EOL USE. The fluence projections considered in this analysis bound EOL, including 24-month fuel cycles and power uprate. Preliminary data from this analysis confirms that EOL USE on these nozzles will exceed the 50 ft-lb. minimum criteria specified in 10 CFR 50, Appendix G, Section IV. Additionally, the preliminary analysis results also indicate that equivalent margins of safety can be demonstrated for these nozzles with USE values as low as 30 ft-lb.

To summarize, the existing operating P-T curves are conservative and valid for Brunswick Plant power uprate implementation. In addition, the BWR Owners' Group and the ongoing plant-specific equivalent margins analyses bound the effects of power uprate and thereby demonstrate compliance with 10 CFR 50, Appendix G, Paragraph IV.A.1.

FLOW-ACCELERATED CORROSION

With respect to the Flow Accelerated Corrosion (FAC) monitoring program and the sensitivity of the EPRI CHECMATE FAC Model, the NRC staff has asked that CP&L address whether the Brunswick Plant will experience a higher steam moisture content as a result of power uprate and whether the higher flow (and, if applicable, higher moisture content) change our monitoring points or affect the sensitivity of the model.

The expected increase in steam moisture content as a result of power uprate is considered insignificant (i.e., $\leq$ 0.03 percent), with the overall steam quality from the reactor pressure vessel decreasing from 99.59 percent to 99.56 percent.

Industry experience, plant experience, and the EPRI analytical model (CHECMATE) provide the primary basis for the Brunswick Plant FAC program. CP&L used the EPRI analytical model (CHECMATE) to rank systems and components with respect to FAC susceptiblity. CP&L does not expect power uprate to have an impact on the Brunswick Plant FAC program.

A 0.03 percent increase in steam moisture content would have less than a 0.5 percent change in the wear-rate calculations. This small change would not result in a change to the monitoring points or affect the FAC model. The approximately 6 percent increase in steam line flow resulting from power uprate will not have a significant effect on FAC. The expected flow increase will have a negligible effect on wear rates (i.e., 1 to 2 percent).

Based on the above, the relatively small increase in flow and moisture that is expected from power uprate would not affect this analytical model for ranking of components or lines for susceptibility to FAC. Therefore, no changes to monitoring points will be required as a result of power uprate.

MOTOR-OPERATED VALVE CAPABILITY

The NRC staff has asked that CP&L confirm that motor-operated valves (MOVs) will be capable of performing their intended function(s) following power uprate. CP&L has reviewed MOVs within the Generic Letter 89-10 program which are potentially impacted by power uprate. CP&L has concluded that the increased thrust required to operate the safety-related MOVs due to increased line and valve differential pressures expected as a result of power uprate is within the capabilities of the existing actuators..

ENCLOSURE 2

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LIST OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by Carolina Power & Light Company in this document. Any other actions discussed in the submittal represent intended or planned actions by Carolina Power & Light Company. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Manager-Regulatory Affairs at the Brunswick Nuclear Plant of any questions regarding this document or any associated regulatory commitments.

Commitment	Committed date or outage
1. None	N/A