CP&L
A Progress Energy Company

John S. Keenan
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DEC 0 4 2001

SERIAL: BSEP 01-0149
TSC-2001-09

U. S. Nuclear Regulatory Commission
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BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING
REQUEST FOR LICENSE AMENDMENTS - EXTENDED POWER UPRATE
(NRC TAC NOS. MB2700 AND MB2701)

Ladies and Gentlemen:

On August 9, 2001 (Serial: BSEP 01-0086), Carolina Power & Light (CP&L) Company requested a revision to the Operating Licenses (OLs) and the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2. The proposed license amendments increase the maximum power level authorized by Section 2.C.(1) of OLs DPR-71 and DPR-62 from 2558 megawatts thermal (MWt) to 2923 MWt. Subsequently, on November 14, 2001, the NRC provided an electronic version of a Request For Additional Information (RAI) concerning the impact of the BSEP extended power uprate on stress corrosion cracking of reactor internals and flow-accelerated corrosion of plant components. The response to this RAI is enclosed.

Please refer any questions regarding this submittal to Mr. David C. DiCello, Manager - Regulatory Affairs, at (910) 457-2235.

Sincerely,

John S. Keenan

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Enclosure:
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John S. Keenan, 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.

Dean S. Mash
Notary (Seal)

My commission expires: August 29, 2004

cc:

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ENCLOSURE

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Response to Request For Additional Information (RAI) 8

Background

On August 9, 2001 (Serial: BSEP 01-0086), Carolina Power & Light (CP&L) Company requested a revision to the Operating Licenses (OLs) and the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2. The proposed license amendments increase the maximum power level authorized by Section 2.C.(1) of OLs DPR-71 and DPR-62 from 2558 megawatts thermal (MWt) to 2923 MWt. Subsequently, on November 14, 2001, the NRC provided an electronic version of an RAI concerning the impact of the BSEP extended power uprate (EPU) on stress corrosion cracking of reactor internals and flow-accelerated corrosion (FAC) of plant components. The responses to this RAI follow.

NRC Question 8-1

Operating experience has identified stress corrosion cracking as a mechanism active in both domestic and foreign BWR plants. As a result, the BWR Owners Group established the BWR Vessel and Internals Project (BWRVIP), which developed an augmented inspection program. The BWRVIP program has been reviewed and approved by the staff as being adequate to control and manage degradation of BWR safety-related reactor internals. Compliance with the provisions included in the staff approved BWRVIP inspection program should ensure that degradation of reactor internals is promptly identified and corrected so that the safety-related reactor internals will continue to perform in service as designed. With respect to the BWRVIP please advise whether this program has been implemented at the Brunswick facility.

Response to Question 8-1

BSEP was the first domestic boiling water reactor (BWR) to identify Intergranular Stress Corrosion Cracking (IGSCC) in the core shroud in the 1993 - 1994 time frame. Since that time, CP&L has supported the development of the BWRVIP and has maintained an active presence on BWRVIP committees. The BWRVIP Inspection and Evaluation (I&E) guidelines were effectively implemented at BSEP in 1996. BSEP continues to implement inspections in accordance with the BWRVIP requirements.

NRC Question 8-2

The GE Licensing Topical Report included in the application addresses generically the issue of component degradation by flow-accelerated corrosion (FAC) and concludes that the existing plant program is adequate for managing any potential changes in the effects of FAC caused by the constant pressure power uprate (CPPU). Since the effects of FAC on degradation of carbon steel components are plant specific, the applicant needs to provide a predictive analysis methodology which must include the values of the parameters affecting FAC, such as velocity, and temperature before and after CPPU and the corresponding changes in components wear rates due to FAC.

(1) It is stated in the submittal that the evaluation of and inspection for flow accelerated corrosion (FAC) after the extended power uprate (EPU) is in compliance with NRC Generic Letter 89-08, "Erosion/Corrosion in Piping." This letter requires that an effective program is implemented to maintain structural integrity of high-energy carbon steel systems. Describe how was this program modified to account for EPU. If the computer code used in predicting wall thinning by FAC in this program is a generic code, specify it. However, if the code is plant specific provide its description.

(2) Specify by how much the material wear rates due to FAC in the feedwater pipeline will change after the EPU.

(3) It is stated in the submittal that for the components in the BOP, the EPU has no significant effect on FAC. What is the value of the change in FAC wear rates to be considered insignificant?

(4) Describe the results of review of the Reactor Water Cleanup system (RWCU) functional capability which led you to conclude that the system can perform adequately after the EPU with the original RWCU system flow.

Response to Question 8-2 (1)

BSEP has implemented and maintains a FAC program in accordance with NRC Generic Letter 89-08 and NSAC/202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program." The BSEP FAC program is an inspection based program which relies on input from the Electric Power Research Institute's (EPRI's) CHECKWORKS computer code, operating experience (e.g., CHECKWORKS Users' Group feedback), and engineering judgment to determine inspection scope. Typically, 75 to 125 components are inspected each refueling outage to confirm corrosion rates and component/system acceptability. As stated in CP&L's license submittal (i.e., Serial: BSEP 01-0086), EPU is not expected to have a significant impact on the FAC program. This is largely based on a generic assessment of the impact of increased EPU flowrates (e.g., Feedwater flow) on corrosion rates, inspection data obtained since the previous 5% power uprate, current corrosion rates, and previous plant modifications which installed FAC resistant materials in areas (e.g., extraction steam lines) where significant FAC was previously observed. The BSEP CHECKWORKS model is

currently being updated to reflect the expected plant conditions under EPU. While EPU is expected to have minimal impact on the BSEP FAC program, the inspection scope will be appropriately modified, as required by program commitments, to incorporate EPU changes in the predicted corrosion rates from the CHECKWORKS computer code.

Response to Question 8-2 (2)

The update of the BSEP CHECKWORKS model to incorporate specific EPU system conditions (i.e., flows, temperatures, and pressures) is currently in progress. Therefore, the computer predicted changes in material wear rates for the feedwater piping have not yet been determined. However, based on previous analyses and inspections, this impact is expected to be minimal. BSEP implemented a 5% power uprate approximatly five years ago. No detectable increase in the material wear rates for the feedwater piping has been observed since this 5% increase in feedwater flow was implemented. Based on current inspection data for the feedwater piping, there is no detectable wear occurring in the monitored feedwater piping. FAC inspections (i.e., ultrasonic tests) of feedwater piping are currently performed every refuel outage. Any predicted changes in feedwater piping wear rates for the CHECKWORKS model update will be factored into the FAC inspection scope as appropriate.

Response to Question 8-2 (3)

EPU is expected to have no significant impact on the FAC program. Plant specific wear rates under EPU are currently being determined as part of the BSEP CHECKWORKS model update. However, based on the previous wear rate determinations for the previous 5% power uprate and actual BSEP piping inspection data, the change in wear rates is expected to be minimal. Changes in FAC wear rates would be considered insignificant if they did not result in accelerated piping replacements or expanded inspections to systems/components.

Response to Question 8-2 (4)

The RWCU System mass flow rate of 107,400 lb_m/hr does not change for the EPU condition. This is approximately 0.84% of the EPU feedwater mass flow rate. Reducing the fraction of feedwater flow rate that is processed by RWCU results in a slight increase in reactor water conductivity (K) from 0.092 to 0.098 S/cm. The conductivity value at EPU conditions is well below the water quality limit and the EPRI Reactor Water Chemistry Guideline Action Level 1.

Reactor water concentration of insoluble iron flow is directly proportional to the increase in feedwater flow for the EPU conditions, resulting in an increase from 0.0042 to 0.0049 lb_m/hr. The increased contaminant removal rate that is required to maintain water chemistry quality in the reactor will result in a higher depletion rate of resins. This depletion rate is inversely proportional to the increased vessel flow rate, with the same contaminant concentrations (e.g., a four-week run under current operating conditions may be reduced under EPU conditions). The increased contaminants, due to the higher feedwater flow, will be removed by more frequent backwashes of the RWCU filter demineralizers.