CP&L
A Progress Energy Company

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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 December 4, 2001, the NRC provided an electronic version of a Request For Additional Information (RAI) requesting information concerning (1) the proposed modifications associated with electrical grid stability and (2) the impact of extended power uprate on environmental qualification at BSEP. 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

MAT/mat

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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. Mason
Notary (Seal)

My commission expires: 8-29-04

cc:

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ENCLOSURE

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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 December 4, 2001, the NRC provided an electronic version of a Request For Additional Information (RAI) requesting information concerning (1) proposed modifications associated with electrical grid stability and (2) the impact of extended power uprate on environmental qualification at BSEP. The responses to this RAI follow.

NRC Question 10-1

Section 6.1.2, "On-Site Power," of the PUSAR, included in CP&L's August 9, 2001, (BSEP 01-0086) submittal regarding extended power uprate (EPU) states:

> Revised electrical system calculations were required to address the load increases. Based on these revised calculations, the existing load shedding scheme [actuated upon a Loss-of-Coolant Accident (LOCA) event] is expanded to also actuate during generator trip events (non-LOCA). This provides additional protection against inadequate voltages on the emergency buses during potential degraded grid events. Administrative load management in conjunction with the additional load shedding results in increased voltage levels for design basis events.

Provide a summary of the planned Main Generator Lockout Load Shed Modification. This summary should describe how the modification will work and include the loads which will be shed upon a generator lockout.

Response to Question 10-1

Projected future load growth on the grid in the BSEP area will make it more difficult for the grid to maintain the minimum required switchyard voltage during a loss-of-coolant-accident (LOCA)

and/or unit trip. This minimum required voltage is based on the minimum emergency bus recovery voltage required to reset the Degraded Grid Voltage Relays (DGVR) following motor starts. To ensure that the DGVRs have adequate reset voltage, both Unit 1 and Unit 2 are currently equipped with selective load shedding which occurs on receipt of a LOCA signal for the associated unit. This load shed scheme is progressive in nature in that, initially, only a few large 4 kV balance-of-plant (BOP) motors are shed. Additional loads may be selected for shedding as future grid load increases. EPU compounds this issue by adding considerable load to each unit's AC Electrical Distribution System.

The objective of the Main Generator Lockout Load Shed Modification is two-fold: (1) to ensure that adequate capacity, voltage, and short circuit margins are maintained for the AC Electrical Distribution System post-EPU, and (2) to ensure adequate long-term 230 kV switchyard LOCA voltage support. To accomplish these objectives, the following changes will be implemented by this modification for each unit:

- The existing administrative load management limit of 3315 amps (i.e., pre-LOCA) will be increased to 3550 amps.
- The setpoints of the overcurrent relays associated with the BOP bus 1C(2C) and BOP bus 1D(2D) incoming line breakers will be increased.
- The breaker control circuits for the majority of nonsafety-related 4 kV motors will be modified to provide the capability to selectively trip the load breaker on a generator lockout signal. Selection of loads for tripping will be procedurally controlled.
- Procedure changes will be implemented to provide tripping of two running Heater Drain Pump motors upon a generator lockout signal.
- Procedure changes will be implemented to block automatic starting of the standby Condensate Pump (CP) and standby Condensate Booster Pump (CBP) motors upon a generator lockout signal.
- Procedure changes will be implemented to block automatic starting of the standby CP and standby CBP motors upon a LOCA signal.
- Procedure changes will be implemented to provide tripping of one running Circulating Water Intake Pump (CWIP) motor upon a LOCA signal.
- Procedure changes will be implemented to provide "part-time" tripping of one running CWIP motor on a generator lockout signal during high grid load conditions.

The generator lockout load shed signal will be derived from three generator lockout relays (i.e., 86G2, 86GP2, and 86GB2). A spare "normally open" contact on each relay will be placed in parallel and the resultant signal multiplied and supplied to the breaker trip circuits of the affected 4 kV motors supplied from the 1C(2C) and 1D(2D) buses. A key-lock selector switch will be installed on the front face of the 4.16 kV switchgear motor compartments. The switch will have two possible states labeled "Enable" and "Disable". With the switch in the "Enable" position,

receipt of a generator lockout signal will trip the associated load or prevent the load from starting. When the switch is in the "Disable" position, the load will not trip or be prevented from startup with a generator lockout signal present. Switch positions will be procedurally controlled.

Operating procedure changes will implement "part-time" tripping of a second running CWIP motor on a unit trip signal during periods of abnormally high grid load conditions. DTRM-GP-24 of the Dispatcher's Technical Reference Manual (DTRM) requires the dispatcher to inform the affected BSEP unit's control room operator when the Eastern Transmission Area load is approaching the point where the required post-unit trip minimum switchyard voltage can no longer be sustained. When it has been determined that the Eastern Transmission Area can no longer support the required LOCA post-unit trip minimum switchyard voltage, a second notification will be made. Prior to the second notification, Operators will refer to plant procedure 1(2)-OP-50, "Unit Trip Load Shedding of Selected Loads." This will guide them to enable the unit trip load shed feature for the second running CWIP on a "part-time" basis. Tripping this load on a unit trip will reduce the voltage drop between the 230 kV Switchyard and the 4.16 kV emergency buses such that the minimum switchyard voltage required for DGVR reset is reduced, maintaining the offsite source operable. Upon dispatcher notification that the grid has returned to normal load conditions, the unit trip load shed switch for this load will be procedurally returned to the "Disable" position.

The Main Generator Lockout Load Shed Modification also installs the hardware capability to provide additional "part-time" load shedding; procedural changes to provide any additional load shedding will be invoked by future design change packages, as needed.

To eliminate the potential for inadvertent tripping of the incoming line breakers to BOP buses 1C(2C) and 1D(2D) due to automatic starting of loads to support an opposite unit's LOCA, this modification will increase the overcurrent relay setpoints associated with the bus 1C(2C) and bus 1D(2D) incoming line breakers.

NRC Question 10-2

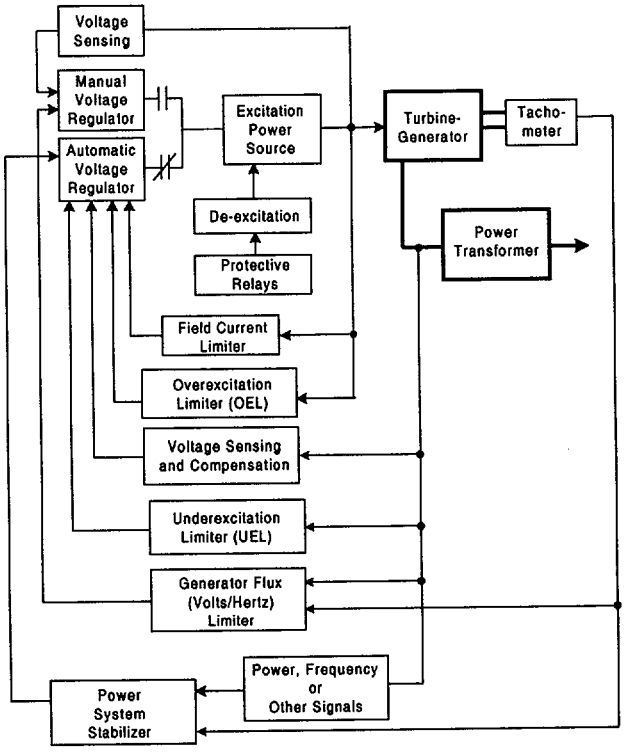
Section 6.1.1, "Off-Site Power," of the PUSAR states:

> Power system stabilizers should be installed on BSEP 1 prior to exceeding 111% OLTP and on BSEP 2 prior to exceeding CLTP to provide adequate damping of post-transient oscillations.

Provide in detail the damping of the post-transient oscillations of the Power System Stabilizer including the schematics. The response should also show how much reactive power (MVARS) is being provided by the power system stabilizer. Does it use the FACTS technology?

Response to Question 10-2

Power System Stabilizer (PSS) is a supplementary control that is input to the excitation system to provide damping to power system oscillations. The inputs are those signals in which the oscillations are observable, such as speed (i.e., frequency) and power. The PSS input has the appropriate phase compensation to modulate field voltage such that torques are generated that are out of phase with those causing the power oscillations. The PSS acts to damp out these oscillations in both normal and contingency conditions. The following provides a simplified schematic of the PSS modification in relation to the existing generator controls.



The exact value of pre and post disturbance damping, with and without PSS, will depend on the electrical system conditions, operating point, and type of disturbance. Figure 1 shows the response to a 2% step in terminal voltage, both with and without PSS.

The primary purpose of the PSS is to add damping to the power-angle (i.e., speed) oscillations by modulating the voltage regulator input. The PSS control is not designed to change voltage/MVAR output in a significant fashion. Figure 1 shows that there is very little difference between no PSS versus PSS control with regard to voltage and MVARS.

The PSS Modification does not use Flexible AC Transmission Systems (FACTS) technology. PSS does not utilize a capacitor in parallel with a thyristor-controlled reactor for variable VAR compensation at a bus. Rather, the PSS modification provides a positive contribution to damping

of the generator rotor angle swings, which are in a broad range of frequencies in the power system. The low frequency modes are due to coherent groups of generators swinging against other groups in the interconnected system. Weak ties due to line outages and heavy system loads can lead to poorly damped inter-tie modes. The PSS control provides significant improvements in inter-tie mode damping with the application of stabilizer. The PSS also provides damping of what is called the local mode, the generator swinging against the rest of the power system. Stronger system ties and lighter loading tend to give higher local mode frequencies, and weaker ties and heavier loading tend to give lower local mode frequencies. The PSS performance is designed to give acceptable performance over a wide range of system conditions, which may result from different operating conditions such as lines out-of-service, varying load levels. The PSS has protective limiters to keep the generator operating within operating limits.

NRC Question 10-3

Section 10.3 of the PUSAR discusses Environmental Qualification. Sections 10.3.1.1 and 10.3.2.1, dealing with equipment located inside and outside containment, state:

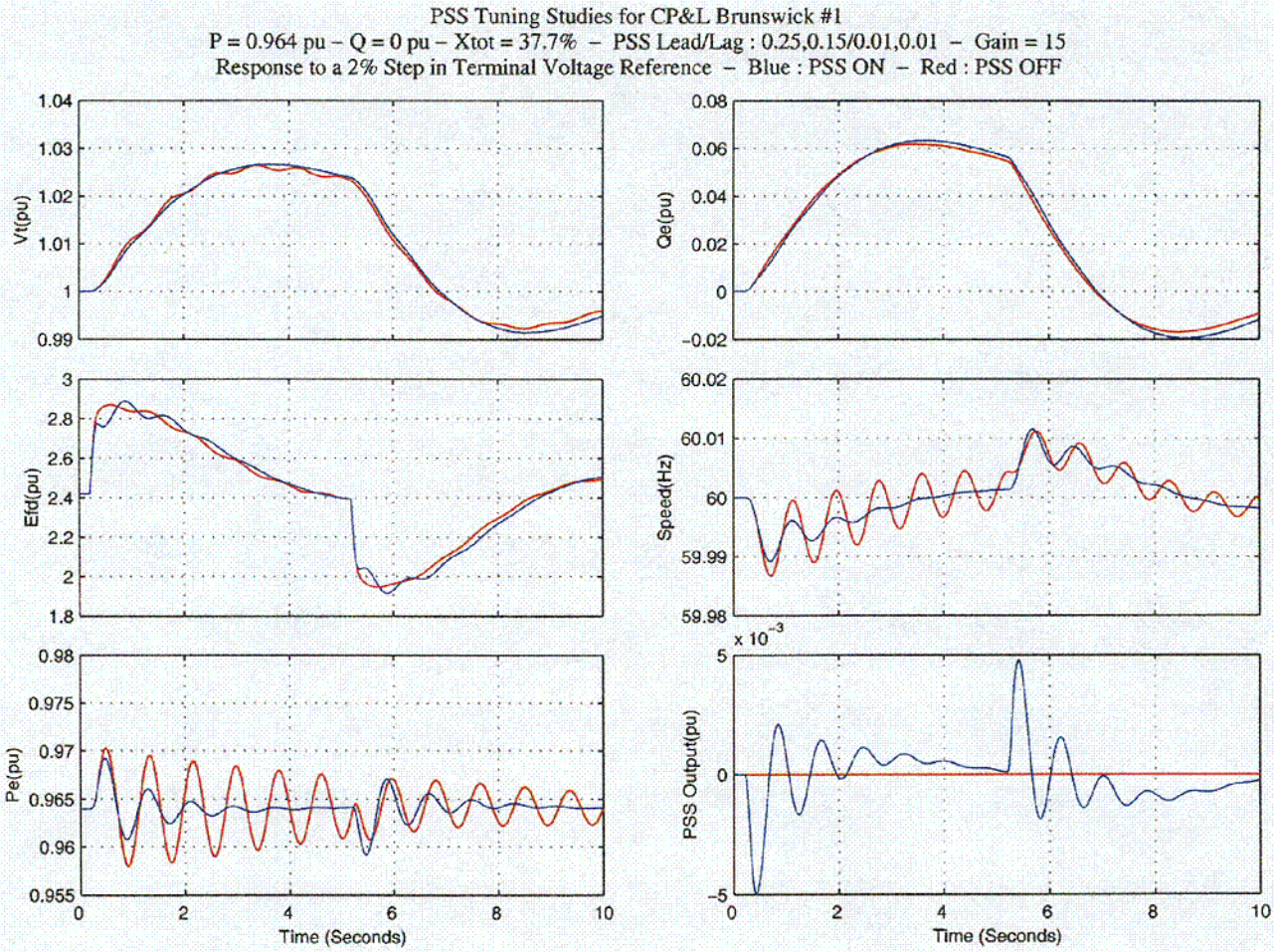
> The qualification of this equipment will be resolved by reanalysis, by refined radiation calculations (location-specific), by slightly reducing qualified life, by adding new equipment, or by replacing the existing equipment with qualified equipment.

What is the status of the CP&L's analysis of the impact of EPU on equipment qualification? What is the schedule for completing necessary changes (e.g., qualification package revisions, equipment replacement, etc.) which result from the EPU?

Response to Question 10-3

Revisions to the Qualification Data Packages (QDPs), to reflect EPU conditions, are currently in progress. The QDP revisions will be completed prior to the completion of the upcoming Unit 1 refueling outage, currently scheduled to begin in March 2002. It is not expected that any physical modifications to plant equipment will be required. However, if unexpected equipment modifications are identified during this update process, the required modifications will be implemented prior to the affected equipment's qualified life being exceeded.

Figure 1


PSS Tuning Studies for CP&L Brunswick #1
P = 0.964 pu – Q = 0 pu – Xtot = 37.7% – PSS Lead/Lag : 0.25,0.15/0.01,0.01 – Gain = 15
Response to a 2% Step in Terminal Voltage Reference – Blue : PSS ON – Red : PSS OFF
Vt(pu)
Qe(pu)
Efd(pu)
Speed(Hz)
Pe(pu)
PSS Output(pu)
x 10^-3
Time (Seconds)
Time (Seconds)

C01