



Carolina Power & Light Company  
PO Box 10429  
Southport NC 28461

Roy A. Anderson  
Vice President  
Brunswick Nuclear Plant  
910 457-2496

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United States Nuclear Regulatory Commission  
ATTENTION: Document Control Desk  
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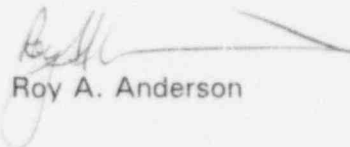
BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62  
ELECTRICAL DISTRIBUTION SYSTEM ENHANCEMENTS

Gentlemen:

On August 31, 1994, Carolina Power & Light Company (CP&L) and the NRC staff met to discuss the status of Electrical Distribution System (EDS) hardware enhancement projects at CP&L's Brunswick Steam Electric Plant, Units 1 and 2. Insights on the safety significance of the projects from the updated Probabilistic Safety Assessment (PSA) model were also discussed. Enclosure 1 provides a summary of the status of the major EDS hardware enhancement projects and the PSA discussions. Enclosure 2 provides a list of commitments in this letter.

Please refer any questions regarding this letter to Mr. R. P. Lopriore at (910) 457-2212.

Sincerely,

  
Roy A. Anderson

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Enclosures

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cc: Mr. S. D. Ebnetter, NRC Regional Administrator, Region II  
Mr. P. D. Milano, NRC/NRR Senior Project Manager - Brunswick  
Mr. C. A. Patterson, NRC Senior Resident Inspector - Brunswick  
The Honorable H. Wells, Chairman - North Carolina Utilities Commission

## ENCLOSURE 1

### BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 NRC DOCKET NOS. 50-325 & 50-324 OPERATING LICENSE NOS. DPR-71 & DPR-62

### ELECTRICAL DISTRIBUTION SYSTEM ENHANCEMENTS

#### BACKGROUND

On May 19, 1993, CP&L and the NRC staff met to discuss the status of the Electrical Distribution System (EDS) enhancement project at the Brunswick Nuclear Plant. Five EDS hardware enhancement projects which were under consideration were discussed during the May 19 meeting. The projects under consideration were:

- SAT Y-Winding Non-Segregated Bus Upgrade
- No-Load Disconnect Switch and Associated Logic Changes
- Switchyard Batteries
- Additional Emergency Diesel Generator
- Emergency Bus Voltage Regulators

On August 31, 1994, CP&L met with the NRC staff to discuss the status of these hardware enhancements and provide information on the safety significance of the projects based on insights from the updated Brunswick Probabilistic Safety Assessment (PSA) model. A summary of the status of the five potential EDS hardware enhancement projects and the PSA information presented at the August 31 NRC staff/CP&L meeting is provided herein.

#### SAT Y-WINDING NON-SEGREGATED BUS UPGRADE

The purpose of this project is to upgrade the capacity of the secondary Y-winding non-segregated bus of the startup auxiliary transformers (SATs) from the current rating of 4000 amps to 5000 amps. This upgrade will provide additional margin for design basis events. Installation of this upgrade has been completed on Unit 2 and is scheduled for completion on Unit 1 during the Spring, 1995 refuel outage (B110R1).

#### NO-LOAD DISCONNECT SWITCH AND ASSOCIATED LOGIC CHANGES

CP&L had previously discussed with the NRC staff a modification that would add a SAT for each unit, thereby improving the capability for obtaining the delayed power source and resolving the GDC-17 issues raised during the Diagnostic Evaluation Team Inspection at the Brunswick Plant. In the May 19, 1993 presentation, CP&L presented an alternative approach to resolving the GDC-17 issues that involves the installation of no-load disconnect switches and associated logic changes in lieu of the additional SATs. This approach provides a means of restoring power to the emergency buses within one hour via a backfeed from the switchyard through the main and unit auxiliary transformers. This modification significantly enhances the capability of obtaining the delayed power source by reducing the time required to restore offsite power to less than one hour. The one hour time limit was established as a reasonable period without offsite power based on the

## Brunswick Station Blackout Coping Analysis.

Installation of the no-load disconnect switches and associated logic change modifications is planned for the Spring 1995 Unit 1 refuel outage (B110R1) and the 1996 Unit 2 refuel outage (B212R1). Installation of these modifications completes the enhancements associated with the availability of the delayed alternate power source at the Brunswick Plant, which CP&L believes resolves outstanding GDC-17 issues.

### SWITCHYARD BATTERIES

The purpose of installing switchyard batteries was to support installation of the new SATs. Based on CP&L's decision to install no-load disconnect switches in lieu of new SATs, installation of switchyard batteries is no longer necessary. As discussed in the August 31, 1994 presentation, the majority of the reductions in core damage frequency which would result from installation of switchyard batteries have been achieved by procedure changes which take advantage of the flexibility in the existing DC electrical system. Therefore, switchyard batteries will not be installed at the Brunswick Plant.

### ADDITIONAL EMERGENCY DIESEL GENERATOR

The Brunswick Nuclear Plant is a two-unit site with four 4kV emergency buses (E1, E2, E3, and E4). Each unit's safety-related loads are distributed among these four emergency buses. Each emergency bus has its own dedicated emergency diesel generator. The Brunswick design is such that any three diesel generators can supply the required safe shutdown loads for one unit and design basis accident loads on the other unit. For a station blackout (SBO) event, the Brunswick design is such that any one diesel generator can provide the necessary power for both units for the required SBO coping duration.

While the Brunswick design provides a high degree of flexibility in serving emergency power system load requirements, the Technical Specification Limiting Condition for Operation (LCO) for the onsite AC power supplies requires a dual unit shutdown if an emergency diesel generator is inoperable for more than seven days. This LCO restriction was the primary factor in the consideration of an additional diesel generator. Following diesel generator out-of-service events in 1991 which required unit shutdowns, CP&L determined that the best approach to resolving the unit shutdown issue was to install an additional diesel generator; however, this resolution did not address the underlying root cause of the diesel reliability. In the May 19, 1993 meeting, CP&L informed the NRC staff that the Company was reevaluating the decision to install an additional emergency diesel generator at the Brunswick Nuclear Plant.

The root cause of the diesel reliability issue at the Brunswick Plant was not related to insufficient time to complete necessary corrective or preventive maintenance. The root cause involved weaknesses in craft training, qualification, and work planning and control. Subsequently, CP&L began an extensive diesel generator improvement program, including completion of repairs and upgrades during the recent dual unit outage and changes in the preventive maintenance program. The preventive maintenance program changes included the establishment of an Emergency Diesel Generator (EDG) Reliability Program, craft and engineering training improvements, and tooling improvements. In addition, maintenance planning and execution were enhanced through work control process improvements.

As a result of the reliability improvements taken at the Brunswick Plant, confidence in the plant's ability to maintain the emergency diesel generators within the current LCO has been restored. As noted in the August 31, 1994 presentation, the backlog of work items has decreased by 50% since 1992. Improvements in personnel training are reflected in recent diesel generator maintenance outages, where two of the four outages were completed approximately 30 percent ahead of schedule. As of August 31, 1994, the EDG reliability index, based on the last 100 starts, is above the target value (Unit 1 is at 98% and Unit 2 is at 100%) and below the trigger values for the last 20, 50, and 100 start/load demands. With the exception of the recent voltage regulator issue on EDG #2, the Brunswick Plant has not experienced an EDG start or load demand failure since November, 1992.

The extensive efforts and resources committed to the existing EDGs have been effective in achieving the desired goals of improved reliability and performance. In addition, improvements in craft and engineering training and maintenance planning and execution have enhanced the Company's ability to perform diesel generator maintenance within the LCO requirements. Improved maintenance processes have been demonstrated during recent maintenance outages. As a result, CP&L believes that existing LCO times support necessary diesel generator maintenance without the complexity of an additional diesel generator.

An additional benefit of a fifth EDG would be a reduction in the core damage frequency (CDF) for the Brunswick Plant. Based on insights from the updated Brunswick PSA, the installation of a fifth EDG would result in an incremental reduction in CDF as compared to predicted impact in the Brunswick Individual Plant Examination (IPE). The reduction in CDF gained from an additional EDG would be less than the reduction achieved to date from other plant changes and would involve a substantially higher cost. The current Brunswick Plant CDF value is within the acceptable range for Boiling Water Reactors.

In view of the increased reliability of the existing emergency diesel generators and the reduced impact on the core damage frequency that would result from the installation of an additional EDG, CP&L has determined that the expected benefits do not justify the cost or complexity of installing an additional emergency diesel generator. Therefore, an additional diesel generator will not be installed at the Brunswick Plant.

#### EMERGENCY BUS VOLTAGE REGULATORS

The purpose of this project was to address the future grid voltage adequacy considering projected load growth on the CP&L transmission system. In the May 19, 1993 meeting, CP&L stated that the Company was evaluating in-plant voltage regulators as a possible solution to the grid voltage issue. This solution would involve installation of four 4kV voltage regulators, one installed between each emergency bus and its respective balance-of-plant bus.

CP&L is currently evaluating revised load growth projections and performing more detailed studies to determine the most effective means of resolving this issue. With the revised load growth projections, off-site grid voltage concerns remain a long-term issue; however, procedures are in place for plant and system operating personnel to monitor and take action for abnormal grid conditions (i.e., generation outages or abnormally high transmission system loads). CP&L will keep the NRC staff informed of the status of these

studies.

#### UPDATED PSA INFORMATION

In August, 1992, CP&L submitted the Individual Plant Examination (IPE) for the Brunswick Nuclear Plant. Since that submittal, CP&L has developed an updated, "living" model referred to as a Probabilistic Safety Assessment (PSA). As identified to the NRC staff in the August 31, 1994 meeting, the PSA model reflects various changes completed since the 1992 IPE, including plant modifications and procedure changes, operating data update, and modeling changes.

The results of the PSA show that the overall CDF is reduced from the IPE value of  $2.7 \text{ E-5}$  / Reactor-Year to  $1.1 \text{ E-5}$  / Reactor-Year. The updated PSA is also more leveled with respect to major CDF contributors. For example, the most dominant IPE CDF contributor, station blackout scenarios, was reduced from 66% of the total CDF to 43%. The emergency bus cross-tie modification and station blackout and loss of DC power procedures were major contributors in the overall reduction in CDF.

As a result of insights gained from the updated PSA model, the relative benefit of the additional diesel generator and switchyard battery modifications with respect to reduction in CDF has been reduced. The incremental reduction in CDF does not justify the high cost of these modifications. While CP&L believes that the current CDF profile for the Brunswick Plant is reasonable, the Company continues to look for cost-effective means of further enhancing plant safety.

#### SUMMARY

The electrical distribution system at the Brunswick Nuclear Plant meets its design basis requirements. Actions have been taken which have reduced the overall CDF by nearly 60% from the original IPE. Additional hardware enhancement projects have been studied. Two enhancement projects are planned for completion in 1996, including the installation of no-load disconnect switches and associated logic changes and an upgrade of the SAT Y-Winding non-segregated bus. Two enhancement projects - installation of switchyard batteries and an additional diesel generator - are not cost justifiable and will not be installed. One enhancement project, emergency bus voltage regulators, remains under study. CP&L will keep the NRC staff informed of the status of this study.

## ENCLOSURE 2

### BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 NRC DOCKET NOS. 50-325 & 50-324 OPERATING LICENSE NOS. DPR-71 & DPR-62

#### 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. CP&L will keep the NRC staff informed of the status of the voltage regulator study.	7/15/95*

\* An update to the staff on the status of the study will be provided by this date.