

December 13, 1996

EA 96-442

Carolina Power & Light Company
ATTN: Mr. W. R. Campbell
Vice President
Brunswick Steam Electric Plant
Post Office Box 10429
Southport, North Carolina 28461

SUBJECT: NOTICE OF VIOLATION
(NRC INSPECTION REPORT NOS. 50-325/96-16 AND 50-324/96-16)

Dear Mr. Campbell:

This refers to the integrated inspection completed on October 26, 1996 at your Brunswick facility. The inspection included a review of your failure to provide temperature compensation for the Plant Process Computer (PPC) feedwater flow algorithm which resulted in operation of Brunswick Unit 2 in excess of (1) the maximum thermal power authorized by the license and (2) thermal limits required by Technical Specification (TS) 3.2.1. The inspection report was sent to you by letter dated November 22, 1996. A closed, predecisional enforcement conference was conducted in the Region II office on December 9, 1996, with you and members of your staff to discuss the apparent violations, the root causes, and your corrective actions to preclude recurrence. A list of conference attendees, NRC slides, and a copy of your presentation materials are enclosed.

Based on the information developed during the inspection and the information you provided during the conference, the NRC has determined that violations of NRC requirements occurred. The violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding them are described in detail in the subject inspection report. Violation A involves the failure to maintain the Unit 2 thermal power within the operating license limits. On August 28, 1996, a reactor engineer reviewing core thermal power calculations associated with the Power Uprate Project determined that the Unit 2 PPC point value for feedwater flow was not properly compensated for feedwater temperature deviations from the normal operating temperature. The condition had existed on Unit 2 since the unit restarted after a refueling outage ending in July 1994 when Unit 2 was modified to add a new PPC and associated software. Due to the failure to temperature compensate the feedwater flow process point value, the core thermal power calculated and indicated by the PPC was less than the actual core thermal power. During periods when feedwater temperature was lower than the normal operating value, Unit 2 was operated at indicated power levels of up to 100 percent power or 2436 megawatts (MW) thermal which was equivalent to actual power levels of up to 102.4 percent power or 2494 MW thermal. This is a violation of License Condition 2.C.1 of Facility Operating License Number DPR-62 which requires that Unit 2 be operated at or less than 2436 MW thermal.

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Violation B involves the failure to maintain the calculated Average Planar Linear Heat Generation Rate (APLHGR) within the limits of TS 3.2.1. The APLHGR limits vary based on power level and feedwater flow to assure that the fuel thermal-mechanical design criteria are preserved during abnormal transients. TS 3.2.1 specifies the approved methodology for determining the limits placed on APLHGR for a given power level and feedwater flow rate. Due to the failure to appropriately compensate for feedwater temperature, the calculated reactor power level inputs to the APLHGR calculation were incorrect and the resulting APLHGR value was non-conservative. The APLHGR values, as calculated using the actual power levels, exceeded the limits specified by TS 3.2.1 between December 10 and December 20, 1995. During the predecisional enforcement conference, your staff noted that the approved methodology for calculating the APLHGR limits specified by TS 3.2.1 was based on generic APLHGR adjustment factors. Your re-analysis of the APLHGR limits using cycle specific adjustment factors indicated that the APLHGR values, based on actual power levels between December 10 and December 20, 1995, were within cycle specific design limits. Although the re-analysis indicates that the actual safety consequence of Violation B was low; the NRC considers any change in reactor parameters that cause unanticipated reductions in the margin of safety to be a significant regulatory concern.

The root causes of the violations included the failure of your design team to properly link the Unit 2 feedwater flow process points to the appropriate compensation formula in the Unit 2 compensation database. The computer index labels for the Unit 2 feedwater flow process points were changed when additional process points were loaded into the database. Due to the inappropriate index labels, the computer linked a compensation value of one to the points instead of the correct compensation value. Your post-modification acceptance testing for the new PPC did not verify that process point numbering was the same in both units and did not verify that the correct relationships between process points and compensation values were preserved when your design team, in an effort to reduce differences between the two units, copied the existing PPC database configuration from the Unit 1 PPC to the Unit 2 PPC.

These violations represent a significant failure to control design parameters that affected the integrity of reactor core protection systems. The NRC expects licensees to provide meticulous oversight of vendor changes to plant process computer software and to conduct comprehensive post-modification testing of new software used to assure operation within specified acceptable fuel design limits. In this case, the NRC is particularly concerned that specified core operating limits were exceeded due to the inadequate design control and testing. Therefore, these violations are classified in the aggregate in accordance with the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy) NUREG-1600, as a Severity Level III problem.

In accordance with the Enforcement Policy, a base civil penalty in the amount of \$50,000 is considered for a Severity Level III problem. Because your facility has been the subject of escalated enforcement actions within the last

two years¹, the NRC considered whether credit was warranted for Identification and Corrective Action in accordance with the civil penalty assessment process described in Section VI.B.2 of the Enforcement Policy. The NRC concluded that credit was warranted for Identification because your staff identified both violations. With regard to consideration for Corrective Action, your corrective actions included: (1) effective, immediate corrective actions to reduce power and correct the software deficiency; (2) revalidation of critical plant process computer functions and confirmation of appropriate testing of the software; (3) review of other computer applications; (4) enhancements to the control of design and testing of computer products; and, (5) training on lessons learned and software configuration control. Based on the above, the NRC determined that credit was warranted for Corrective Action.

The application of the factors considered in the civil penalty assessment process, absent the exercise of discretion, resulted in no civil penalty. However, you should be aware that the NRC considered imposing a civil penalty, under Section VII.A of the Enforcement Policy, because of the potential impact of weak vendor oversight and inadequate design control and testing of software affecting core operating parameters. However, because your reactor engineer demonstrated a safety conscious attitude which resulted in the identification of the software deficiency and to encourage prompt identification and comprehensive correction of violations, I have been authorized, after consultation with the Office of Enforcement, not to propose a civil penalty in this case. Significant violations in this area in the future could result in a civil penalty.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. In your response, you should document the specific actions taken and any additional actions you plan to prevent recurrence. After reviewing your response to this Notice, including your proposed corrective actions and the results of future inspections, the NRC will determine whether NRC enforcement action is necessary to ensure compliance with NRC regulatory requirements.

¹ A Severity Level III violation was issued on November 19, 1996, (EA 96-354) related to environmental qualification program deficiencies. A Severity Level III violation was issued on July 12, 1996, (EA 96-181) related to design control measures for service water system modifications. A Severity Level III violation was issued on April 4, 1996, (EA 96-054) for failure to meet fitness-for-duty requirements. A Severity Level III violation was issued on November 20, 1995, (EA 95-228) related to suitability of materials used in valves in the residual heat removal system. A Severity Level III problem was issued on September 8, 1995, (EA 95-166) related to design control, modification and testing of the high pressure injection system and reactor core isolation cooling system.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be placed in the NRC Public Document Room (PDR).

Sincerely,

Original Signed by
Luis Reyes for

Stewart D. Ebnetter
Regional Administrator

Docket Nos. 50-324
License Nos. DPR-62

Enclosures: 1. Notice of Violation
2. List of Conference Attendees
(Not to be Published in NUREG-0940)
3. Licensee Presentation Material
(Not to be Published in NUREG-0940)
4. NRC Slides (Not to be Published in NUREG-0940)

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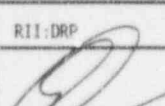
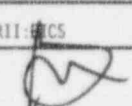
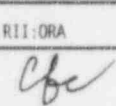
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NRC Resident Inspector

U.S. Nuclear Regulatory Commission

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