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

BRUNSWICK NUCLEAR PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
RESPONSE TO NRC STAFF REQUEST FOR INFORMATION - CONTROL ROD DRIVE
SCRAM ACCUMULATOR LICENSE AMENDMENT REQUEST

Gentlemen:

On January 25, 1993, Carolina Power & Light Company (CP&L) submitted a request for amendments to the Control Rod Drive and Control Rod Drive Scram Accumulator Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. Enclosure 1 of this letter documents information requested by the NRC staff during conference calls with Brunswick Nuclear Plant personnel regarding these amendments. As requested by the NRC staff, a reference noted in the January 25, 1993 basis for the amendment request (NEDE-14584, "Assurance of Acceptable Scram Through Control Rod Drive Analysis") is provided as Enclosure 2. Enclosure 3 provides a summary of commitments in this letter. CP&L would appreciate the opportunity to meet with the NRC staff to discuss the information contained in this submittal.

Please refer any questions regarding this submittal to Mr. R. P. Lopriore, Manager-Regulatory Affairs, at (910) 457-2212.

Sincerely,


Roy A. Anderson

KAH/

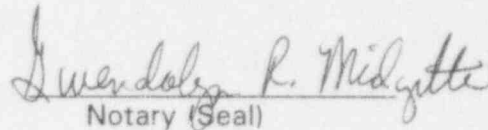
Enclosures

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Roy A. Anderson, 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.


Notary (Seal)

My commission expires: *August 12, 1996*

cc: Mr. D. H. Brown, State of North Carolina
Mr. S. D. Ebner, Regional Administrator, Region II
Mr. P. D. Milano, NRR Senior Project Manager - Brunswick Units 1 and 2
Mr. C. A. Patterson, Brunswick NRC Senior Resident Inspector
The Honorable H. Wells, Chairman - North Carolina Utilities Commission

ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNIT 1 AND 2 NRC DOCKETS 50-325 & 50-324 OPERATING LICENSES DPR-71 & DPR-62 REQUEST FOR LICENSE AMENDMENTS CONTROL ROD DRIVE SCRAM ACCUMULATORS

RESPONSE TO REQUEST FOR INFORMATION

Background

On January 25, 1993, Carolina Power & Light Company (CP&L) submitted a request for amendments to the Control Rod Drive and Control Rod Drive Scram Accumulator Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed amendments include two changes. The first change adds an exemption statement from the requirements of Technical Specification 3.0.4 to Technical Specification 3.1.3.1, ACTION b. The second change revises Technical Specification 3.1.3.5, Control Rod Scram Accumulators, to address operation with more than one inoperable control rod drive scram accumulator.

On August 23, 1993, CP&L received a request for additional information from the NRC staff requesting that CP&L provide information demonstrating how the proposed Technical Specification amendment request (allowing multiple inoperable accumulators without inserting the control rod) would affect control rod scram times during depressurization events. CP&L submitted a response to NRC staff questions on December 28, 1993, indicating that the control rods were capable of meeting the scram reactivity function assumed in the safety analysis without contribution of the control rods with inoperable accumulators. CP&L has held additional discussions with the NRC staff regarding this amendment since the December 28, 1993 submittal. As a result of these discussions, the NRC staff requested:

- Assurance that control rods with inoperable accumulators would insert (scram) during depressurization events, and
- A copy of Reference 1, Enclosure 1 in the January 25, 1993 submittal (NEDE-14584, "Assurance of Acceptable Scram Through Control Rod Drive Analysis").

Provided herein is the information requested by the NRC staff. A discussion of the applicability of NEDE-14584 to Brunswick Units 1 and 2 is also included.

Control Rod Insertion Capability During Depressurization Events

The most rapid depressurization events are those associated with postulated design basis loss of coolant accidents. The revised licensing basis for the Brunswick Plant is the SAFER/GESTR LOCA Analysis, which has been reviewed and approved by the NRC staff.

The most rapid depressurization event, as analyzed in the SAFER/GESTR analysis using 10 CFR 50, Appendix K assumptions, results from a design basis suction line break. As shown in the SAFER/GESTR LOCA analysis, reactor pressure remains above 950 psig for more than four seconds and above 600 psig for more than 12 seconds. Scram accumulators are not necessary for control rods to meet scram time requirements at full operating pressure. Measured core average control rod 90% insertion scram times are consistently less than the values (approximately 3.5 seconds) required by Technical Specification 3.1.3.3. Furthermore, control rods with an inoperable scram accumulator are expected to have 90% insertion times of less than ten seconds at a constant pressure of 600 psig.

In the event of a design basis loss of coolant accident, control rods with inoperable scram accumulators would experience a scram force due to a reactor pressure of greater than 950 psig during the initial period of the accident and during initial control rod motion. Initial control rod motion would occur after sensing and scram relay response times on the order of 0.5 seconds. While control rods with operable accumulators would experience extra margin over the force necessary to initiate rod motion, high reactor pressure (greater than 950 psig) ensures that control rods with inoperable accumulators will begin and continue to insert. Reactor pressure remains greater than 950 psig for the first three seconds after control rod motion begins. Control rods with and without operable accumulators will approach 90% insertion by this time. During the following eight seconds, the scram force supplied by reactor pressure (greater than 600 psig) ensures that control rods continue to insert the remaining distance into the core without assistance of the accumulator.

Applicability of NEDE-14584 to the Brunswick Plant

As requested by the NRC staff, a copy of NEDE-14584 is provided as Enclosure 2. NEDE-14584 was referenced in CP&L's January 25, 1993 submittal as an example of past analyses which support the allowance of as many as eight inoperable control rods, as provided by the Technical Specifications. The following discussion clarifies the applicability of NEDE-14584 to the Brunswick Plant.

The existence of inoperable control rods affects scram reactivity insertion requirements for transient safety analyses and energy deposition for a Rod Withdrawal Error in the startup range and a Control Rod Drop Accident. Analyses have been performed in these areas which account for the existence of inoperable control rods. Technical Specification requirements for inoperable control rod separation and operable control rod scram times ensure that analysis criteria consistently used by General Electric (GE) for transients, rod withdrawal error, and control rod drop accident analyses are met.

Since NEDE-14584 was generated as part of the supporting analysis work during development of the fast scram systems in BWR/6 designs, the specific scram times used in the report are not applicable to the Brunswick Plant; however, the report is an example analysis which assumes that eight control rods which meet separation requirements are inoperable. The analysis demonstrates that eight inoperable control rods would not appreciably affect the outcome of the analysis; therefore, the broad conclusions of NEDE-14584 are generically applicable to the Brunswick Plant.

With eight control rods not participating in a fast scram, the minimum reactivity occurs

when all rods scram at the same average speed. Any distribution of speeds about the average value improves the scram reactivity insertion function relative to all rods inserting at the same speed. This result would not be expected to be dependent upon the average speed that is assumed (i.e., whether the average speed is that for full insertion in 1.5 seconds or 3.5 seconds). A distribution about the average causes some rods to insert faster, improving the scram reactivity insertion relative to all rods inserting at the same speed.

A second analysis demonstrating the acceptability of eight inoperable control rods as an analysis assumption is contained in NEDO-21231, "Banked Position Withdrawal Sequence (BPWS)," Section 7, January 1977. This document was provided to and reviewed by the NRC staff in support of the generic licensing effort associated with the banked position withdrawal sequence. NEDO-21231 demonstrates that, for a control rod drop accident, licensing limits will not be exceeded with eight inoperable control rods which meet separation requirements. NRC staff review of NEDO-21231 was documented in a letter from O. D. Parr (NRC) to G. G. Sherwood (GE) dated January 18, 1978.

CP&L submitted a request for license amendment to incorporate BPWS into the Technical Specifications for Brunswick Units 1 and 2 on August 3, 1987. The NRC staff issued a Safety Evaluation and License Amendment on April 19, 1989 (Amendments 127 and 157 for Unit 1 and Unit 2, respectively).

In addition to the above referenced analyses, on September 17, 1987, the BWR Owners' Group submitted, via letter BWROG-8754, document EAS-46-0487, "Revised Reactivity Control Systems Technical Specification." This document discusses the overall control rod requirements and served as the original basis for NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4," September, 1992. NUREG-1433 includes an allowance for multiple withdrawn control rods with inoperable accumulators. The BNP license amendment request was based on the NUREG-1433 specifications regarding control rods and control rod scram accumulators.

SUMMARY

Allowance of withdrawn, moveable control rods with inoperable accumulators that meet separation requirements is an acceptable operating condition with reactor pressure greater than 950 psig. High reactor pressure provides adequate assurance that control rods with inoperable accumulators would insert (scram) during depressurization events. The proposed license amendment request for the Brunswick Nuclear Plant provides an entry condition of 950 psig for allowing multiple control rods with inoperable accumulators to remain withdrawn. This entry condition ensures that adequate reactor pressure is available to insert the withdrawn control rod during a depressurization event without assistance of the accumulator.

Technical Specification requirements for inoperable control rod separation and operable control rod scram times ensure that analysis criteria consistently used by General Electric (GE) for transients, rod withdrawal error, and control rod drop accident analyses are met. Enclosure 2, NEDE-14584, is one example of an analysis which assumes eight inoperable rods which meet separation requirements and demonstrates that the resulting plant performance conforms to applicable limits.

ENCLOSURE 2

BRUNSWICK STEAM ELECTRIC PLANT, UNIT 1 AND 2
NRC DOCKETS 50-325 & 50-324
OPERATING LICENSES DPR-71 & DPR-62
REQUEST FOR LICENSE AMENDMENTS

CONTROL ROD DRIVE SCRAM ACCUMULATORS

NEDE-14584

ASSURANCE OF ACCEPTABLE SCRAM THROUGH CONTROL ROD DRIVE ANALYSIS

June 1976