



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 168 TO FACILITY OPERATING LICENSE NO. DPR-62

CAROLINA POWER & LIGHT COMPANY, et al.

BRUNSWICK STEAM ELECTRIC PLANT, UNIT 2

DOCKET NO. 50-324

1.0 INTRODUCTION

By letter dated March 29, 1989 (Reference 1), Carolina Power & Light Company (the licensee), requested changes to the Brunswick Steam Electric Plant (BSEP) Technical Specifications (TS) to permit operation in the maximum extended operating domain (MEOD). The MEOD encompasses both a maximum extended load line limit (MELLL) and increased core flow (ICF) regions of the power/flow map. The licensee's submittal included proposed Figure and Table changes to the BSEP TS relating to average power range monitor (APRM), rod block settings and the limiting power/flow line.

Enclosed with the March 29, 1989 letter was a General Electric Company (GE) analysis of the consequences of operation in the MEOD (Reference 2) to justify the proposed changes. The requested changes are in the general categories identified as:

- (1) deletion or modification of specifications having cycle-specific parameter limits and replacement of certain values of these limits with a reference to a core operating limits report (COLR) and deletion of the redundant linear heat generation limit from the Specifications;
- (2) modification of the flow-biased APRM scram and rod block equations to accommodate the expanded operating domain; and
- (3) modification of the rod block monitor (RBM) trip setpoints and RBM system requirements.

The proposed changes are addressed individually in the following Safety Evaluation (SE) Section 2.0. The evaluation includes reference to separate, related approvals of the specific areas regarding elimination of cycle-specific parameter values and deletion of the linear heat generation rate (Reference 3) and the loss-of-coolant accident analysis (Reference 4).

8910230059 891012
PDR ADDC 05000324
P FDC

2.0 EVALUATION

2.1 Elimination of Flow-Biased APRM Scram and Rod Block Trip Setpoint Setdown Requirement

In the current BSEP Technical Specifications, the flow-biased APRM scram and rod block trip setpoints are reduced (setdown) when the core MAPLHGR is greater than the fraction of rated thermal power (FRTD). This requirement is associated with a now obsolete Hensch-Levy minimum critical heat flux ratio criterion. The GE analysis (Reference 2) enclosed with the BSEP submittal includes the results from the analyses that were performed to determine a set of flow and power dependent fuel thermal limits minimum critical power ratio (MCPR) and MAPLHGR ratio that would be needed to satisfy the pertinent licensing criteria if APRM setdown were eliminated. The new limits should (1) prevent violation of the MCPR safety limit, (2) keep the fuel thermal-mechanical performance within the design and licensing basis, and (3) keep peak cladding temperature and maximum cladding oxidation within allowable limits. The results of the analyses with approved analytical methods are as follows:

- (1) New generic power-dependent MCPR and MAPLHGR limit adjustment factors are developed which consider two power ranges distinguished by a defined power (30 percent of rated) below which reactor scrams on turbine stop valve closure and turbine control valve fast closure are bypassed. The MAPLHGR relation is a factor, MAPFAC(P) which is multiplied by the rated MAPLHGR limit to obtain the power-dependent MAPLHGR limit.
- (2) New generic flow-dependent MCPR and MAPLHGR limit adjustment factors are developed. These factors are determined from analyses of slow flow-runout transients with the requirement that the peak transient linear heat generation rate does not exceed the fuel design basis values. In connection with this amendment request, the new flow-dependent MCPR factors, MCPR(F), will replace the previously used MCPR multiplier, K_f , which will no longer be utilized.

The development of the adjustment factors described above used a TS improvement program, APRM/RBM Technical Specification (ARTS) Program, which, in part, supports both the implementation of updated fuel thermal limits and the elimination of the APRM trip setdown requirements. The transient analysis results discussed in the following SE Section 2.2 are a part of the ARTS program. The ARTS concept has been used over the past few years successfully and with staff approval by a number of utilities having BWR reactors. Its use in the present amendment request is acceptable to the staff.

2.2 Abnormal Operational Transients

All transients of Chapter 15 of the Brunswick FSAR were considered for the MEOD. The transients reevaluated were generator load reduction without turbine bypass (LRNBP), feedwater controller failure maximum demand (FWCF), and inadvertent high pressure coolant injection (HPCI) events. The potentially limiting LRNBP and FWCF events were evaluated at the power/flow conditions corresponding to the MELLL bounding point (100 percent power, 75 percent flow)

and the ICF bounding point (100 percent power, 105 percent flow). The HPCI event was analyzed at both points with an additional 2 percent power uncertainty allowance as prescribed by the use of the approved GEMINI methodology. Reference 2 presents the results of cycle-specific calculations, using standard methodology, for the reevaluated events at the bounding condition of ICF for BSEP Units 1 and 2. These are presented for ODYN options A and B and for each fuel type presently loaded in the BSEP units and are compared with the values for standard operating conditions. The results indicate that the LRNBP is limiting under ICF conditions for each unit. All transient analyses were done with approved methodology (Reference 5).

GE has also examined other events and affected system components related to the requested extensions. These include overpressure protection, LOCA events, pressure differentials and vibration response on reactor internals and fuel assemblies. The results show that design limits will not be exceeded. The containment loss-of-coolant accident (LOCA) response was analyzed and the results show no significant impact of the MEOD. A separate evaluation of the SAFER/GESTR LOCA methodology has been recently documented. The review of these various GE examinations has concluded that suitable analyses were performed and the results are comparable to other reviews and are acceptable for BSEP.

2.3 Modification of Flow-Biased APRM Scram and Rod Block Trip Equations

The MEOD proposal changes the APRM flux scram lines on the power/flow map and permits operation up to the new APRM flux scram line ($0.66W + 64$ percent) and up to the intersection with the 100 percent power line occurring at a flow of 75 percent. This is a standard change for MELL. For ICF, the proposed flow increase is to 105 percent core flow at 100 percent power with a linear expansion to 110 percent core flow at 70 percent power. The increased flow would be allowed throughout a plant cycle. The flow-biased rod block trip equation is changed to $0.66W + 58$ percent with a maximum value of 108 percent. The maximum value of 108 percent necessitates a modification to establish a clamping function for the rod block trip level (see Section 2.5).

2.4 Modification of RBM Trip Setpoints and RBM System Operability Requirements

The RBM system serves solely to mitigate the consequences of a rod withdrawal error (RWE) anticipated operational occurrence. A modified RBM system configuration is described in Reference 2 and will be implemented during the upcoming refueling outages for each BSEP unit. The process of defining RBM operating requirements entails a generic RWE analysis to determine that neither the safety limit nor the fuel thermal-hydraulic basis is jeopardized by the complete withdrawal of a single control rod. This modification is made in coordination with the ARTS program and allows the selection of the RBM setpoint such that the RWE analysis results are bounded by the limiting transient analysis (Section 2.2). The specific setpoints will be documented in a Core Operating Limits Report in accordance with approved procedures (Reference 3).

2.5 Plant Modifications

The aforementioned modifications to the APRM and RBM systems are necessary to ensure the availability of the expanded domain. This includes the modifications necessary to establish the clamping function associated with the flow-biased APRM rod block TS. These modifications are to be performed for BSEP Unit 2 during Refueling Outage 8 and BSEP Unit 1 during Refueling Outage 7. This SE may be considered applicable to both Units 1 and 2 since the basis for the changes is essentially the same. However, in accordance with the licensee's projected reload schedules, implementation of the specific TS changes on Unit 1 is not required until the next Unit 1 refueling outage.

2.6 Technical Specification Changes for MEOD

The proposed changes to the BSEP TS are identified in Enclosures 4 and 5 of the licensee's submittal. The changes include editorial changes to the TS index entries, deletion of the definitions of core MAPLHGR ratio and fraction of rated thermal power, a revision to the Bases Sections associated with the specific changes to the Safety Limits and Limiting Safety System Settings. The basis for the changes and the staff conclusions are detailed in the previous SE sections.

Changes to the Limiting Conditions for Operation (LCO) were also proposed as follows:

(1) TS 3.1.4.3. - Rod Block Monitor

Changes are necessary to identify the new APPLICABILITY ranges and ACTION statements associated with the proposed RBM system operability requirements (see Section 2.4).

(2) TS 3.2.1 - Average Planar Linear Heat Generation Rate

Changes are necessary to identify the new flow and power-dependent adjustment factors.

(3) TS 3.2.2.1 - Minimum Critical Power Ratio

Changes are necessary to identify the adjustment of the MCPR limit for core flow and power, to delete the APRM setpoint Specification, and to renumber the Specifications for continuity.

(4) TS 3.3.4 and footnote (f) to Table 3.3.4-1

Changes are necessary to identify the withdrawal ranges and ACTION statements associated with control rod block instrumentation similar to Item (1) above.

For changes (1) through (4) above, revised BASES discussion paragraphs were made to be compatible with the revised Specifications.

Changes were made to Section 6 (Administrative Controls) to state that the core operating limits associated with the requested changes will be identified in the Core Operating Limits Report.

The requested changes are the same for both BSEP units. The staff has reviewed the information submitted for operation of BSEP Units 1 and 2 with extended operating regions. Based on this review, the staff concludes that appropriate documentation was submitted to justify the proposed TS changes. The changes identified in the licensee submittal are acceptable as proposed.

3.0 ENVIRONMENTAL CONSIDERATIONS

These amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released off site; and that there should be no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration, and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR §51.22(c)(9). Pursuant to 10 CFR §51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

4.0 CONCLUSION

The Commission made a proposed determination that this amendment involves no significant hazards consideration which was published in the FEDERAL REGISTER (54 FR 32706) on August 9, 1989, and consulted with the State of North Carolina. No public comments or requests for hearing were received, and the State of North Carolina did not have any comments.

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: M. McCoy

Dated: October 12, 1989

REFERENCES

1. Letter (NLS-89-060) from A. B. Cutter (CP&L) to Document Control Desk (USNRC) dated March 29, 1989 transmitting a Request for Licensing Amendment on Maximum Extended Operating Domain.
2. NEDC-31654P, "Maximum Extended Operating Domain Analysis for Brunswick Steam Electric Plant," February 1989 (GE Nuclear Energy) transmitted as Enclosure 7 to Reference 1.
3. Letter, E. G. Tourigny (USNRC) to L. W. Eury (CP&L) dated May 25, 1989. Subject: Issuance of Amendment No. 131 to Facility Operating License No. DPR-71 and Amendment No. 161 to Facility Operating License No. DPR-62 - Brunswick Steam Electric Plant, Units Nos. 1 and 2, Regarding Changes on Elimination of Cycle Dependent Parameter Values and Deletion of the Linear Heat Generation Rate Limit (TAC Nos. 66153 and 66154).
4. Letter, E. G. Tourigny (USNRC) to L. W. Eury (CP&L) dated June 1, 1989. Subject: SAFER/GESTR-LOCA Analysis, Brunswick Steam Electric Plant, Units 1 and 2 (TAC Nos. 72845/72855).
5. General Electric Standard Application for Reactor Fuel (NEDE-24011-P-A-US) with Safety Evaluation incorporated.

AMENDMENT NO. 168 TO FACILITY OPERATING LICENSE NO. DPR-62 - BRUNSWICK, UNIT 2

Docket File

NRC PDR
Local PDR
PDII-1 Reading
S. Varga (14E4)
G. Lainas
E. Adensam
P. Anderson
E. Tourigny
N. Le
L. Spessard (MNBB 3701)
OGC
D. Hagan (M4BB 3302)
E. Jordan (MNBB 3302)
B. Grimes (9A2)
T. Meeks (4) (P1-137)
W. Jones (P-130A)
J. Calvo (11D3)
M. McCoy
ACRS (10)
GPA/PA
ARM/LFMB

cc: Licensee/Applicant Service List