



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 41 TO FACILITY OPERATING LICENSE NO. NPF-86  
NORTH ATLANTIC ENERGY SERVICE CORPORATION  
SEABROOK STATION, UNIT NO. 1  
DOCKET NO. 50-443

1.0 INTRODUCTION

By application dated May 30, 1995, (Ref. 1) North Atlantic Energy Service Corporation (North Atlantic) proposed an amendment to the Appendix A Technical Specifications (TS) for the Seabrook Station, Unit No. 1 (Seabrook). The proposed amendment would change the upper limit for the moderator temperature coefficient (MTC) specified in Technical Specification 3.1.1.3 to  $+0.5 \times 10^{-6} \Delta k/k/^{\circ}F$ . This upper limit would be applicable for all rods out (ARO) at the beginning of cycle (BOC) for power levels up to 70% rated thermal power (RTP) with a linear ramp to 0  $\Delta k/k/^{\circ}F$  at 100% RTP. The currently specified upper limit for all operating conditions is 0  $\Delta k/k/^{\circ}F$ . Additionally, a reference for the analytical method used to determine the cycle-specific MTC upper limit would be added to TS 6.8.1.6.b.

North Atlantic's application and supplemental letter dated August 28, 1995, proposed certain changes to the Basis to Technical Specification 3.1.1.3 to provide a commitment to comply with the Anticipated Transients Without Scram (ATWS) Rule and the basis for the Rule by assuring ATWS core damage frequency will remain below the Commission established target of  $1.0 \times 10^{-5}$  per reactor year. The commitment would be implemented by determining a more restrictive, cycle-specific upper MTC limit and placing it in the Core Operating Limits Report (COLR).

Each transient and accident identified in the Seabrook Station Updated Final Safety Analysis Report (UFSAR) has been previously evaluated for the proposed change and submitted for NRC review in YAEC-1871 (Ref. 2). The results demonstrated that the acceptance criteria specified for each event were met and were approved by the NRC in Amendment 33 (Ref. 3) issued November 23, 1994. YAEC-1871 also included a discussion of ATWS which was based on the Westinghouse report WCAP-11993 (Ref. 4). However, WCAP-11993 was submitted by Westinghouse for information only and, as a result, has never been formally reviewed by the staff. Therefore, it could not be used as a basis for supporting a TS change which increases the positive value of the MTC. The proposed amendment renews the previously proposed request to increase the positive value of the MTC in TS 3.1.1.3 and presents additional TS and Bases modifications to support this request.

## 2.0 EVALUATION

The Seabrook TS currently require the MTC to be within the limits specified in the Core Operating Limits Report (COLR) with a maximum upper limit of  $0 \Delta k/k/^\circ F$  at all power levels. In order to reduce the amount of burnable neutron absorber required to control reactivity and thereby provide significant improvement in fuel utilization, North Atlantic has proposed to operate Seabrook with a positive MTC at low power levels. The proposed change to the TS would allow a maximum upper MTC limit of  $+0.5 \times 10^{-4} \Delta k/k/^\circ F$  with all control rods withdrawn, BOC, for power levels up to 70% RTP with a linear ramp to  $0 \Delta k/k/^\circ F$  at 100% RTP.

To justify the change in allowed MTC, North Atlantic reanalyzed UFSAR events which could be affected significantly by the change, using NRC approved methods and the proposed  $+0.5 \Delta k/k/^\circ F$  MTC value below 70% power, and submitted them for staff review in YAEC-1871. These included the most limiting events, control rod withdrawal and ejection, loss of load, boron dilution, loss of flow and locked rotor. The results were within the limits specified in the UFSAR, indicating that the proposed change in MTC limit is acceptable for the standard limiting UFSAR events.

However, the information initially provided for the effect of MTC change on ATWS analysis forming the bases for the ATWS rule (10 CFR 50.62) was not sufficient. The justification provided was based on the Westinghouse topical report WCAP-11993 (Ref. 4), a probability analysis of parameters important for ATWS, which had been developed several years ago during a previous review of positive MTC interaction with the analysis bases for the ATWS rule. That report had not been submitted for review and could not provide a basis for justification of the proposed Seabrook TS change without an extensive review. Therefore, North Atlantic decided to address the ATWS problem by limiting the MTC to be within the values used in the Westinghouse calculations forming part of the input for the ATWS rule development. These calculations used a value of  $-8 \text{ pcm}/^\circ F$  (1 pcm is equal to  $10^{-5} \Delta k/k$ ) for the MTC at the initial event conditions of full power, equilibrium xenon, to provide a value not to be exceeded for 95% of the cycle as specified by the NRC. Information letters on ATWS analysis using a  $-8 \text{ pcm}/^\circ F$  MTC were submitted by Westinghouse in References 5 and 6.

The cycle-specific hot zero power (HZP), ARO, MTC limit specified in the Seabrook COLR will be derived to assure that the limiting hot full power (HFP), ARO, MTC is equal to or more negative than  $-8 \text{ pcm}/^\circ F$ . The behavior of the MTC with cycle exposure and power level is such that even for cycles designed with a limit of  $-8 \text{ pcm}/^\circ F$  at HFP, ARO, there will be times when the MTC is less negative than this limit. Therefore, North Atlantic reviewed the power history of previous Seabrook cycles to determine the fraction of time when the MTC would have been less negative than  $-8 \text{ pcm}/^\circ F$ . Their conclusion was that the MTC of previous cycles designed with a ARO, HFP limit of  $-8 \text{ pcm}/^\circ F$  would be less negative for less than 5% of the time, thus meeting

the ATWS assumption. The staff concurs that this conclusion should apply to future Seabrook cycles as well since future cycles are expected to have more efficient startups and fewer trips.

Thus, the MTC will be compatible with the analyses forming the bases for the ATWS rule. Each fuel cycle will be designed to accomplish this using NRC approved methods for analysis. In addition, North Atlantic has included a statement to the Bases for TS 3.1.1.3 to identify the fact that the reactor core will be designed to have an MTC less positive than  $-8 \text{ pcm}/^{\circ}\text{F}$  for at least 95% of the cycle time at full power. This is an acceptable solution to the ATWS problem and the proposed MTC TS change falls within the bases of the ATWS rule.

### 3.0 TECHNICAL SPECIFICATIONS

The following TS and Bases changes are proposed:

- (1) TS 3.1.1.3 is changed to permit the MTC to be  $+0.5 \times 10^{-4} \Delta k/k/^{\circ}\text{F}$  up to 70 percent power with a linear ramp to 0 at 100% RTP.
- (2) The Basis to TS 3.1.1.3 is modified to include a commitment to compliance with the ATWS Rule and the basis for the Rule by assuring ATWS core damage frequency will remain below the target of  $1.0 \times 10^{-5}$  per reactor year established in SECY-83-293 (Ref. 7). In addition, the reactor core will be designed to have an MTC less positive than  $-8 \text{ pcm}/^{\circ}\text{F}$  for at least 95% of the cycle time at full power.
- (3) The amendment approving the above proposed TS changes will be referenced in TS 6.8.1.6.b as the approved analytical method for determining the cycle specific upper MTC limit to be placed in the COLR. North Atlantic has agreed to submit this proposed amendment request.

We have reviewed the information submitted by North Atlantic for Seabrook to justify proposed TS changes to the requirements for the MTC and permit a positive MTC up to  $+0.5 \times 10^{-4} \Delta k/k/^{\circ}\text{F}$  below 70% RTP with a linear ramp to 0 at 100% RTP. Based on this review, the staff has concluded that the reactor will operate within the analyses forming the relevant bases for the ATWS rule. The staff has concluded that appropriate information was submitted and the proposed changes to the TS are acceptable.

### 3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Hampshire and Massachusetts State officials were notified of the proposed issuance of the amendment. The State officials had no comments.

### 4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC 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 offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (60 FR 35082). Accordingly, the 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.

## 5.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 6.0 REFERENCES

1. Letter and attachments from T. Feigenbaum, North Atlantic Energy Service Corporation, to USNRC Document Control Desk, dated May 30, 1995, "License Amendment Request 95-05: Positive Moderator Temperature Coefficient (TAC No. M92006)."
2. YAEC-1871, "Safety Analysis in Support of Wide-Band Operation and Core Design Enhancements for Seabrook Station," September 1993.
3. Letter from A. De Agazio (NRC) to T. Feigenbaum (North Atlantic Energy Service Corporation (North Atlantic)), "Amendment No. 33 to Facility Operating License NPF-86: Wide-Band Operation and Core Enhancements - License Amendment Request 93-18 (TAC M87849)," November 23, 1994.
4. WCAP-11993, "Joint Westinghouse Owners Group/Westinghouse Program: Assessment of Compliance with ATWS Rule Basis for Westinghouse PWRs," December 1988.
5. NS-TMA-2096, letter from T. Anderson, Westinghouse, to R. Mattson, NRC, "ATWS submittal," June 8, 1994.
6. NS-TMA-2182, letter from T. M. Anderson, Westinghouse, to S. Hanauer, NRC, "ATWS submittal," December 30, 1979.
7. SECY-83-293, W. Dirks (NRC), "Amendments to 10CFR50 Related to Anticipated Transients Without Scram (ATWS) Events," July 19, 1983.

Principal Contributor: L. Kopp

Date: September 14, 1995