

# NORTHEAST UTILITIES



THE CONNECTICUT LIGHT AND POWER COMPANY  
WESTERN MASSACHUSETTS ELECTRIC COMPANY  
HOLYOKE WATER POWER COMPANY  
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January 7, 1988

Docket No. 50-423

B12786

Re: 10CFR50.90 and 50.62

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

- References:
- (1) R. L. Ferguson letter to E. J. Mroczka, Cycle 2 Reload, dated December 1, 1987.
  - (2) A. C. Thadani letter to R. Newton (Chairman, WOG), ATWS Moderator Temperature Coefficient, dated June 12, 1987.
  - (3) R. Newton (Chairman, WOG) letter to A. C. Thadani, WOG/NRC Meeting Summary: Implications of Current Core Design Trends on the ATWS Rule, dated November 23, 1987.
  - (4) J. F. Opeka letter to V. S. Noonan, ATWS Rule - Implementation Plan, dated November 5, 1986.
  - (5) E. L. Doolittle letter to E. J. Mroczka, ATWS Rule - Implementation Plan, dated January 21, 1987.
  - (6) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, Cycle 2 Reload, Technical Specification Change Requests, dated September 9, 1987
  - (7) J. F. Opeka letter to T. Murley, Millstone Unit No. 3, Report on Plant Startup and Power Escalation Testing, dated July 22, 1986.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3  
Cycle 2 Reload Technical Specification Change Requests  
(TAC No. 66023)

## INTRODUCTION

In a letter dated December 1, 1987 (Reference (1)), the NRC requested information regarding the expected moderator temperature coefficient (MTC) for Millstone Unit No. 3 during the

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upcoming Cycle 2. The purpose of this request was to allow the NRC to determine, as indicated in a June 12, 1987 letter (Reference (2)), whether the initial MTC for Cycle 2 would be more positive than those used in the anticipated transients without scram (ATWS) analyses performed for Westinghouse plants. In related correspondence between the NRC Staff and the Westinghouse Owners Group (WOG), the Staff has requested, for all Westinghouse plants, confirmation of the continued applicability of previously derived initial assumptions regarding reactivity feedback in the ATWS analyses that were used by the Staff in the development of the ATWS rule. The NRC's stated basis for these questions is a concern that industry trends toward longer cycles, use of optimized fuel designs, power upratings, and so forth may have an unfavorable impact with regard to the risk reduction achieved by the ATWS rule.

As a result of an October 7, 1987 meeting among the NRC, the WOG, and Westinghouse, a separate meeting of the WOG Analysis Subcommittee held on October 28, 1987, and subsequent discussions, the WOG agreed to provide a technical response to the NRC request. As indicated to the NRC Staff in Reference (3), this report will include the WOG's assessment of the conclusions of the Staff's analysis of the reduction in ATWS risk described in SECY-83-293 as it is affected by changes in reactivity feedback. Furthermore, it is intended that this report be generic to all Westinghouse PWR designs in addressing the ATWS reactivity feedback issue and therefore obviates the need for further plant-specific NRC Staff review.

Northeast Nuclear Energy Company (NNECO), as a member of the WOG supports the ongoing generic WOG program, which will provide results in mid-January, 1988. However, in the interim, a plant-specific response to Millstone Unit No. 3, Cycle 2, is provided here. The following paragraphs provide justification for continued compliance with the ATWS rule for Millstone Unit No. 3, Cycle 2.

#### BACKGROUND

The only requirement for Westinghouse PWRs as stated by the final ATWS rule, 10CFR50.62 Paragraph (c)(1), is:

Each pressurized water reactor must have equipment from sensor output to final actuation device, that is diverse from the reactor trip system, to automatically initiate the auxiliary (or emergency) feedwater system and initiate a turbine trip under conditions indicative of an ATWS. This equipment must be designed to perform its function in a reliable manner and be independent (from sensor output to the final actuation device) from the existing reactor trip system.

For Westinghouse PWRs, this requirement is met by the installation of AMSAC (ATWS Mitigating System Actuation Circuitry), which

provides equipment to trip the turbine and initiate auxiliary feedwater diverse from the reactor protection system. The NRC has reviewed several AMSAC designs for Westinghouse plants, as presented in WCAP-10858, Rev. 1, and approved their use on a generic basis.

The bases for the ATWS rule are described in SECY-83-293, "Amendments to 10CFR50 Related to Anticipated Transients Without Scram (ATWS) Events," July 19, 1983. After consideration of both prescriptive and evaluation model rule formats, comments from interested parties on proposed alternatives, the substantial quantity of technical evaluations performed during preceding years, and the potentially large expense of performing plant-specific evaluation model analyses, the NRC's ATWS Steering Group (responsible for the approach to the alternative) directed the NRC ATWS Task Force (responsible for the technical basis) to evaluate prescriptive options for each reactor manufacturer. The NRC Staff used the above results from the probabilistic risk assessment analysis in combination with engineering judgement to develop the final rule alternatives proposed to the Commission in SECY-83-293. Value/Impact (V/I) calculations were performed by the ATWS Task Force in order to determine the degree of prescribed requirements for each vendor.

In considering the potential consequences of an ATWS core damage accident, the Task Force used, in its V/I calculation, a target for core damage frequency due to ATWS events of no more than about  $1 \times 10^{-5}$  per year, which is 10% of the proposed core damage safety goal of  $10^{-4}$ . The definition of unacceptable plant conditions leading to core damage used by the Task Force for Westinghouse PWRs was conservatively assumed as exceeding 3200 psig. This pressure is a conservative bound for ASME Service Level C for Westinghouse PWRs. As a result of the SECY-83-293, NRC Staff recommendations to the Commission, the final ATWS rule, 10CFR50.62, was posted in the Federal Register on June 26, 1984. For Westinghouse plants, the only ATWS rule requirement was the implementation of features that have been incorporated into approved AMSAC designs.

The following paragraphs demonstrate Millstone Unit No. 3 compliance with the 10CFR50.62 requirements and the bases established in SECY-83-293.

### **APPLICABILITY OF 10CFR50.62 TO MILLSTONE UNIT NO 3**

In Reference (4), NNECO informed the Staff that Millstone Unit No. 3 would be in full compliance with the requirements of 10CFR50.62 by the end of the second refueling outage. The above schedule has been accepted by the Staff (Reference (5)). The following information is provided in order to respond to the specific NRC Staff request for Cycle 2 data.

In performing the probabilistic analysis for PWRs reported in Enclosure "D" of SECY-83-293, "Recommendations of the ATWS Task

Force," simplified event trees for each generic reactor design were used by the NRC Staff. These simplified event trees were constructed to include the accident sequence considerations assumed to represent the important ATWS accident sequence events identified in prior studies. Conservative assumptions were made in a number of areas in order to simplify the representation and allow a very broad applicability.

Among the assumptions made for this assessment was the fraction of time for which reactivity feedback (measured in terms of initial MTC for the SECY-83-293 assessment) would be unfavorable. Unfavorable reactivity feedback was defined as the existence of initial plant conditions such that an ATWS transient would result in reactor coolant system pressure above 3200 psig. For non-turbine trip cases, it was assumed that this would occur 10 percent of the time. For turbine trip transients, it was arbitrarily assumed that this would occur 1 percent of the time.

As indicated in letter NS-EPR-83-2833 (E. P. Rahe, Westinghouse, to S. J. Chilk, NRC, October 3, 1983), the results of studies performed generically for Westinghouse plants indicate that, for the typical 4-loop plant design which represents the limiting design, the peak pressure resulting from an ATWS would be 3200 psig for a full power MTC of  $-5.5 \text{ PCM}/^\circ\text{F}$ ; lower peak pressures would occur with more negative MTC values. An assessment of reactivity feedback, as compared to that which would cause transient peak pressure to exceed 3200 psig, was made for Millstone Unit No. 3 Cycle 1 and Cycle 2. For Cycle 1, the full power MTC is more negative than  $-10.5 \text{ PCM}/^\circ\text{F}$  with equilibrium Xenon. For the Cycle 2 core design, full power MTC is more negative than  $-7.6 \text{ PCM}/^\circ\text{F}$  with equilibrium Xenon conditions. Both cycles satisfy the core reactivity assumptions of SECY-83-293. Therefore, the reactivity feedback bases used in SECY-83-293 are confirmed for Millstone Unit No. 3, Cycle 1 and Cycle 2. The actual Cycle 1 MTC, measured at hot zero power, beginning of life conditions, is documented in the Millstone Unit No. 3 startup test report, Reference (7).

#### SUMMARY

With regard to the NRC Staff's recent request to NNECO for information regarding MTC and ATWS for Millstone Unit No. 3, the following key points are noted:

1. The objective of the ATWS rule is to demonstrate an acceptable level of reduction in the risk of ATWS events. This is accomplished for Westinghouse reactors by the installation of AMSAC, as demonstrated by the NRC Staff's favorable V/I assessment of the AMSAC option for mitigating ATWS events. In addition, the SECY-83-293 analysis shows that the likelihood of core damage due to ATWS events met the NRC Staff's target of no more than about  $1 \times 10^{-5}$ /yr.

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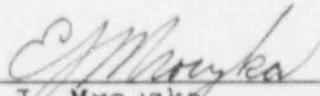
2. NNECO has committed to the installation of the NRC-approved AMSAC design in Millstone Unit No. 3, and the NRC Staff has approved the schedule for this installation.
3. Although specific and detailed information related to ATWS rule compliance is not required for core design changes, we have provided, in response to the NRC's Millstone Unit No. 3 Cycle 2 specific question, confirmation that the assumptions set forth in the basis for the ATWS rule will be met, and the expected risk of core damage due to ATWS, assuming installation of AMSAC, will be less than  $1 \times 10^{-5}$ . For comparison purposes, as requested by the NRC Staff, this was also true for Cycle 1.

For these reasons, Millstone Unit No. 3 is in compliance with the ATWS rule.

We believe the above information coupled with the information provided in Reference (6) provides a complete basis for approval of the requested amendment. We also believe that this one-time-only evaluation provides further evidence that the WOG approach to resolution of the ATWS issue is appropriate without detailed, cycle-specific analyses. Of course, if the Staff has any additional questions, NNECO will be available to discuss the Staff's concerns.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

  
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Senior Vice President

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