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Docket No. 50-245 B10289



Director of Nuclear Reactor Regulation Attn: Mr. Dennis M. Crutchfield, Chief Operating Reactors Branch #5 U. S. Nuclear Regulatory Commission Washington, D.C. 20555

References: (1) D. G. Eisenhut letter to All SEP Licensees, dated July 7, 1981.

> W. G. Counsil letter to D. G. Eisenhut, dated (2) July 29, 1981.

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Millstone Nuclear Power Station, Unit No. 1 SEP Topic IV-2, Reactivity Control Systems Including Functional Design and Protection Against Single Failures

Reference (1) requested the SEP licensees to commit additional resources devoted to completion of the SEP. In Reference (2), Northeast Nuclear Energy Company (NNECO) committed to develop Safety Assessment Reports (SARs) for certain SEP topics which would be submitted for Staff review. In accordance with this commitment, NNECO hereby provides the Safety Assessment keport for SEP Topic IV-2, Reactivity Control Systems Including Functional Design and Protection Against Single Failures which is included as Attachment 1.

We trust the Staff will appropriately use this information to develop a Safety Evaluation Report for this SEP topic.

Very truly yours,

NORTHEAS'I NUCLEAR ENERGY COMPANY

W. G. Counsil Senior Vice President

Doc:et No. 50-245

ATTACHMENT 1

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SAFETY ASSESSMENT REPORT

SEP TOPIC IV-2, REACTIVITY CONTROL SYSTEMS INCLUDING FUNCTIONAL DESIGN AND PROTECTION AGAINST SINGLE FAILURES

September 1981

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 1 SAFETY ASSESSMENT REPORT

TOPIC IV-2, RFACTIVITY CONTROL SYSTEMS, INCLUDING FUNCTIONAL DESIGN /.ND PROTECTION AGAINST SINGLE FAILURES

1.0 INTRODUCTION

The purpose of this assessment is to ensure that the design basis for Millstone Unit No. 1 reactivity control systems is consistent with analyses performed to verify that the protection system meets General Design Criterion 25. This assessment is limited to the identification and evaluation of inadvertent control rod withdrawls and molpositioning of control rods which may occur as a result of single failures in the electrical circuits of the reactivity control systems.

2.0 CRITERIA

General Design Criterion 25 requires that the Reactor Protection System be designed to assure that specified acceptable fuel design limits are not exceeded for any single malfunction of the reactivity control systems, such as accidental withdrawal of control rods but not including a control rod ejection incident. Reactivity control systems need not be single failure proof; however, the protection system must be capable of assuring that the specified acceptable fuel design limits are not exceeded in the event of a single failure in the reactivity control systems.

Standard Review Plan, Section 7.7, states:

The control systems not required for safety are acceptable if failures of control system components or total systems would not significantly affect the ability of plant safety systems to function as required, or cause plant conditions more severe than those for which the plant safety systems are designed.

3.0 DISCUSSION

In Reference 1, NNECO provided the Staff with information concerning potential single failures in reactivity control systems which could cause an inadvertent reactivity insertion. These single failures are limited to failures which result in control rod withdrawal or increased recirculation rates. Single failures which can cause control rod positioning in other than design sequence include rod drift, rod drop, control rod drive housing failure, and operator error. Below 20% full power, the rod worth minimizer circuits provide a rod withdrawal block to back up administrative procedures for rod withdrawal sequence. The rod worth minimizer is described in Section 7.10.2 of the FSAR. Control rod velocity limiters, described in Sections 6.1.4 and 6.5 of the FSAR, limit the free fall velocity of a dropped control rod. The control rod drive housing supports are described in Sections 6.1.5 and 6.6 of the FSAR. The rod block monitor (RBM), described in Section 7.3.5.3 of the FSAR, prevents fuel damage by blocking further withdrawal of control rods at power levels below those where fuel damage could occur. Two redundant RBM channels are provided.

NNECO has analyzed control rod malfunctions in connection with the Design Basis Event reviews for SEP; the conclusions were forwarded to the Staff in Reference 2. These results showed that for an inadvertent rod withdrawal or drop due to mechanical failure or operator error, the design criteria would not be exceeded.

A single failure in the recirculation pump control can cause also a reactivity insertion. A recirculation pump control failure which causes the pumps to ramp up to 100% speed will increase speed at a rate of 20%/second. The maximum recirculation rates are inherently limited to values below the threshold of fuel damage when power operation is initially within the core operating map. This event was analyzed in Section 4.3.3.3 of the FSAR and in Reference 2. The results of these analyses showed that the limiting MCPR would not be reached.

4.0 CONCLUSIONS

NNECO has deteremined that single failures in the rod control system will not lead to reactivity insertions more severe than those previously analyzed, and thus the requirements of General Design Criterion 25 are met. This was verified in the Design Basis Event reviews, Reference 2.

5.0 REFERENCES

- 1. W. G. Counsil letter to D. M. Crutchfield, dated March 24, 1981.
- 2. W. G. Counsil letter to D. M. Crutchfield, dated June 30, 1981.

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