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Docket No. 50-245
B11864

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

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Degraded Grid Protection for Class 1E Power Systems

In May, 1984(1) Northeast Nuclear Energy Company (NNECO) proposed that the voltage and time delay relay panels associated with the degraded grid protection modification would be installed but tied into the alarm circuits only. The existing undervoltage (70% to 90%) protection was to be kept in service until the final tie-ins were made. This final tie-in was to take place during the refuel outage scheduled during the fourth quarter of 1985. The purpose of this letter is to update the Staff as to the current status of the project to provide final tie-ins of this equipment.

Project History

As originally conceived, the project was to have been implemented in two phases, with the final phase to be completed during the 1984 refueling outage. Phase 1 involved an initial relocation of the undervoltage detection to the Class 1E buses from the high side of the station reserve transformer. Phase 2 was to involve a split of the LNP logic into two separate divisions to allow for the auto-reinstatement of the load shed feature. Upon further investigation it was determined that the modification would have to be completed in only one phase. The specific reasons for this change of schedule were reported to the Staff in October, 1982.(2) A final design was completed at the end of 1983 and forwarded to the Staff.(3) The engineering and design for the modification were complete as of March, 1984.

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(1) W. G. Counsil letter to D. M. Crutchfield, "Degraded Grid Protection for Class 1E Power Systems," dated May 11, 1984.

(2) W. G. Counsil letter to D. M. Crutchfield, "Degraded Grid Protection for Class 1E Power Systems," dated October 4, 1982.

(3) W. G. Counsil letter to D. M. Crutchfield, "Millstone Nuclear Power Station, Unit No. 1 Degraded Grid Protection for Class 1E Power Systems," dated January 17, 1984.

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Following completion of the design and engineering of the system, unforeseen delays and problems arose in connection with procurement of the voltage and time delay relay panels from the vendor.

These problems, which were documented to the Staff,[4] included relays which did not perform to specification during the acceptance testing of the panels and relays which could not be calibrated as stated in their instruction manual. Following replacement and/or modification of the relays causing the problems, acceptance testing resumed April 2, 1984. These problems encountered during the acceptance testing phase of the project were further highlighted by the occurrence of two related 10CFR Part 21 reportable events[5][6] for the relay types being used.

In view of the problems associated with the relays, and taking advantage of past experience with two other Millstone projects which had shown that spurious plant trips could be avoided if an extensive "burn-in" period is used, NNECO proposed to install the panels during the 1984 refuel outage but to only tie into the alarm circuits and keep the existing undervoltage (70% and 90%) protection in service until the final tie-ins were made. Previous experience with Anticipated Transient Without Scram (ATWS) related modifications had shown the importance of having new systems connected to the plant electrical system during all modes of plant operation in order to monitor the new outputs for spurious operation before trip circuits are energized. It was felt that allowing an exhaustive "burn-in" period would prevent spurious trips and unwarranted transients.

Spurious operation of the undervoltage protection system would trip both the preferred off-site power supply and the feedwater system. These spurious transients would be of a more severe nature than those experienced in conjunction with the ATWS project. The modifications were installed, tied into the alarm circuits only, during the 1984 refueling outage.

Proposed Delay in Complete Implementation

As a part of the internal safety review conducted by Northeast Utilities Service Company (NUSCO) for plant design changes, an integrated safety evaluation is performed following the safety evaluations done by the various engineering disciplines. As a part of the integrated safety evaluation for this modification, the principles of Probabilistic Risk Assessment (PRA) were applied to assist in

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(4) W. G. Counsil letter to D. M. Crutchfield, "Millstone Nuclear Power Station, Unit No. 1, Degraded Grid Protection for Class 1E Power Systems," dated May 11, 1984.

(5) IE Information Notice No. 82-50, "Modification of Solid State AC Undervoltage Relays Type ITE-27."

(6) D. D. Duval (Brown Boveri) letter to R. C. DeYoung (NRC, Office of Inspection and Enforcement), dated March 13, 1984.

judging the impact of the design change on plant safety as required by 10CFR50.59:

- o if the probability of occurrence or the consequences of an accident or a malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or
- o if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or
- o if the margin of safety as defined in the basis for any technical specification is reduced.

Although the design for degraded grid protection reflected sound engineering and design practices, the integrated safety evaluation showed that the chance of a station blackout following a loss of the switchyard would be approximately 2.4 times greater with the new design than with the existing undervoltage (70% and 90%) protection. This increase in probability is referenced to the base conditions as analyzed in the Probabilistic Safety Study (PSS) for Millstone Unit No. 1 submitted to the Staff in July, 1985.(7)

The application of PRA methods, having identified the increased probability of a station blackout, led NNECO to the determination that the final tie-in of the existing circuitry would not be prudent until the design can be refined. Further, implementation of this design change is unacceptable, not merely an unreviewed safety question(8) and the modification can be reengineered to eliminate the adverse impacts discussed above. The problem centers around the increased probability of a station blackout as a result of eliminating redundant train interactions.

The application of PRA methods in the integrated safety evaluation of the Degraded Grid Protection plant design change request (PDCR) was one of the first such applications of the plant-specific PSS for NNECO. The delay in the timing of the PRA evaluation in relation to the initiation of the PDCR was the result of the expenditure of manpower and resources earlier this year required by NUSCO in developing and implementing the Integrated Safety Assessment Program (ISAP).

As a result of the delay in completing the integrated safety evaluation of the PDCR, the time available prior to the outage was not sufficient to allow the necessary redesign and procurement of the materials necessary to complete final tie-in of the system during the 1985 refuel outage (which began October 26, 1985

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(7) J. F. Opeka letter to J. A. Zwolinski, "Millstone Unit No. 1 Probabilistic Safety Study - Results and Summary Report," dated July 10, 1985.

(8) This is contrasted with other design changes which constitute unreviewed safety questions pursuant to 10CFR50.59, but which are suitable and appropriate for implementation following review and disposition of the concerns identified.

and is scheduled to end in November, 1985). It is therefore planned that the panels installed during the 1984 outage with tie-ins to alarms only be maintained in their current configuration until the next refueling outage at which time the final tie-ins will be completed. Interim procedures, currently under review by the Staff, will continue to be used when responding to these alarm circuits. The redesign and procurement effort will be completed in time to support final implementation during the 1987 refueling outage. The scope of these modifications is such that mid-cycle implementation is not feasible.

While we realize that implementation of this project has taken considerable time since its inception, there is no other realistic alternative available at this juncture. In this case a circuit design based on normally accepted methods and procedures was found to have an unintentional adverse impact which outweighs the intended improvement. While we did not anticipate this development, we believe it is illustrative of the benefits that the ISAP process will foster as it is fully implemented at Millstone Unit No. 1. The intricacies associated with proper implementation of design changes necessitate the conduct of thorough and comprehensive reviews. The ultimate goal of improved overall plant safety will be served in the long term via the ISAP process.

The final implementation of this project will be completed as summarized above unless otherwise informed by the NRC Staff. Should your Staff require additional information on any aspect of this project, we would be happy to accommodate your request.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

J. F. Opeka
Senior Vice President

cc: C. I. Grimes