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January 30, 1992

Docket No. 50-336
B14005

Re: 10CFR50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Shutdown Cooling System Autoclosure Interlock Deletion

Introduction

Northeast Nuclear Energy Company (NNECO) hereby proposes to remove the autoclosure interlock (ACI) from the shutdown cooling system (SDCS) suction valves at Millstone Unit No. 2. The current design provides an ACI and an open permissive interlock (OPI) on each of the isolation valves to reduce the probability of inadvertent connection of the reactor coolant system (RCS) to the SDCS when the RCS pressure is above 280 psia. Motor-Operated Valves (MOVs) 2-SI-651 and 2-SI-652, which are in series and controlled by these interlocks, create a double barrier to isolate the SDCS suction line from the RCS. The OPI prevents the SDCS suction isolation valves from being opened when the RCS is already pressurized. The ACI closes the SDCS suction isolation valves when the RCS pressure increases above 280 psia. The proposed modification will remove the ACI feature of the SDCS Suction Valves 2-SI-651 and 2-SI-652. Instead, an alarm will be added on these valves to warn the operators whenever a SDCS suction isolation valve is open and the RCS pressure is greater than 280 psia.

Removal of the SDCS ACI feature addresses Commission concerns regarding the potential for failure of the ACI circuity which could cause inadvertent isolation of the SDCS with subsequent loss of shutdown cooling capability during cold shutdown and refueling operation. In addition, the proposed modification is consistent with the recommendations of Generic Letter 88-17, "Loss of Decay Heat Removal."

The proposed removal of ACI features will result in a change in the Millstone Unit No. 2 Technical Specifications. Therefore, pursuant to 10CFR50.90, NNECO hereby proposes to amend its operating license, DPR-65, by incorporating the changes identified in Attachment 1 into the Technical Specifications of Millstone Unit No. 2.

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Background

The SDCS is designed to achieve and maintain a cold shutdown condition by removing residual energy from the RCS and decay heat from the reactor core. While the RCS has a design pressure of 2500 psia, the SDCS components have a design pressure of 500 psig, with the exception of SDCS Suction Line GCB-1 which has a design rating of 300 psig. Since two piping systems of different design pressures are connected, suitable isolation capability must be provided when the RCS is being operated at high pressure. To ensure that isolation of the SDCS will remain in effect after any credible failure has occurred, two isolation devices in series are provided (2-SI-651 and 2-SI-652).

When the SDCS is in use, the system becomes an extension of the reactor coolant pressure boundary. Since a number of pressurization sources exist within or are connected to the high-pressure RCS, the low-pressure SDCS must be protected against postulated pressurization transients when the systems are connected. To accomplish this, Relief Valve 2-SI-468 is provided on the SDCS suction line.

The overpressure protection of the SDCS which is provided by the SDCS relief valve is based on those transients postulated to occur during normal SDCS operation. This relief valve is not intended to protect the SDCS against overpressurization as a result of being inadvertently exposed to full RCS pressure during power operation. A relief device with the capacity to protect against this event would not be practical. Should the SDCS be exposed to RCS pressure during power operation, the SDCS could rupture at a point outside the containment causing an interfacing system loss-of-coolant accident (ISLOCA) outside containment.

To guard against this, appropriate alarms and two instrumentation interlocks are used to reduce the probability of the inadvertent connection of the RCS to the SDCS when the RCS is pressurized. These interlocks are generally described in Reactor Systems Branch Technical Position (BTP) 5.1. The first interlock is designed to prevent opening the SDCS isolation valves when RCS pressure is above the SDCS design pressure. This feature is the OPI. It protects against the spectrum of events which result from the SDCS suction isolation valves being opened when the RCS is already pressurized. The proposed design modification does not involve any change to this interlock.

The second interlock automatically provides a close signal to the isolation valves when RCS pressure exceeds 280 psia. Therefore, should these valves be inadvertently left open during RCS heatup and pressurization, the SDCS isolation valves would automatically close upon reaching a predetermined pressure set point. This feature is the ACI. Removal of ACI is being proposed as a way to decrease the probability of loss of shutdown cooling events.

As previously described, it is necessary to have two valves in series to form a reactor coolant pressure boundary so that no single failure can result in complete loss of this barrier. The double barrier is established by the

operator closing both valves when going from SDCS operation to steam generator cooling during plant heatup. Failure to establish this double barrier is possible due to a failure of the valve, valve operator, valve controls, or by operator error. A potential operator error is the closure of only one valve followed by RCS pressurization. It is this operator error that ACIs (and alarms) are intended to guard against.

The design of ACI presents an optimization issue between two competing safety functions. When the SDCS is needed, the suction valves must remain open. Failures resulting in valve closure are a safety concern due to the loss of decay heat removal. Conversely, when ACI action is required, failures which leave the valves open adversely impact safety by overpressurizing the SDCS.

The industry has experienced a number of spurious valve closure events caused at least in part by the presence of the ACI. A frequent cause of spurious ACI action is the accidental or intentional de-energization of a power supply during refueling. This event frequently results from maintenance work performed during refueling outages. The ACI circuit can be actuated after losing any of several power supplies. A second spurious valve closure is an ACI actuation following receipt of an invalid high RCS pressure signal due to testing. Again, this type of testing is usually performed only during refueling outages. While redesign of the pressure loops and ACI circuit could eliminate the loss of power supply problems, it would not protect against invalid pressure signals.

Resolution of issues related to loss of shutdown cooling events has been a topic of increasing concern to both the NRC and the industry for several years. Studies have identified spurious operation of ACI as the most frequent cause of reported loss of SDCS events between 1976 and 1983.(1)

Spurious operation of ACI results in the closure of the SDCS pump suction valves. This has two potential impacts. The most immediate result of valve closure is loss of SDCS flow and corresponding loss of decay heat removal from the core. The resultant RCS temperature rise can result in pressurization of a closed system or loss of fluid through boiling if the reactor vessel head is removed for refueling. The second result of valve closure may be significant damage to the SDCS pumps due to loss of suction. This event is serious due to the potential for complicating the short-term recovery of core cooling and the longer repair time.

Since ACI is a significant contributor to loss of SDCS events at other plants, NNECO is proposing removal of the feature from Millstone Unit No. 2. The NRC has encouraged removal of ACI in Generic Letter 88-17. In that document, the NRC suggests that utilities seeking removal of ACI consider the approach taken by Pacific Gas and Electric in removing the ACI from the Diablo Canyon units.

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(1) Reference NRC Case Study Report AEOD/C503 dated December 1985.

Safety Assessment

In September 1989, Combustion Engineering (CE) completed a report, CE NSPD-550, "Risk Evaluation of Removal of Shutdown Cooling System Auto-Closure Interlock," which documents the results of an analysis of the impact of removing the ACI from the SDCS. The evaluation was performed to determine the change in ISLOCA frequency, the change in SDCS unavailability, and the impact on mitigating low-temperature overpressure events due to the removal of ACI. This evaluation addresses seven guidelines for ACI removal recommended by the NRC in a memorandum from R. W. Sharon (Chief, Reactor Systems Branch) dated January 28, 1985. In summary, the following discussion describes how each of the seven items will be met. It should be noted that this discussion closely parallels that accepted by the NRC for Diablo Canyon.(2)

1. Means available to prevent a LOCA outside containment.

   The Millstone Unit No. 2 design provides for a double barrier between the RCS and the SDCS. The design provides a very high probability that at least one barrier can be established and maintained under postulated conditions. Procedural controls, training, alarms, and the OPI function minimize the potential that the operator will fail to achieve double isolation during normal heatup and pressurization of the RCS. In addition, a review and evaluation have been performed for Millstone Unit No. 2 (see Attachment 2) to justify removal of the ACI associated with the Millstone Unit No. 2 SDCS suction valves. This evaluation has shown that removal has no measurable impact on the ISLOCA frequencies.

2. Alarms to notify the operator that SDCS suction valves are mispositioned.

   Visual and audible alarms will be provided in the main control room to inform the operator if either of the SDCS suction valves is not fully closed when RCS pressure is above 280 psia. These alarms, located on the main control boards, are annunciator type which provide operators with both flashing lights and audible signals. The alarm set points will be tested at least once every 18 months to verify operation, and is designed to alert the operators upon alarm circuit failure.

3. Verification of the adequacy of relief valve capacity.

   As a part of the original system design, calculations were performed by CE to ensure that the relief device in the SDCS suction line had adequate capacity to prevent overpressurization of the SDCS. These calculations have been reviewed to confirm that ACI was not credited in the selection

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(2) Reference U.S. Nuclear Regulatory Commission, "NRC Safety Evaluation Relating to Removal of Auto Closure Interlock Function at Diablo Canyon," February 17, 1988.

of limiting events or mitigation of the resulting transients. Therefore, the calculations remain applicable with the ACI removed. Based on a plant-specific probabilistic risk assessment analysis (see Attachment 2), it is concluded that the capacity of SDC Relief Valve 2-SI-468 is adequate except for the overpressure transient where one or more safety injection (SI) pumps may actuate. The operating practices at Millstone Unit No. 2 have minimized the potential for SI pump actuation as far as practicable and cannot be reduced further without adversely affecting the shutdown LOCA risk. Millstone Unit No. 2 Technical Specifications Surveillance Section 4.5.3.2 requires that all but one high-pressure safety injection (HPSI) pump be verified inoperable whenever RCS temperature is at or below 275°F. In addition, Procedure OP2207 also specifically directs this action and then cautions against allowing work that can cause a HPSI pump start until all pumps are disabled.

4. Means other than ACI to ensure that both isolation valves are closed.

   As described in Item 2 above, the proposed modification involves alarms, position indication, procedures, and training to ensure that the double barrier is established upon heatup.

5. Assurance that the OPI is not affected by ACI removal.

   The OPI function will be maintained in its present form, and this interlock will be tested at least once every 18 months to verify operability.

6. Assurance that valve position indication will remain available in the control room after ACI removal.

   The current design provides for valve position indication on the main control board and on the computer display located in the main control room. This indication will be present even when valve operation is locked out during power operation. Additional indication that the valve is closed will be provided by the lack of alarm at any pressure above the alarm set point.

7. Assessment of the effect of ACI removal on SDCS availability and low-temperature overpressure event.

   A plant-specific evaluation (Attachment 2) was conducted to investigate the risk impact of removing the ACI from the Millstone Unit No. 2 SDCS Suction Valves 2-SI-651 and 2-SI-652. In place of the ACI, an alarm will be provided to alert the operator that the SDCS suction valve is not fully closed when the RCS pressure is above the alarm set point. The plant-specific report (Attachment 2) for Millstone Unit No. 2 justifies removal of the ACI based on a safety assessment of the effect of ACI removal on low-temperature overpressure protection (LTOP), SDCS availability, and ISLOCA potential.

Based on the plant-specific analysis (see Attachment 2), it is concluded that the impact of the ACI removal on the ISLOCA frequency is negligible. Based upon industry experience, it is concluded that the frequency of loss of SDCS events could be reduced by approximately 28 percent when the ACI is removed. At Millstone Unit No. 2, the SDCS isolation MOVs are de-energized in the OPEN position during midloop operation. This operating practice minimizes the risk associated with the inadvertent ACI event. Therefore, the 28 percent reduction in SDCS unavailability is not totally applicable to Millstone Unit No. 2. However, ACI removal provides a definite safety benefit since a potential for leaving the SDC isolation valves de-energized in the OPEN position is eliminated when the ACI is deleted and the need for the above-mentioned operating practice is eliminated. Inadvertent ACI actuations that cause the loss of the SDCS are risk-significant if they occur during midloop operations. The analysis (Attachment 2) determined that LTOP plays a significant role in the mitigation of overpressure transients. Based on insights gained during the analysis, the potential for common-cause failure of LTOPs was identified as significant. Therefore, as part of the analysis it was verified that at Millstone Unit No. 2, LTOP consists of two completely independent trains which are used to mitigate LTOP events that may occur during SDC operations. The report concludes that the risk attributed to overpressure transients is not significantly affected by the ACI removal.

The analytical methods used to determine ISLOCA frequency involve fault-tree analysis along with mechanical and human error probabilities. The NRC has previously approved ACI removal for several plants utilizing this approach, including Waterford, San Onofre, and Diablo Canyon.

The discussion presented above demonstrates an adequate level of safety to support the proposed design modification.

Description of the Proposed Changes

The proposed Technical Specification change would delete the surveillance requirement (Section 4.5.2.C.1) associated with the SDCS ACI concurrent with the deletion of ACI circuitry planned for the next refueling outage. Surveillance Requirement 4.5.2.C.1 of the Millstone Unit No. 2 Technical Specifications requires that the automatic isolation of SDCS from the RCS be verified on an 18-month interval. However, with the ACI function removed, there is no longer a need to retain this surveillance requirement within the Technical Specifications.

In addition, a surveillance requirement is proposed to be added in place of the existing Requirement 4.5.2.C.1. Specifically, the new surveillance requirement would verify the operation of the OPI that prevents opening of the SDCS suction valves when the RCS pressure is greater than 300 psia. This new surveillance requirement would ensure that the significant components that were shared by the ACI and OPI and tested under the requirements of

Surveillance 4.5.2.C.1 will continue to be appropriately tested. NNECO has determined that any changes to the bases section are not needed.

Significant Hazards Consideration

In accordance with 10CFR50.92, NNECO has reviewed the attached proposed changes and has concluded that they do not involve a significant hazards consideration. The basis for this conclusion is that the three criteria of 10CFR50.92(c) are not compromised. The proposed changes do not involve a significant hazards consideration because the changes would not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated. The removal of the SDCS ACI was evaluated generically in CE NSPD-550 in terms of the frequency of an ISLOCA, the availability of the SDCS, and the effect on overpressure transients. This generic evaluation has been supplemented by the plant-specific submittal (Attachment 2) for Millstone Unit No. 2. There is a negligible change in the calculated probability of an ISLOCA event associated with ACI removal. The evaluation demonstrates that removing ACI, and replacing it with a valve position alarm, will reduce the number of spurious closures of suction valves and thus increase the availability of SDCS. The present LTOP system will remain available per Technical Specification 3.4.9.3 to mitigate a pressure transient. The proposed change related to testing of existing OPI has no impact on the design basis accidents. Therefore, the proposed changes would not increase the consequences of an accident previously analyzed.

2. Create the possibility of a new or different kind of accident from any previously evaluated. The effect of an overpressure transient at cold shutdown conditions will not be altered by removal of the ACI function. The ACI is intended to ensure that the low-pressure piping of the SDCS is properly isolated from the RCS pressure during start-up operations, it does not protect against hardware failure. The valve position alarm will warn against both operator error and hardware failure.

   While it is true that the ACI initiates an autoclosure of the SDCS suction valves on high RCS pressure, overpressure protection of the SDCS is provided by the SDCS relief valve and not by the slow-acting suction valves that isolate the SDCS from the RCS.

   The possibility of a loss of SDCS is reduced by the proposed change because the potential of the SDCS isolation valves being closed by a spurious signal will be eliminated. No other failures are introduced by ACI removal. Therefore, the proposed changes will not create the possibility of a new or different kind of accident from any previously evaluated.

3. Involve a significant reduction in a margin of safety. The SDCS ACI function is not a consideration in a margin of safety for any technical

Specification. However, since the evaluation of CE NSPD-550 and the Millstone Unit No. 2 plant-specific evaluation indicates that the availability of the SDCS is increased with removal of ACI, implementation of the modification (addition of a control room alarm) and procedural changes will produce an increase in overall safety.

Moreover, the Commission has provided guidance concerning the application of standards in 10CFR50.92 by providing certain examples (51FR7751, March 6, 1986) of amendments that are considered not likely to involve a significant hazards consideration. Although the proposed change related to the ACI surveillance is not enveloped by a specific example, the proposed change would not involve a significant change in the probability or consequences of an accident previously analyzed. With the removal of ACI and an addition of a control room alarm, the Millstone Unit No. 2 plant-specific evaluation predicts a negligible change in ISLOCA. The proposed change related to the testing of OPI is enveloped by Example (ii), a change that constitutes an additional limitation, restriction, or control not presently included in the Technical Specifications. The proposed change will verify the operation of the existing OPI at least once per 18 months. The OPI prevents the SDCS/RCS isolation valves from being opened when the RCS pressure is greater than 300 psia.

Based upon the information contained in this submittal and the environmental assessment for Millstone Unit No. 2, there are no radiological or nonradiological impacts associated with the proposed change, and the proposed license amendment will not have a significant effect on the quality of the human environment.

The Millstone Unit No. 2 Nuclear Review Board has reviewed and approved the attached proposed revision and has concurred with the above determinations.

To allow for implementation of the design change related to this Technical Specification change during the next refueling outage, currently scheduled to start May 1992, your timely review and approval of the proposed license amendment is requested.

In accordance with 10CFR50.91(b), we are providing the State of Connecticut with a copy of this proposed amendment.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

J. F. Opeka
Executive Vice President

cc: See next page

cc: T. T. Martin, Region I Administrator
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

Mr. Kevin McCarthy, Director
Radiation Control Unit
Department of Environmental Protection
Hartford, CT 06106

STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me, J. F. Opeka, who being duly sworn, did state that he is Executive Vice President of Northeast Nuclear Energy Company, a Licensee herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Licensee herein, and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Notary Public

My Commission Expires March 31, 1993