NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

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EXPIRES 04/30/98

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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TITLE (4)

The Evaluation for Removal of Startup Rate Trip Feature was Potentially Non-Conservative

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
07	15	96	96	-- 029 --	01	06	03	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	000		20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)	X	50.73(a)(2)(v)		Specify in Abstract below or NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On July 15, 1996 at approximately 1300 hours with the plant in Mode 5 at 0% power, it was discovered that the analysis for the removal of the High Startup Rate (SUR) Trip from Millstone Unit 2 in 1978 may not have addressed all possible control rod withdrawal events. The SUR Trip feature was removed in accordance with Amendment number 38 to the Technical Specifications issued on April 19, 1978. This event is being reported pursuant to the requirements of 10 CFR 50.73(a) (2) (v), "any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to shut down the reactor and maintain it in a safe shutdown condition."

The cause of this event was the failure to adequately identify the design basis requirements of the SUR Trip. This event caused an inconsistency between the safety analysis and plant configuration for Cycles 2 and 3. Millstone 2 safety analyses for Cycle 4 and later recognized the removal of the SUR Trip. The investigation of this event demonstrated that Millstone 2 can operate without the SUR trip.

There were no automatic or manually initiated safety systems activated as a result of this event.

This revision is a complete re-write to the LER.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. Description of Event

On July 15, 1996 at approximately 1300 hours, with the plant in Mode 5 at 0% power, it was discovered that the analysis for the removal of the High Startup Rate (SUR) Reactor Trip from Millstone Unit Number 2 in 1978 may not have addressed all possible control rod withdrawal events. The SUR Trip feature was removed in accordance with Amendment number 38 to the Technical Specifications issued on April 19, 1978.

On July 17, 1996 at 2018 hours, while in Mode 5 at 0% power, an immediate report was submitted pursuant to the requirements of 10 CFR 50.72(b)(2)(iii)(A), "any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to shut down the reactor and maintain it in a safe shutdown condition."

During the investigation of this event, an error was identified in the current cycle Uncontrolled Control Element Assembly (CEA) Bank Withdrawal analysis. This second event concerned the use of power peaking factors in this analysis which did not bound all possible operating conditions. This second error was reported in an update report on August 12, 1996. Subsequent analysis has shown that this error is not reportable in that the use of incorrect peaking factors would not allow operation of the facility outside design basis limits.

There were no automatic or manually initiated safety systems activated as a result of this event. Additionally, no operator actions were required in response to this event since the SUR Trip was removed in 1978 and this is a report of an historical event.

This event is being reported per 10 CFR 50.73(a)(2)(v), "any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to shut down the reactor and maintain it in a safe shutdown condition."

II. Cause of Event

The cause of this event was the failure to adequately identify the design basis requirements of the SUR Trip.

III. Analysis of Event

The original plant design for Millstone Unit No. 2 included a Start Up Rate (SUR) Trip that was described in the initial pre-license submittals as an equipment protection trip. The Final Safety Analysis Report (FSAR) accepted by the Staff on May 10, 1974, credited the Variable Over Power (VOP) Trip as providing protection against reactivity addition events. The SUR Trip was not credited in the FSAR. In 1977, Northeast Nuclear Energy Company (NNECO) determined that the best solution to problems concerning spurious actuations of the Reactor Protection System would be to remove certain equipment protection trips (including the SUR trip) and the setpoint requirements from the Technical Specifications. Confirmation that the SUR trip could be removed from the Technical Specifications was received from Combustion Engineering in a letter dated July 29, 1977, which stated that "no credit was taken for the High SUR Trip in the safety analyses and that no safety limit is directly related to the trip." Using this information, NNECO, in the letter of September 2 1977, requested an amendment to the Technical Specifications which would eliminate the SUR Trip.

NNECO received the amendment allowing removal of the SUR trip in Amendment number 38 to the Technical Specifications, with corresponding Safety Evaluation Report on April 19, 1978. The SUR Trip was then removed from the plant prior to the start of Millstone Unit 2, Cycle 2.

During the current Design Basis Review, it was questioned whether the physical removal of the SUR trip in 1978 placed Millstone Unit 2 outside of its design basis. ASEA Brown Boveri - Combustion Engineering (ABB-CE) informed NNECO by correspondence on July 15, July 18 and July 19, 1996, that the original design of Millstone Unit 2 incorporated the protective action of a SUR trip to provide protection for subcritical Control Element Assembly (CEA) withdrawal. ABB-CE further explained that, with an operational SUR trip feature, an entire spectrum of events initiated from subcritical conditions were rendered non-limiting and therefore were not included within the plant accident analysis. As a result, the Cycle 2 and 3 safety analysis performed by Combustion Engineering (C-E) addressed Uncontrolled CEA bank withdrawal events initiated from Hot Zero Power, and credited the Variable Over Power (VOP) Trip to terminate the event, without violation of the fuel design limits.

Therefore, Millstone Unit 2, Cycles 2 and 3, with the safety analysis performed by Combustion Engineering, implicitly credited the SUR trip to prevent Uncontrolled CEA bank withdrawal events initiated from subcritical conditions from becoming limiting. Therefore, the removal of the SUR trip during Cycles 2 and 3 allowed Millstone Unit 2 operation outside of the assumptions of the safety analysis. There was no documentation in the FSAR to explain the dependence on the SUR trip to prevent Uncontrolled CEA Bank Withdrawal events initiated from subcritical conditions from becoming limiting. Also during the discussions between NNECO and C-E related to removing the SUR trip from the Technical Specifications, no documentation has been found that explained this dependence on the SUR trip. An additional causal factor of this event is poor communications by NNECO with C-E. No documentation has been found that NNECO informed C-E that the SUR trip had been physically removed, instead of being just removed from the Technical Specifications. NNECO had opportunities at the start of Cycles 2 and 3 to identify the removal of the SUR trip to C-E during the initiation of the cycle designs, but no evidence was found that this communication had actually occurred.

The actual safety significance of this event is low since no uncontrolled CEA withdrawal events occurred from a subcritical condition which would have required the SUR trip. The potential safety significance is high, in that if such an event had occurred, there is no assurance that fuel design limits would not have been exceeded.

As a result of this discrepancy in the safety analysis for Cycles 2 and 3 (1978 through 1980) for the Uncontrolled CEA Bank withdrawal event from subcritical due to the SUR trip removal, a review of the Westinghouse supplied safety analysis for Cycles 4 through 9 (1980 through 1989) was also performed. Westinghouse began supplying fuel for Millstone 2 in Cycle 4 (1980). At that time Westinghouse analyzed the Uncontrolled CEA Bank withdrawal event from subcritical in the Basic Safety Report (WCAP 9660). The Westinghouse supplied analyses did not credit the SUR trip. The Westinghouse supplied safety analysis indicated acceptable results for CEA withdrawal incidents from subcritical without the SUR Trip. The Westinghouse analysis uses the VOP Trip to terminate the event, with no fuel limit DNBR or centerline melt violations.

As a result of this discrepancy in the safety analysis for 1978 through 1980 for the Uncontrolled CEA Bank Withdrawal event from subcritical due to the SUR trip removal, a review of the Siemens Power Corporation (SPC) supplied safety analysis for Cycles 10 through 13 (1989 to present) was also performed. SPC began supplying fuel for Millstone 2 in Cycle 10 (1989) and the safety analysis for the current fuel cycle (Cycle 13) is supplied by SPC. The SPC supplied Safety Analysis does not credit the SUR trip. The SPC supplied safety analyses indicated acceptable results for "Uncontrolled Control Rod Assembly Withdrawal from a subcritical or low power startup condition" without the SUR Trip installed. The SPC analysis uses the VOP Trip to terminate the event, with no fuel DNB or centerline melt limit violations. It was SPC's intention to make this analysis bound Mode 2 and Mode 3 by using the most limiting parameters from either Mode as the input to this analysis. For example, the initial power level used in the analysis is 1E-9 of full power. However, as a result of the review performed associated with this event an error was discovered in this analysis. This review determined that non-conservative power peaking factors were used in the Siemens analysis of the CEA bank withdrawal event for

Modes 2 and 3. As a result, the analysis did not consider the increased radial and axial peaking factors for rod insertion to the power dependent insertion limits (PDIL's) allowed in Mode 2, and did not address the impact on radial and axial peaking factors from potential Mode 3 CEA bank withdrawal configurations. This error caused the CEA bank withdrawal analysis to not bound operations in Modes 2 and 3. This error existed for Cycles 10 through 13.

To correct this error, limiting radial and axial peaking factors were identified for potential Mode 3 CEA bank withdrawal configurations, and CEA bank configurations allowed by the Power Dependent Insertion Limits in Mode 2. The resulting limiting axial and radial peaking factors were then used in the corrected Rod Withdrawal analysis, which concluded that fuel limits for DNBR and centerline melt were still met. The safety significance of this error is low, since the fuel limits for DNB and centerline melt protection were still met for Cycles 10 through 13 after correction of the error.

Based on the completion of the revised Uncontrolled CEA Bank Withdrawal event from subcritical analysis, the VOP Trip provides fuel protection against exceeding DNBR or fuel centerline melt limits. This analysis includes CEA bank withdrawal events initiated from either Mode 2 or Mode 3 conditions. The revised analysis demonstrates that Millstone 2 can continue to operate without the SUR trip. A submittal to the NRC providing the updated analysis is planned. Also in this submittal to the NRC, NU will request NRC concurrence that it is acceptable to continue to operate without the SUR trip. This request will be made, since the original NRC approval for removal of the SUR trip prior to Cycle 2 was based on the premise that the SUR trip was solely an equipment protection trip. As discussed above, during Cycle 2 and 3 this was not correct, since C-E was implicitly crediting the SUR trip to prevent CEA Bank Withdrawal events from subcritical from becoming limiting.

IV. Corrective Action

As a result of this event, the following actions have been, or will be, performed.

1. Review the Cycle 3 C-E "ground rules" document to determine whether any other issues similar to the SUR trip that could have been improperly understood from Cycle 2 and 3. This corrective action will be complete prior to entry into Mode 4 from the current outage.

2. Modify procedures to send to the safety analysis supplier (typically the fuel supplier) a copy of all relevant Technical Specification amendments/NRC Safety Evaluation Reports that could reasonably affect the safety analysis, as they are received from the NRC. This will ensure that safety analysis suppliers are kept informed of the final determinations on Technical Specification changes. This corrective action will be complete prior to entry into Mode 4 from the current outage.

3. Update the Millstone Unit 2 FSAR Section 14.4.1 for the Uncontrolled CEA Bank Withdrawal event from subcritical/low power to reflect the revised SPC analysis. This corrective action has been completed.

V. Additional Information

Similar Events

LER 93-016: This LER identified the discovery of errors in assumptions for shutdown cooling flow rate used for the boron dilution accident analysis. The boron dilution event was reanalyzed for Modes 4, 5 and 6 using a maximum of two operable charging pumps when RCS cold leg temperature is less than 300 degrees Fahrenheit, and increasing the required shutdown margin requirement for operating Mode 5.

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LER 86-010: This LER identified the discovery of errors in assumptions for the CEA withdrawal from subcritical accident analysis. In particular, the error concerned the number of reactor coolant pumps assumed to be operating in operating Modes 3, 4 and 5. The CEA withdrawal from subcritical accident analysis was reanalyzed and a change to the Technical Specifications was approved by the NRC in April 1987.

LER 85-001: This LER identified the discovery of an error in core power distribution (axial shape index) assumptions for Small Break Loss of Coolant Accident (SBLOCA) analysis. The SBLOCA analysis was reanalyzed with the existing Technical Specification axial shape index limits and acceptable results were obtained.

LER 83-007: This LER identified the discovery of an error in assumptions in the Steam Generator Tube Rupture (SGTR) radiological consequences analysis. This error concerned the assumptions for using low steam generator pressure and the atmospheric dump valves in manual mode. The SGTR accident was reanalyzed using higher steam generator pressures and the atmospheric dump valve in automatic mode. Acceptable results were obtained.

Energy Industry Identification System (EIIS) codes

Control Rod Drive Mechanism - AA
Reactivity Control Systems - JD